The Measurement of Economic Development:

Alternative Composite Indices

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Declaration

I, the undersigned, hereby declare that the work contained in this dissertation is my own original work and has not previously in its entirety or in part been submitted at any university for a degree.

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ABSTRACT

The success of policies aimed at economic development cannot be monitored and evaluated without development indicators. These indicators are also crucial in comparing levels of development across time and space so as to come a greater understanding of the development process. Yet, economic development does not mean the same thing to everyone. As a result, there exists a variety of indicators of economic development. Five main classes of development indicators are distinguished on the basis of the shift over time in our understanding of economic development (Chapter 1). A distinction is drawn between indicators of national income and economic growth (Chapter 3), employment, unemployment and underemployment (Chapter 4), and poverty and inequality (Chapter 5). Social indicators (Chapter 6) and composite indices (Chapter 7) of economic development represent two futher classes of development indicators. These indicators differ in terms of their content, method and technique, comparative application, simplicity, clarity, focus, availability and flexibility. These main classes of development indicators are evaluated with reference to these dimensions of measurement which are described in detail in Chapter 2. There is no one indicator that can be described as an ideal, all encompassing measure of economic development, at least not in terms of its performance on these dimensions of measurement. Hence, the measurement of development remains imperfect, but nonetheless makes an invaluable contribution to the study of economic development. In fact, development studies will be impossible without access to such a variety of development indicators.

Given the importance of development indicators in development studies, two new composite indices of development are presented here to address two specific gaps

in indicator research. Indices of Human Security (HSIs) and Inefficiency ratios are developed to determine the extent to which countries have made progress on human security as defined by the UNDP (Chapter 8). Progress is assessed in terms of both effort and outcomes, as well as the extent to which efforts are actually translated into outcomes. Indices of Reconstruction and Development (RDIs) are employed to measure the extent to which the nine provinces of South Africa have made progress on the development objectives described in the Reconstruction and Development Programme (RDP) (Chapter 9). The measurement results suggest that there remain substantial disparities in progress on both human security and reconstruction and development. These new composite indices are also employed to determine those development characteristics associated with progress on human security and reconstruction and development. So, for example, disparities in human security are associated with certain urban and population dynamics, as well as communications capacity and infrastructural development. Progress on reconstruction and development is associated with lower population pressure, higher matric pass rates, less poverty and inequality, and more political representativeness at the provincial level. The RDIs also underscore the extent to which progress on the RDP has not materialised in rural areas. Furthermore, current provincial disparities in progress on reconstruction and development appear still to be indicative of the racial dynamics of development so characteristic of the Apartheid era.

OPSOMMING

Dit is onmoontlik om sonder ontwikkelingsindikatore die sukses van beleid wat gemik is op ekonomiese ontwikkeling te moniteer of te evalueer. Ontwikkelingsindikatore is ook onontbeerlik in die vergelyking van ontwikkelingsvlakke oor tyd en ruimte om sodoende 'n beter begrip van die ontwikkelingsproses te verkry. Ekonomiese ontwikkeling het egter nie dieselfde betekenis vir almal nie. Gevolglik bestaan daar 'n verskeidenheid van ontwikkelingsindikatore. Vyf hoofklasse van ontwikkelingsindikatore word onderskei op grond van verskuiwings oor tyd in die interpretasie van ekonomiese ontwikkeling (Hoofstuk 1). 'n Onderskeid word getref tussen maatstawwe van nasionale inkome en ekonomiese groei (Hoofstuk 3), indiensname, werkloosheid en onderindiensname (Hoofstuk 4), en armoede en ongelykheid (Hoofstuk 5). Sosiale indikatore (Hoofstuk 6) en saamgestelde indekse (Hoofstuk 7) van ekonomiese ontwikkeling verteenwoordig twee verdere groepe indikatore. Hierdie indikatore verskil in terme van hul inhoud, metode en tegniek, vergelykende toepassing, eenvoud, duidelikheid, fokus, beskikbaarheid en buigsaamheid. Hierdie hoofklasse van ontwikkelingsindikatore word geëvalueer met verwysing na hierdie dimensies van meting, wat in groter besonderhede in Hoofstuk 2 bespreek word. Daar is nie een indikator wat beskryf kan word as 'n ideale, allesomvattende maatstaf van ekonomiese ontwikkeling nie, ten minste nie in terme van die prestasie daarvan op hierdie dimensies van meting nie. Gevolglik is die meting van ekonomiese ontwikkeling onvolmaak, alhoewel dit 'n onskatbare bydrae lewer tot die studie van ekonomiese ontwikkeling. Om die waarheid te sê, ontwikkelingstudies sal onmoontlik wees sonder toegang tot so 'n verskeidenheid van ontwikkelingsindikatore.

Gegewe die belangrikheid van ontwikkelingsmaatstawwe in ontwikkelingstudies, word twee nuwe saamgestelde indekse hier aangebied om twee spesifieke gapings in navorsing oor ontwikkelingsmaatstawwe aan te spreek. Indekse van Menslike Sekuriteit (MSIs) en Ondoeltreffendheidsratio's word ontwikkel om te bepaal tot watter mate lande vordering gemaak het in menslike sekuriteit, soos definieer deur die UNDP (Hoofstuk 8). Vordering word gemeet in terme van sowel pogings en uitkomste as die mate waartoe pogings werklik in uitkomste omskep word. In Hoofstuk 9 word Indekse van Heropbou en Ontwikkeling (HOIs) gebruik om te meet tot watter mate die nege provinsies in Suid-Afrika vordering gemaak het in die bereiking van die ontwikkelingsdoelwitte wat uitgespel word in die Heropbou- en Ontwikkelingsprogram (HOP). Die metingsresultate dui daarop dat daar wesenlike ongelykhede bestaan in beide menslike sekuriteit en heropbou en ontwikkeling. Hierdie nuwe saamgestelde indekse word ook gebruik om te bepaal met watter ontwikkelingskenmerke ongelykhede in menslike sekuriteit en heropbou en ontwikkeling geassosieer word. So, byvoorbeeld, toon dispariteite in menslike sekuriteit 'n verband met sowel stedelike en bevolkingsdinamika as kapasiteit in kommunikasie en infrastruktuur. Vordering in heropbou en ontwikkeling word ook geassosieer met laer bevolkingsdruk, beter matrikulasieresultate, minder armoede en inkomste-ongelykheid, en wyer politieke verteenwoordiging op provinsiale vlak. Die indekse beklemtoon ook die mate waartoe vordering met die HOP nog nie in landelike gebiede gematerialiseer het nie. Verder wil dit voorkom asof huidige provinsiale ongelykhede in vordering met heropbou en ontwikkeling steeds kenmerkend is van die rasse-dinamika agter ontwikkeling wat so kenmerkend was van die Apartheidsera.

For my mother, who through unselfish sacrifice, has made this possible.

'The awareness that we are not capable of unveiling eternal truths may well give a sombre colouring to our work. But to me ephemeral is the destiny of all that is human, and we must reckon with this fact. It is not given to us to bid the stars to stand still, as did Joshua over the vale of Aijalon. Truth, like the daily bread, must be won each day anew, and in this task, as in all others, science and learning are but the mirror of life.' [Stark, 1952]

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Chapter 1

Introduction

1.1 THE DEVELOPMENT DIVIDE AND THE MEASUREMENT OF ECONOMIC DEVELOPMENT

The measurement of economic development has as its central focus the comparison of levels of development. In international terms, the current development divide between developed and developing countries is huge. According to the latest Human Development Report, developing countries represent about eighty per cent of the world population, yet produce less than a fifth of global economic output (UNDP, 1999: 34). Equally great disparities exist with regard to other aspects of economic development. By 1997, for example, more than 2.6 billion people lacked access to basic sanitation, more than 850 million adults were illiterate, approximately 840 million people were malnourished, and more than 1.3 billion people lived on less than one dollar a day, the majority of whom reside in developing countries (UNDP, 1999: 22). Similar development divides exist within most countries, either between regions or within certain regions in these countries. Consequently, the measurement of economic development remains central in any study of economic development.

This thesis, which deals with the measurement of economic development, has two main aims. Firstly, it entails an overview of existing development indicators. The main classes of development indicators are discussed in Chapters 3 to 7. The dimensions of measurement used to guide this analysis are related in Chapter 2.

The second objective of this thesis is to present two new composite indices of development. This measurement effort draws from the existing body of research on

indicator development. It is aimed at addressing two distinct gaps in current research on indicator development. The UNDP in 1994 propagated human security as a new, inclusive description of development. Yet, the UNDP has to date made no effort at actually measuring development with the aid of this conceptual framework. Chapter 8 presents an attempt at quantifying the extent of such *international disparities in human security*. The Reconstruction and Development Programme (RDP) has since 1994 been used as main reference on the development objectives of the South African government. Yet, to date there exists no summary measure with which to assess overall progress on the nineteen development objectives included in the RDP. Chapter 9 presents an attempt at quantifying the extent of *provincial disparities in progress on reconstruction and development*.

The thesis also attempts to come to a better understanding of the dynamics of progress in human security and reconstruction and development. Consequently, the composite indices of development presented in Chapters 8 and 9 are used to determine those development characteristics with which progress in human security and reconstruction and development are generally associated.

The aim of the discussions on welfare economics and the indicator movement presented in this introductory chapter is to further contextualise these two main objectives of the thesis. The measurement of economic development has as its central focus the comparison of levels of development across countries, regions, households and individuals. For this purpose, development indicators are used to determine for example whether the position of a country has improved, deteriorated or remained unchanged over time. Alternatively, indicators can be used to determine whether a country is relatively better or worse off than other countries.

Welfare economics has a similar objective, namely to assess the effects of policy interventions at the level of social welfare. The concern here more specifically

is with the assessment of the impact of development policy. Development indicators are used to determine whether development initiatives have actually improved the quality of life of individuals and societies. Hence welfare economics is central in explaining the rise of the indicator movement. An overview of development indicators such as that embarked on in these pages cannot therefore be complete without explaining the relation between welfare economics, development policy and indicator development. This is the aim of the first part of this introductory chapter.

An overview of existing development indicators also requires that the indicator movement be put into historical perspective. Alternative development indicators came to the fore as the meaning of economic development changed. These shifts in the meaning of development are used to identify those classes of measures discussed in Chapters 3 to 7. The idea, therefore, is not to present an in-depth discussion and critique of alternative theories of development, but rather to explain how the central thrust of the indicator movement evolved over time. Specific theories of development are referred to only where such discussion aids the explanation of the search for alternative indicators of development.

1.2 WELFARE ECONOMICS, DEVELOPMENT POLICY AND INDICATOR DEVELOPMENT

Welfare economics or normative economics, as it is also sometimes called, is concerned with the 'study of criteria for ranking alternative economic situations (as) better or worse' (Mishan 1981: 3)[1]. Boulding (1959: 8), Merriam (1968: 721) and Ng

[1] Welfare comparisons require value judgements, e.g. regarding the trade-off between equity and efficiency. Hence the tag of 'normative economics'. According to Mishan (1981: 3), the more historically correct term for welfare economics is political economy. Economics, in fact, originated from nineteenth century writings on political economy (Anderson, 1991: 42-47). Political economy is

(1979: 2) make similar points. Economics and development economics in particular have always been concerned with policies aimed at promoting social and economic improvements (Smithies, 1955: 1). Hence development policy and the need for measurement are central to welfare economics.

The earliest notion of welfare is based on the utility gained from the consumption of goods and services (Mishan, 1981: 116-121). According to Bentham (as quoted in Little, 1957: 6-14), satisfaction derives from the utility of objects. The happiness of society, moreover, depends on the satisfaction of its individual members. A distinction, though, must be drawn between welfare theorists who believe in the measurability of utility and those who do not. This distinction has also been described as that between utility theory as opposed to choice theory (Little, 1957: 29).

Walras, Marshall, Wicksell, Pigou and Robertson had faith in the measurability of utility. Pigou (1946: 23-42) measured utility in terms of income. According to him, money presents the best measuring rod of satisfaction. This old school of welfare economics defined the social optimum as the maximum sum of individual utilities (Little, 1957: 15).

Pareto, Robbins, Hicks, Samuelson and Arrow relied on ordinal notions of utility. They employed indifference curve analysis in their comparisons of welfare. This came to be known as the 'new welfare economics'. The reason they opted for ordinal utility was that they came to realise that utilities cannot be meaningfully added nor compared across individuals. The social optimum, they argued, would rather be where 'the highest level of satisfaction is reached' (Little, 1959: 6-15). Indifference curve analysis, moreover, allowed them to arrive at the same theorems as the old

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concerned not only with allocation and distribution but also focuses on the relative undesirability of phenomena such as unemployment (Mishan, 1981: 3).

school of welfare economics (Samuelson, 1955: 204-228; Little, 1957: 37; Burtt, 1972: 257-276; Roy, 1991: 172).

These basic premises of the 'old' and 'new' welfare economics imply different approaches to development policy and the measurement of development. The 'old' welfare economics presents an apt description of the earliest concerns in indicator development. The 'new' welfare economics is indicative of later developments in indicator research.

The 'old' welfare economics is concerned primarily with obtaining one specific outcome (i.e. maximum output) either by leaving things to the market or by applying a particular combination of fiscal and monetary policy. Progress towards this goal is measured with the aid of measures of national income and economic growth. These indicators are discussed in Chapter 3 (page 39).

The 'new' welfare economics recognises that the assessment of levels of social welfare is about trade-offs between different objectives. According to Little (1957: 84), 'any statement about how welfare (can) be increased, (has) to be qualified by a reference to whether the distribution of income would be favourably or unfavourably affected'. The choice, therefore, is not only about allocation but also about distribution (Mishan, 1981: 111-114). Government has to assess how different policies impact on welfare, at both the individual and the social level. To perform this type of assessment, one requires what Mishan (1981: 27) calls 'comparative criteria'. One such criterion is Pareto efficiency, which requires that a reallocation which increases total economic output makes everyone better off and no one worse off (Mishan, 1981: 7-9). This criterion matches Meier's (1995) definition of economic development. He defines economic development as a sustained increase in per capita income that is not accompanied by increases in poverty (Meier, 1995: 7-12). In the case of the 'new' welfare economics, development policy implies a multifaceted

approach aimed at achieving more than one outcome. A variety of development indicators is required to assess progress on these objectives. Proponents of the 'new' welfare economics also pay particular attention to the immeasurability of the utility derived from the consumption of goods and services. Hence measurement is not confined to monetary-based indicators of development as in the 'old' welfare economics. These alternative indicators of development are discussed in Chapters 4 to 7 of this thesis.

1.3 OVERVIEW OF THE INDICATOR MOVEMENT

An overview of existing development indicators requires a broad classification of such measures. According to Baster (1972: 5-6), there are two possible avenues for such classification. One can either group indicators according to the specific meaning the measure attaches to development, or according to the method used to devise the particular measure. There remains dissent amongst development economists both as to the meaning of development and the correct methodology of measurement.

The conceptual boundaries between indicators are vague and more value-laden than the methodological boundaries. In this sense, a methodological classification perhaps allows a clearer distinction between different indicators. Improvements, moreover, in technical expertise have contributed much to the indicator movement. Researchers have often borrowed from the existing body of indicator research in order to develop improved but not necessarily completely new indicators of development (Oster *et al.*, 1978: 3-20).

Yet, conceptual rather than methodological advance appears to be the driving force behind indicator development. According to Colman and Nixson (1994: 2-8), development indicators measure 'improvement ... with respect to some set of criteria

or values'. Measurement will continue to evolve as these values and criteria change, irrespective of whether such measurement entails the use of existing or new methodologies. In fact, similar methods are often applied to different concepts of development. A methodological classification, therefore, does not allow one to trace the history of the indicator movement.

The first question, therefore, is 'what' to measure. The answer depends on one's understanding of development. Only then can one proceed to ask 'how' measurement will be affected. Hence a classification of development indicators requires an understanding of the concept of economic development. The meaning of the concept has evolved continuously. There is a myriad of concepts of development, each of which focuses on certain aspects of economic development. Terminology such as growth, well-being, living standards, and quality-of-life are often used interchangeably with the concept development. Inequality and poverty, furthermore, are often considered synonymous with underdevelopment. Therefore, as Adelman (1975: 302-309) noted, it is necessary to conceptualise and to define exactly the meaning of development in any study of development economics.

In the following pages, five main classes of development indicators are identified. Each represents a distinguishable or recognisable group of indicators related to some specific and enduring concept of development. The classification conforms somewhat with that of Baster (1985) and Colman and Nixson (1994). Colman and Nixson (1994: 8-20) distinguish between purely economic indicators, distributional ones, 'green' indicators, and mixed indicators of development. Baster (1985: 28-34) differentiates between income-based and needs-based measures of well-being.

1.3.1 Indicators of national income and economic growth

The earliest notion of 'development' is that of improvements in aggregate output. This mirrors Adam Smith's and other classical economists' description of welfare as the accumulation of material wealth (Smithies, 1955: 6-7). During the 1940s, 1950s and early 1960s the emphasis was on growth-orientated strategies. Theoretical models like those of Rostow, Lewis and Harrod-Domar were most prominent during these years (Todaro, 1985: 63). Economic growth, industrialisation, and capital formation were viewed as the most effective ways of eradicating poverty and of improving standards of living (Lewis, 1955: 420; Mishan, 1977: 25; Lipton and Ravallion, 1995: 2554). The period 1950-65, for example, characterised by high growth rates, came to be referred to as the golden era of economic development (Adelman and Morris, 1997: 833).

Income and economic growth were measured in monetary terms. Social variables received little or no attention during these years (Zienkowski, 1972: 379-380). Aggregate income was calculated with the aid of national accounts. The rate of economic growth was derived from these estimates of aggregate income. Over the years, the measurement and comparison of income has been refined and standardised internationally through the implementation of the United Nations System of National Accounts (SNA) and International Comparison Programme (ICP). Since the 1980s, there has also been an increasing concern with 'greening' the national accounts (Costanza *et al.*, 1991: 7-15; Mitchell, 1996: 3). Rising environmental concerns encouraged a flood of developments in environmental accounting. These measurement efforts involved an adjustment of income-based measures of development, either by adding satellite accounts to the SNA or by adjusting estimates

of GDP/GNP. These indicators of economic development are discussed in Chapter 3 (pages 39 to 91).

There has since been a shift away from such sole preoccupation with income and economic growth. The reason was the apparent failure of sustained economic growth to eliminate income inequality and poverty in the developing world as it had done in the by-then-developed countries (Bartelmus, 1987: 347; Hulme and Turner, 1990: 3-7; Lipton and Ravallion, 1995: 2570). Opinions differ as to when exactly the focus in development economics shifted away from income and growth. Desai (1991: 351) and Schyns (1998: 3) claim that this doubt as to the sufficiency and desirability of economic growth had already settled by the late 1960s. Slater (1993: 105) and Bruno *et al.* (1998: 117) argue that it was only by the 1980s, the so-called 'time of disenchantment', that this shift took place. During this period, many developing countries were faced with an economic crisis, as they were plagued by inter alia declining growth rates and per capita incomes, increasing debt burdens, rising unemployment, and increasing income inequality (Bertrand, 1983: 90; Slater, 1993: 105-108).

1.3.2 Indicators of employment, unemployment and underemployment

During the 1950s and 1960s high economic growth rates were achieved on the back of capital-intensive growth in the manufacturing sector. Yet, growth in employment stagnated. Poor households, moreover, remained dependent on labour income for their livelihood (Lipton and Ravallion, 1995: 2591). Hence job creation was considered an important means of ensuring that more people would share in the benefits of economic growth (Smithies, 1955: 12-13; Streeten, 1979b: 29-30).

The 'big push' and 'leading sector' approaches to development exemplified this concern with unemployment. The argument behind the 'big push' theory was that economic growth and job creation could only be achieved through industrialisation. This required government to launch large-scale investment programmes and to become actively involved in education (Martinussen, 1997: 57). The 'leading sector' approach focused on the creation of jobs and the acceleration of economic growth through public works programmes in designated sectors, especially the housing sector (Van der Berg and Siebrits, 1993: 113).

As it became evident that the reasons for unemployment - the failure of labour markets to clear - were rather complex, the concern in measurement shifted beyond unemployment rates. These indicators of the labour market dynamics of economic development are discussed in Chapter 4 (pages 92 to 128).

1.3.3 Indicators of poverty and inequality

By the late 1960s distributional issues rose to the fore in the development debate. This happened amidst the neomarxist challenge and the continued failure of sustained growth to alleviate widespread poverty (Afxentiou, 1990: 78-87; Hoadley, 1981: 157-163; Krige, 1990: 53; Koretz, 1992: 12; Slater, 1993: 93). The economic crisis of the 1980s following on the oil shocks of the 1970s saw a temporary re-emphasis of growth (Griffen and Knight, 1989: 15). The concern with distribution, though, resumed in the late 1980s (Desai, 1991: 351).

Thus, poverty and inequality were the main concerns of development economists during the 1970s and much of the 1980s. Studies of poverty and inequality recognised the economic, social, political and physical causes of underdevelopment. These causes included lack of education and housing, poor

nutrition, lack of political enfranchisement, and inadequate access to capital and finance (Burkey, 1996: 3-25; Martinussen, 1997: 298-300). Yet, measurement efforts tended to focus exclusively on income in quantifying the extent of poverty and inequality (Kakwani, 1981: 21). These income-based indicators of poverty and inequality are discussed in Chapter 5 (pages 129 to 177). In later years, though, the concern in studies of poverty and inequality moved beyond income.

1.3.4 Indicators of basic needs fulfilment and human development

Poverty and inequality during the 1980s came to be associated with disparities in people's capability to take advantage of opportunities for development rather than disparities in their income (Mead, 1991: 3; Anand and Ravallion, 1993: 133-136; Sen, 1993: 30; Squire, 1993: 377). The focus now was on the fulfilment of people's basic needs and their potential for self-realisation. Drover and Korans (1993: 5-9) describe this as the shift from compensatory to empowering welfare. The work of Amartya Sen stands central in this regard. Sen was originally mostly concerned with the theory of minimum income and poverty comparisons. Later, though, he revised his definition of poverty and, in his theory on entitlements and capabilities, placed greater emphasis on access to public services (Sugden, 1993: 1951-1954).

A 1976 International Labour Organisation publication entitled 'Employment, Growth and Basic Needs: A One-World Approach', saw *the basic needs development approach* gain worldwide attention. The approach focused on 'the alleviation of the worst aspects of poverty by supplying a minimum standard of living to all persons' (Dixon, 1987: 130). This was to be achieved by fulfilling basic consumption needs such as nutrition and housing, as well as making available to people public services such as health care, education and sanitation (Hulme and Turner, 1990: 3-7; Krige,

1990: 53; Gernier and Majeres, 1992: 63). The fulfilment of these basic needs was an end in itself (Streeten, 1979b: 28; Streeten, 1994: 232-237; UNDP, 1997a: 1-2).

Ul Haq (1989: 258) heralded the *human development approach* as an entirely new and 'revolutionary' perspective on economic development. Its origins can in part be traced to the theory of human capital, which postulates that investment in human resources will see productivity and earnings rise (Marshall *et al.*, 1980: 263, as quoted in Barker and Backer, 1992: 104). The approach saw development efforts focus on the provision of educational and health care services to the poor in order to develop national human resources. The provision of public services was considered a means towards broadening people's choices and enhancing their potential (Ravallion, 1997b: 631; UNDP, 1997a: 1-2).

Central to both the basic needs and human development approaches was the provision of public services, be it as an end or a means. Both approaches recognised the human element of economic development. During the 1980s, therefore, indicator research was largely dedicated to the development of social indicators of development (Baster, 1972: 1-4; Bertrand, 1983: 89; Bartelmus, 1987: 347-350). This thrust in measurement was called the 'social indicator movement'. The UNDP's Human Development Report has become the international statistical flagship of the human development approach (Aturupane *et al.*, 1994: 244-246). The variety of social indicators used to assess progress on basic needs fulfillment and human development are discussed in Chapter 6 (pages 178 to 217). These two approaches, though, only hinted at the broad and multidisciplinary approach to development that was to be adopted by the 1990s.

1.3.5 Measuring the many facets of economic development

Possibly the most significant characteristic of the development debate is that over the years up to the 1990s a consensus evolved that development was not only about economics and sociology. Runciman (1966: 36-52) referred to this as the need to distinguish between the economic, social and political elements of development. Richard Stone (1986: 11), in his 1984 Nobel Memorial lecture, noted that the 'three pillars on which an analysis of society ought to rest are studies of economic, socio-demographic and environmental phenomena'. Bertrand (1983: 89-90) and Bartelmus (1987: 348-350) aired similar concerns. This multidisciplinary nature of the problem of underdevelopment became even more evident in the 1990s. Development economics now came face to face with issues such as democratisation, crime, HIV/AIDS, migration, environmental degradation and globalisation (Bracho, 1989: 123; Engel, 1990: 2; Goulet, 1990: 38; Costanza *et al.*, 1991: 9; Mead, 1991: 4; Thoma and Gheorge, 1992: 284; UNDP, 1994: 34).

A multidisciplinary perspective on development may be described as a so-called *total approach* to development. Such an approach recognises that development cannot be narrowed down to economic development. The interplay of all forces, economic, social, political, environmental and cultural, should be recognised (Ligthelm and Coetzee, 1984: 18; Meier, 1995: 3-6; Bhalla and Lapeyre, 1999: 4-28). Consequently, a variety of indicators are required to study the many possible paths to development success (Bracho, 1989: 123-130; Flexner, 1991: 16; Adelman and Morris, 1997: 839)[2]. Numerous social, environmental and political indicators of development, which will be discussed in Chapter 6 (pages 178 to 217), have been

[2] The United Nations Commission for Sustainable Development, for example, in its third session of April 1995 approved a framework for the measurement of sustainable development. The framework

developed. These indicators are also included in a variety of composite indices of development, which are discussed in Chapter 7 (pages 218 to 257). These measurement efforts heed Kakwani's (1981: 21) appeal that 'an ideal welfare measure should incorporate all the factors that contribute to welfare directly as well as indirectly'. The composite indices of development presented in Chapters 8 and 9 are based on a similar understanding of the meaning of economic development.

The indicator movement, therefore, over time surrendered its initial preoccupation with income and growth. Indicators came to include, amongst others, measures of unemployment, poverty and inequality, basic needs fulfilment, human development, and the overall quality of life (Rao, 1976: 93; Griffen, 1988: 6; Slater, 1993: 105-108). The focus in measurement moved away from command over resources towards opportunities for economic, social, cultural and political development (Oster *et al.*, 1978: 3-20; Arndt, 1981:457-466)[3]. Despite these many undercurrents in the indicator movement, measures of income and economic growth have remained the most prominent (Colman and Nixson, 1994: 20; El Serafy, 1995: 61-62), although Srinivasan (1994b: 238-239) disputes this.

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included a total of 130 economic, social, environmental and institutional indicators (UN Commission for Sustainable Development, 2000).

[3] This shift in focus is also reflected in the central themes of the respective Development Decades propagated by the United Nations. The First Development Decade (1960-70) highlighted the need for economic growth in LDCs (Nafziger, 1997: 10). The Second Development Decade (1970-80) saw the focus shift to the social aspects of development, i.e. 'treating development as a single process involving the transformation of a whole social system, of which economic activities ... are (only) a part' (Khan and Zerby, 1982: 130). In the decades since, the development concerns of the United Nations have shifted to issues such as sustainable development, the role of gender and international cooperation in development (UNESCO, 2000).

1.4 THE APPROACH OF THIS THESIS TO THE MEASUREMENT OF DEVELOPMENT

The lack of conceptual consensus regarding the meaning of development largely explains the proliferation of development indicators (page 6). Conceptual consensus, therefore, can go some way in enhancing the respectability of the measurement efforts described in Chapters 8 and 9 of this thesis. According to Engel (1990: 9-12), the absence of a 'shared or universal moral language in which to deliberate about the meaning' of development seriously hampers prospects for conceptual consensus.

A shared moral language on development requires a supreme moral principle to answer those questions central to moral philosophy (Gewirth, 1978: 3). The question as to what the 'good life' entails - which is central to measurement (page 6) - represents one such question. Such a principle would allow one to define development whilst adequately addressing issues regarding conflicts of interest and the prioritisation of needs. The *Principle of Generic Consistency* meets these requirements. It requires government (as the primary agent of development) to 'act in accord with the generic rights' of its constituents. These actions include both negative and positive obligations. Negative obligations are about creating a safe and stable environment within which others do not adversely affect any person's quality of life. Positive obligations are about assisting those without the necessary means to enjoy the desired quality of life (Gewirth, 1978: 135-271).

A similar but slightly different approach to the quest for a shared language of development is that of *moral rights*. If development objectives represent moral rights, development studies represent a kind of universal language for deliberating on development issues. According to Shue (1980: 13), a moral right refers to a rational

and justified demand for the guaranteed provision of certain basic conditions required to facilitate development. Shue (1980: 18-29) distinguishes between three types of moral rights. *Basic rights* represent a 'shield for the defenseless against at least some of the more devastating and common of life's threats'. These rights are considered preconditions for the fulfilment of other rights (Shue, 1980: 18). *Security rights* refer to those rights instrumental in guarding access to other rights. Their aim is the 'removal of the most serious and general conditions that would prevent or severely interfere with the exercise of whatever (other) rights the person has' (Shue, 1980: 22). *Subsistence rights* pertain to the provision of 'minimal economic security at least to those who cannot provide for themselves' (Shue, 1980: 24).

The development objectives included in the composite indices of development presented in Chapters 8 and 9 of this thesis all fit the Principle of Generic Consistency, or can be argued to represent moral rights. Hence the measures of development presented in this thesis are grounded in some shared moral language on development.

Section A

An Evaluation and Comparison of Existing Development Indicators

Chapter 2

Classifying and Evaluating Development Indicators

2.1 PURPOSE OF MEASUREMENT

The twentieth century has witnessed the rise of a wide range of development indicators. According to Streeten (1995: 28), this continued search for alternative ways to measure development contributes to the 'intellectual muscle therapy that helps to avoid analytical cramps'. These efforts in indicator research, though, differ in purpose. Rao *et al.* (1978: 6) describe this in terms of the variety of answers to the question as to 'who is supposed to receive what information and why this information is supposed to be relevant'. Baster (1972: 4-5), Kao and Liu (1984: 401), and Scott (1988: 83-86) distinguish between the following three main purposes of measurement:

Firstly, there is *description*, or in Scott's (1988) words, *monitoring*. Rao *et al.* (1978: 80-82) identified this as the main goal of measurement. Here the development indicator proposes simply to describe trends and diagnose either progression or retrogression in terms of certain facets of the development process (Kao and Liu, 1984: 401). The quest, therefore, is simply to present certain details on the phenomena under consideration. Pigou (1946: 3), in claiming that 'when a man sets out upon any course of inquiry, the object of his search may be either light or fruit', considers this light the 'knowledge for its own sake' resulting from such description. These descriptive indicators are also the key to comparative analysis (Baster, 1972: 4-5). This brings one to the next purpose of measurement, namely analysis.

Secondly then, measurement can be geared exclusively towards *analysis*. Kao and Liu (1984: 401) define this as the study of 'interrelations and trade-offs between various policies and activities'. The objective now is to explain differences resulting from the comparison of descriptive indicators, or to better understand the underlying causes and/or effects of these differences. In terms of Pigou's (1946: 3) 'object of ... either light or fruit', *analysis* represents the fruit, i.e. 'knowledge for the sake of good things to which it leads'. This implies that the fruits of analysis need to be utilised, which brings us to the third main purpose of development indicators.

Finally, indicators can be used for *evaluation* and *prediction*. Scott (1988) defines this as the purpose of planning. Measurement here focuses on the 'prediction of future trends or outcomes in order to better assess and evaluate the effectiveness and efficiency of development initiatives' (Kao and Liu, 1984: 401).

Thus, the three main purposes of measurement are very much interdependent. Although development indicators are often developed with only one of these goals in mind, description without analysis, and analysis without application or practical value, can be argued to be suboptimal in terms of utilising the full benefits of indicator development.

In terms of policy formulation and evaluation, this close association between the three elements of purpose is confirmed. Roxas (1989: 179) lays the primary emphasis on policy. According to him development indicators should at all times be 'operational in providing handles and performance indicators for managing and guiding the development process'. Thus, development indicators need to actually feature in decision making, e.g. directing policy on foreign aid (Beckerman and Bacon, 1966: 519; Veenhoven, 1996: 41). In this context, policy formulation and

evaluation are dependent on descriptive, analytical, as well as explanatory and predictive work in indicator development.

There are those, though, like Rao *et al.* (1978: 80-82) and Perthel (1981: 52), who claim that indicator development over time has witnessed a shift from one purpose of measurement to another. Earlier writers appear not to have readily recognised the inherent interdependence between the three purposes described here. These types of argument, however, may be confusing 'purpose' with some of the other dimensions of measurement (Table 2.1, page 21). Indicators are not 'timeless' measures and do change as the concerns of policy makers change (Baster, 1985: 23-28; Rose, 1995: 114) and as societies change and science develops (Rao *et al.*, 1978: 50-53). This implies more of a change in 'content' and 'technique and method' than in 'purpose'. Purpose, in fact, overlaps with all the other dimensions of measurement addressed here. For example, it influences data requirements (Scott, 1988: 83-86) and to some extent determines the focus, comparative application, methodological specifications, and availability of development indicators (Gans, 1971: 146-149; Rao *et al.*, 1978: 28-30). In the opinion of Rao *et al.* (1978: 92), purpose ultimately determines the appropriateness of development indicators.

There is also the question of how political and other factors influence indicator development efforts. Sachs (1995: 5), in terms of the purpose of measurement, asks 'what development, for whom and within what institutional structures'? Thus, the nature of the measurement effort depends on the social sensitivity of the author as well as the environmental, social, economic and cultural context of the particular analysis (Lind, 1992: 100; Sachs, 1995: 5-7). So, for example, the specific design of the UNDP's Human Development Index (HDI), with its exclusive focus on income and educational and health care outcomes, is often attributed to its resulting political

appeal in furthering certain causes. Gans (1971: 146) articulated this quite accurately, arguing that 'purpose is more than simply the formal hypothesis put forward (and that) it includes the writer's intellectual and political aims'.

2.2 FRAMEWORK FOR CLASSIFICATION AND EVALUATION OF DEVELOPMENT INDICATORS

One can classify and evaluate development indicators according to a number of general dimensions of measurement (Table 2.1, page 22). Although these dimensions do not fully address all the methodological and conceptual issues involved in measurement, they do present a useful framework for distinguishing between different types of development indicators. The focus here is on a general comparison of development indicators in terms of certain broad parameters rather than a discussion of issues relating to specific types of measurement. These types of specifics, e.g. the selection of variables in composite indexing or determination of Purchasing Power Parity (PPP) for income comparisons, will be elaborated on in a detailed discussion of existing indicators in subsequent chapters.

The call for such a framework for classifying and evaluating development indicators is not new. Drewnowski (1972: 77) claimed that one requires some 'ordering principles for the selection of useful indicators and rejection of ill-conceived and inapplicable ones'. Wish (1986: 97-98) similarly argued that 'indicators require a systematic rationale for categorisation'. These dimensions, however, are not always mutually exclusive, but often overlap and/or are interdependent. In each case the nature of this overlap or interdependence will be related in the subsequent discussion.

Finally, the sequence in which the dimensions are presented here should not be seen as denoting their relative importance.

Table 2.1: General dimensions for classifying and evaluating development indicators

Dimension	Description
1. Content	What aspects or facets of economic development does the indicator measure?
2. Technique and method	Does the indicator measure economic development in a quantitative (qualitative), objective (subjective), cardinal (ordinal), or uni-dimensional (multi-dimensional) manner[4]?
3. Comparative application	Does the indicator compare the level of economic development (a) across space ('cross-section') or time ('time-series'), (b) at an individual, household, regional, national, international, or other level of measurement, and (c) in an absolute or relative manner?
4. Focus	Does the indicator measure economic development in terms of input ('means') or output ('ends')?
5. Clarity and simplicity	How clear and simple is the indicator in its content, purpose, method, comparative application and focus?
6. Availability	How readily available are data on the particular indicator across time and space?
7. Flexibility	How relatively flexible is the indicator in allowing for changes in content, purpose, method, comparative application and focus?

2.2.1 Content of development indicators

The first question one needs to answer when wishing to classify any measure of development is what aspect of development the indicator measures. The conceptual framework stands central in this regard. This relates to the meaning of development in the particular analysis. Development indicators tend to differ according to the different views on the meaning that individual researchers ascribe to development (Baster, 1985: 38-43). Conceptual diversity to a large extent explains the development of such a myriad of indicators. Historically, the semantics of development have evolved as the focus of development policy and also the values of

[4] The distinction between uni-dimensional as opposed to multi-dimensional measures refers to the difference between indicators individually measuring one particular component of development (e.g. the unemployment rate) as opposed to indicators combining a number of individual indicators into one composite (e.g. the Human Development Index) (page 27).

policy makers have changed. Perthel (1981: 46) argues that this is the prime reason why we have seen a shift from economic to socio-economic indicators since World War II.

The content of development indicators is also often related in terms of the number of dimensions of the development process the particular measure covers. As the focus of development economics over the years shifted from growth, to unemployment, to poverty, to basic needs - and more recently still - to a growing environmental concern (Chapter 1, pages 6 to 14), the shift has been away from a one-dimensional towards a more multi-dimensional approach to the measurement of development. Wilson and Woods (1983: 12-14) and Kao and Liu (1984: 401) accordingly argue that due to the complex nature of the development process, any useful indicator needs to reflect more aspects or facets of the development process than it measures directly. Drewnowski (1974: 35-37) defines this requirement as 'comprehensiveness'. Perez (1989: 207-214) defines it as the need for a holistic approach to indicator development, i.e. combining global and national-specific elements in measurement. Fischer-Kowalski *et al.* (1993: 475-487), furthermore, emphasise the need for development indicators to be acceptable to scientists from a variety of disciplines. These arguments all confirm the need for a multidisciplinary approach to measurement. Multidimensional indicators, though, require a careful approach to empirical design (Erikson, 1993: 67-83; McGranahan, 1995: 55-56), an issue to be elaborated on in subsequent pages.

Indicators can accordingly be broadly grouped into any number of categories based on content, e.g. income, welfare, poverty and quality-of-life. The detailed discussion of existing development indicators in Chapters 3 to 7 is presented in terms of the major groups of development indicators identified in Chapter 1 (pages 6 to 14).

Drewnowski (1972: 85-86) claims that the need for consensus on a conceptual framework remains crucial in indicator research. Baster (1985: 38-43) and Wish (1986: 97-98) air similar concerns, arguing for better attempts at an agreement on conceptual content. Yet, the grounds on which such consensus rests, e.g. being based on the overlap of variables across studies, the results from questionnaires, or empirical techniques such as multivariate, principal component or discriminant and factor analysis, are not always that clear. This issue also overlaps with the dimension of 'technique and method'. To Morgan (1968: 39), though, the requirement is for conceptual clarity in measurement rather than conceptual consensus. Therefore, as Veenhoven (1996: 41) puts it, a 'useful' indicator needs to be one that theoretically is 'well interpretable and measures a clear phenomenon that represents a specific concept in a comprehensive way'. A clearly articulated conceptualisation of development can keep measures from being made out to be based on a 'subjective development' of indicators (Apthorpe, 1985: 47-60).

2.2.2 Technique and method of measurement of development

Without going into the specifics related in the following chapters, the varied techniques and methods employed in indicator development can be classified according to four often-made general distinctions in measurement. These, in essence, are the most general ways in which to answer the question of how one measures the particular facets of development for the specific purposes identified in the previous paragraphs. To Apthorpe (1985: 47-60) such distinctions are necessary in order to 'keep the theoretical and technical foundations of different indicators in mind when evaluating them'. Whynes (1974: 89), furthermore, argues that the existence of such

a variety of techniques alone justifies such an overview of development indicators according to technique and method.

The first general distinction is between a *qualitative* versus a *quantitative* approach to measurement. This respectively entails the measurement of the relative goodness or worth of the attributes or characteristics of development as opposed to the measurement of the facets of development in terms of numbers. Whereas some measurement efforts are characterised by an either-or attitude, others have been calling for an integrated or balanced approach. So, for example, Sachs (1995: 5-7) argues that quantitative measures can be complemented by qualitative ones where necessary. Such an integrated approach requires the results to be compared across different techniques and methods in order to better evaluate the outcome in terms of validity and robustness (Kravis *et al.*, 1975: 1-16).

Secondly, development indicators are also often classified according to the relative degree of *objectivity* or *subjectivity* in measurement. According to Apthorpe (1985: 47-60), this in turn refers to the extent to which one measures development using external evaluation ('observer ratings') or self-evaluation ('questionnaires'). External evaluation, though, is often subject to subjectivity. Observer ratings, for example, are usually dependent on the observer's own perceptions and opinions of the particular issue involved and the objects and/or subjects being observed. Thus, development indicators based on external evaluation can only remain objective insofar as measurement is 'free from circumstantial distortion or manipulation' and based on the 'autonomous professional handling' of observations (Perez, 1989: 207-214).

As was the case with quantitative and qualitative indicators, there have been some calls for the integration of objective and subjective practices in measurement.

Wish (1986: 97-98), Allardt (1993: 88-94), and Diener and Suh (1996: 206-210) claim that good indicators should combine external evaluation with self-evaluative techniques. Perez (1989: 207-214) and Ul Haq (1989: 249-253), furthermore, call for decentralised measurement, i.e. a greater involvement by communities in measurement, and the development and evaluation of development indicators. In terms of Apthorpe's (1985) above-mentioned distinction between objectivity and subjectivity, the mainstream of indicator research is characterised by an either-or attitude. Some analysts prefer questionnaire surveys for measurement (e.g. using census results in estimating unemployment rates). Others extol the virtues of external observation of impersonal phenomena (e.g. counting the number of hospital beds in evaluating service delivery in health care). It is, however, rather a case of some aspects of the measurement technique being relatively objective or subjective. So, for example, the gathering of data using self-administered questionnaires may be considered subjective. Yet, the sample selection and analysis of the survey data are usually performed with the aid of relatively objective statistical techniques. In this sense, one should refrain from classifying methods and techniques as per definition being subjective or objective.

Thirdly, development indicators can be classified in terms of the scale of measurement, i.e. *cardinal* versus *ordinal* measurement. Whereas cardinally-scaled indicators indicate the magnitude of the difference between two or more entities, ordinal indicators reflect relative rankings only (Whynes, 1974: 89). The use of the former type of measurement obviously enables one to do ordinal rankings as well, although ordinal scales cannot also be used as cardinal measures. Care needs to be taken in understanding that cardinal measures reflect the magnitude of differences whilst simultaneously allowing meaningful interpretation of these differences, e.g.

individuals on average earning $300 more in country A than in country B on the basis of per capita estimates of GDP. Measures that do not facilitate both quantification and meaningful interpretation of differences between entities are ordinal, e.g. the difference between country A and B on the Human Development Index (HDI) being .024.

Finally, Rao *et al.* (1978: 88) classify the construction methods used in indicator development as generating either *simple* (uni-dimensional) or *combined* (multi-dimensional) indicators. It represents either the extent to which the particular method caters for a uniform measurement of one specific aspect of the development process, or whether it involves a combination of a number of different measures of individual facets of development into a single or composite indicator. In the case of the latter, the selection of indicator components and their weighting and combination require a careful investigation on validity and international comparability (McGranahan, 1995: 55-56), an issue to which we return in Chapter 7.

It is worth noting that these four dimensions of measurement techniques do not necessarily stand in a fixed relation to one another. Thus, one can, in the measurement of development, employ methods and techniques characterised by any possible combination of these four dimensions. Composite indices of development best illustrate this. Ultimately, these indices represent any number of uniform measures of development combined into an ordinal measure using quantitative (but often equally subjective) techniques. The uniform measures included in the composite index usually represent indicators measured with the aid of a variety of qualitative, quantitative, objective, subjective, cardinal and ordinal techniques.

In the case of all four of these general dimensions of measurement techniques one can distinguish a number of statistical parameters often used in the empirical

evaluation of development indicators. These include, amongst others, validity, sensitivity, discriminant power, statistical significance, autocorrelation, multicollinearity, robustness, comparability, the overall accuracy and reliability of data, and the degree of over- or underreporting (Rao *et al.*, 1978: 92; Scott, 1988: 83-86; Lind, 1992: 92-94; Alberti *et al.*, 1994, as quoted in Sachs, 1995: 5-7; Diener and Suh, 1997: 192-200). Validity itself, for example, is further subdivided in terms of content, temporal, substantive, discriminative and concurrent validity (Lind, 1992: 92-94; Diener and Suh, 1997: 192-200; Veenhoven, 1996: 41-45). Given the improved coverage and high level of development of international data bases, these parameters have perhaps featured less in more recent literature on indicator development. Measurement efforts today employ available data rather than devising new data bases (Fischer-Kowalski *et al.*, 1993: 475-487). The extent to which these statistical parameters feature in the evaluation of specific types of development indicators will become evident in the next chapters.

As mentioned elsewhere, the choice of technique and method in indicator development does not meaningfully stand apart from the other dimensions of measurement described here. Baster (1972: 4-5), on the one hand, argues that 'method' is primarily determined by 'purpose'. Purpose, in fact, has been argued to be the factor determining the choice or outcome as to all the other dimensions of measurement (page 20). Erikson (1993: 67-83), on the other hand, claims that the 'focus' of measurement, to which we subsequently turn, determines 'technique'. There is also truth in arguing that 'technique' may be employed in establishing consensus as to 'content' (page 24).

As for 'comparative application', some techniques may be more suitable than others in measuring development at certain levels across time or space.

2.2.3 Comparative application of development indicators

A third central concern in the measurement of development is the manner in and level at which indicators attempt to make comparisons. Firstly, there is the question as to when the comparison is made. There are two possibilities here. An indicator can compare development across space or time. This entails respectively the measurement of the *level* of development at some particular point in time (cross-section analysis) or of *changes* in this level over time (time-series analysis) (Drewnowski, 1972: 80-83; Erikson, 1993: 67-83). Efforts in indicator development do not lean towards any one of the two approaches in particular. Kravis *et al.* (1975: 17-25), for example, put particular emphasis on intertemporal comparison, whereas Roxas (1989: 179) argues for a simultaneous measurement of both levels and also of changes in levels of development.

Secondly, there is the question as to the level at which comparison takes place. For Kuznets (1966: 16) this represents the first step in the measurement process, i.e. choosing the basic unit for grouping and analysing evidence. One can distinguish between indicators measuring development at an individual, household, regional, national and international level (Wish, 1986: 97-98).

A third aspect of comparative application entails the choice as to whether development will be measured in absolute or in relative terms at that particular level. Whilst 'absolute' indicators measure development independently of anything else, 'relative' indicators measure development in relation or proportion to something else, usually a predetermined standard or level of development enjoyed at the same or at a higher level. So, for example, regional levels of development are often expressed in terms of their relation to nationally or globally achieved ones. As Streeten (1995: 34-

35) rightly points out, this also in each case entails a choice as to whether to include the 'productive' or 'unproductive' members of society, or in more familiar terms the economically active or total population, in the measurement effort.

Closely related to comparative application, is the issue of disaggregation. Arguments in favour of disaggregation imply that one should be able to apply development indicators across space by means of the necessary adjustments. So, for example, Kravis *et al.* (1975: 17-25) and Bracho (1989: 123-130) argue that one requires measures that are disaggregable by sex, age, geographic area, and other economic and social parameters in order to illustrate the distributive dimensions of economic development. Disaggregation is also crucial in adequately explaining the results of comparative analysis at various levels of measurement, e.g. the household, the regional and the national level. This, as Rose (1995: 114) points out, is equally important in terms of both intra- and inter-country comparisons, not only to narrow the gap between LDCs and developed countries, but also to address specific national developmental issues. This contradicts Perthel's (1981: 52-53) claim that intra-country comparisons have become more important than inter-country comparisons. A balance needs to be struck between the usefulness of summary measures and the need for disaggregation. Ideally, summarisation should not 'obscure information on major facts' useful in explaining differences across units or levels of measurement (Rao *et al.*, 1978: 92; Baster, 1985: 23-28).

Comparative application overlaps with a number of the other dimensions of measurement. Firstly, there is the overlap with 'purpose'. Comparison is an important element in description, analysis and evaluation. Rao *et al.* (1978: 9-27) define this in terms of the choice of measuring the current situation, differences in patterns, the connections between these differences, or to enhance the recognition of

interdependencies. Whilst cross-sectional analysis may suffice for descriptive and analytical purposes, time-series analysis is indispensable in building models for forecasting and evaluation purposes. 'Absolute' measures, furthermore, may be more apt for description and 'relative' ones for analysis. Purpose of measurement, therefore, significantly influences comparative application in measurement.

Secondly, comparative application overlaps with 'content'. 'Content' features in the sense that intertemporal measurement requires continuity in conceptual definition (Scott, 1988: 83-86). Morris (1979: 20-40) emphasised the need for international comparative indicators. International comparisons, however, need to be made across similar countries (Rose, 1995: 114) within a relatively comparable conceptual framework (Whynes, 1974: 105-107). This need for contextual and conceptual comparability applies equally to comparisons across other levels of measurement.

In the third instance, 'technique and method' cannot be divorced from comparative application. All methods of measurement may not be equally suited to comparisons across time and space (Drewnowski, 1972). So, for example, an objective, quantitative and cardinal method may deliver better results for comparative purposes both across time and space. Alternatively, a subjective, qualitative and ordinal method per definition makes it more difficult to fully appraise differences in the indicators. Comparison, furthermore, requires methodological consistency across both time and space, as well as levels of measurement (Whynes, 1974: 105-107).

Finally, indicator availability can differ substantially across comparative levels of measurement, depending on the availability of information required for indicator development (Rose, 1995: 114; Ul Haq, 1995: 50-54). Problems with regards to the availability of data over time can limit the possibility of constructing time-series

indicators, as can limited availability over space in the case of cross-sectional indicators.

2.2.4 Focus of development indicators

Next, one can distinguish between indicators focusing on inputs into as opposed to outputs resulting from the development process. This is similar to the distinction between the measurement of means to achieve objectives *versus* objectives themselves (Stewart, 1985: 2), or people's command over resources *versus* the degree to which needs are actually being met (Erikson, 1993: 67-83). Streeten (1995: 34-35) asks whether 'people (are) simply the passive targets of development policy' or whether 'they (are) active participants determining the actual level of development'. The former implies that one should readily be able to assess the results of development initiatives based on the nature of the inputs therein. In this sense, the focus in measurement would be on means. The alternative view, however, assumes that actual results are dependent on the way in which people use these inputs. Since the nature of this interaction between inputs and their users differs considerably according to circumstances, the relation between means and ends is not that clear-cut and the focus in measurement is on output. This therefore implies a focus in measurement on means ('input') as opposed to ends ('output').

There seems to have been a shift in indicator development towards an emphasis on ends rather than means (Drewnowski, 1974: 35-37; Richards, 1982: 1-14). According to Baster (1985: 23-28), the focus has shifted away from income indicators towards development indicators measuring the actual level of living. This has been the result of the delivery of general means such as income often failing to

achieve the desired results in terms of welfare. Yet the measurement of means, be it in terms of income or some other indicator of access to resources and opportunities, remains important in evaluating the success of development initiatives in terms of both means and ends (Baster, 1985: 23-28).

The focus of measurement has important implications for some of the other dimensions of measurement identified here. Firstly, as far as 'content' is concerned, some facets of economic development present *means* and others *ends*. So, for example, indicators measuring economic development in terms of per capita income and budgetary allocations are more concerned with means because monetary resources are only means to certain ends. Unemployment and inequality measures also fall into this category. Whilst job opportunities may ensure people of an income to allow them to meet certain ends, inequality measures only present estimates of the distribution of means such as income. On the other hand, indicators concerned with basic needs fulfilment and public service delivery focus more on the ends of economic development. Some indicators, furthermore - notably poverty measures - attempt to link means and ends in measurement, e.g. relating certain minimum consumption requirements to income levels.

In the second instance, according to Sen (1979: 1-3), 'focus' is sensitive to 'purpose' in that the different approaches to inquiry attempt to answer different questions. Ideally, though, thorough monitoring, analysis, evaluation and prediction require the simultaneous measurement of both means and ends since the two interact to determine the actual level of economic development.

Furthermore, in terms of choice of 'technique and method', 'focus' also plays a role, since some methods may be more suitable for measuring means and others for ends. So, for example, self-evaluative techniques may better represent society's

perceptions about the actual achievements of economic development than externally-based ones. This will be more so where the development objectives that the particular community puts a premium on differ from the development objectives guiding decision-making in the public sphere.

2.2.5 Clarity and simplicity of development indicators

Another general criterion for 'good' measurement relates to clarity and simplicity (Drewnowski, 1974: 35-37). This requirement, in the first instance, implies *conceptual* clarity. According to Morris (1979: 3-5), some development indicators floundered because they were too complex and attempted to capture everything about the development process simultaneously. Thus, conceptual clarity is important not only in clearly identifying the content or meaning of the indicator, but also in improving methodological clarity and simplicity in allowing for a clearer interpretation of the said indicator. In other words, it is easier to decide how to measure something once you know exactly what you are measuring. Bracho (1989: 123-130) sees this as the need to 'demystify' development indicators by avoiding unnecessary academic jargon.

Secondly, a substantial part of the literature on indicator development has focused on the need for *methodological* clarity and simplicity. 'Good' methodology, according to Streeten (1995: x), requires simplicity in terms of the construction, presentation and interpretation of development indicators. As far as construction goes, Perez (1989: 207-214) argues that indicators should not require too sophisticated a methodology or statistical data base. With regard to presentation and interpretation, Erikson (1993: 67-83) notes the importance for indicators to clearly

present the overall picture in terms of the measured content of economic development. This requirement of clarity and simplicity in construction and interpretation is particularly evident in the literature on composite indicators. The argument is that such indicators should not include so many subcomponents as to make them unmanageable and/or difficult to interpret (Ul Haq, 1995: 46-48). This implies an inherent need for conceptual clarity and methodological simplicity.

The resulting benefits of methodological clarity and simplicity include the availability of a set of simple, cost-effective, operational and practically useful indicators (Bracho, 1989: 123-130; Alberti *et al.*, 1994, as quoted in Sachs, 1995: 5-7). It may, furthermore, improve the possibilities for an expansion in application of such measurement across time and space (Perez, 1989: 207-214). Interpretive and conceptual clarity may also prove beneficial in enabling indicators to be more credible in terms of public opinion (Roxas, 1989: 179). These benefits are particularly important given the resource and time constraints often faced in indicator development (Bracho, 1989: 123-130).

Finally, clarity and simplicity in indicator development require that the purpose, comparative application, and focus of measurement be clearly demarcated.

2.2.6 Availability of development indicators

The question here is how readily available the information for particular development indicators is across time and space. Drewnowski (1974: 35-37), Rao *et al.* (1978: 92) and Scott (1988: 83-86) list timeliness and frequency as important criteria for evaluating the availability of development indicators. Bracho (1989: 123-130) takes this one step further, arguing for the regular release of reports on

development indicators to the mass media to allow widespread discussion as to the relative merits and/or drawbacks of the particular indicator(s).

Availability, on the one hand, is dependent on 'content' and 'technique and method'. The historical shift in the central concerns of economic development has meant that not all development indicators are equally available across time and space. Continuous improvements and further developments in methodology, similarly, imply that indicators are not always equally available across time.

On the other hand, availability to some extent influences the choice or outcome in measurement as to 'purpose' and 'comparative application'. Analysis, prediction and evaluation require relatively good data coverage across time and/or space. With regards to comparative application, the availability of data influences the choice of level of measurement, e.g. confining analysis to a regional rather than to a household level. Finally, as far as comparisons across time and space go, intertemporal measurement presumes relatively good coverage across time, whereas cross-sectional efforts require relatively good coverage across space.

2.2.7 Flexibility of development indicators

Flexibility, according to Drewnowski (1974: 35-37), needs to be emphasised as a separate criterion for a 'good' development indicator. Flexibility here encompasses the particular indicator's ability to accommodate changes in the other dimensions of measurement. Richards (1982: 1-14) and Perez (1989: 207-214) identify this criterion as the need for dynamism in measurement. 'Dynamism' represents the ease with which the particular development indicator over time can be adapted to allow for (a) changes in the views on the meaning of economic

development, and (b) new developments in measurement techniques and the expansion of statistical data bases (Perez, 1989: 207-214). Streeten (1995: xii) defines the former requirement as flexibility in measurement in terms of allowing for changes in the focus of development initiatives. Thus, as Ul Haq (1995: 46-48) puts it, development indicators can be evaluated in terms of the relative degree to which they have allowed past and can possibly accommodate future adjustments in technique, methodology, concept and other dimensions of measurement as the measurement process becomes more refined and/or theoretical and conceptual points of reference shift. So, for example, conventional measures of income, such as GDP and GNP, were relatively inflexible in allowing for the changing scope of economic development. Composite indicators, though, are more flexible, given that their components can be changed so as to reflect the increasing socio-economic and environmental focus in development economics. This, however, comes at the cost of comparability (pages 29 to 32).

2.3 CONCLUDING REMARKS ON CLASSIFYING AND EVALUATING DEVELOPMENT INDICATORS

Development indicators can be classified and evaluated in terms of the seven dimensions of measurement presented in Table 2.1 (page 21). Such evaluation of existing development indicators, grouped in terms of the nature of their general 'content' and ordered in relative historic perspective according to the groupings identified in Chapter 1, follows in Chapters 3 to 7 in order to gain a greater understanding of the current status of the measurement of economic development. Note that there is no necessarily 'ideal' or 'correct' answer to each of the questions

posed in Table 2.1. Particular development indicators, rather, will each yield a unique set of answers. Nor can one expect any particular indicator to simultaneously meet all these criteria equally well, as was pointed out in discussions on the overlap and interdependence between these dimensions. This overlap and interdependence seems to have increased as indicator development witnessed more coordinated and integrated efforts in measurement (Baster, 1985: 23-28).

Chapter 3

Indicators of National Income and Economic Growth

3.1 SCOPE OF THIS CHAPTER

Estimates of national income per capita and economic growth rates to date remain the most widely used indicators of economic development. The World Bank and IMF, for example, employ measures such as real GNP per capita in order to distinguish between low, middle and high-income economies. These indicators are discussed here in terms of the different dimensions of measurement identified in Chapter 2. This discussion is preceded by a brief overview of the history of national accounting. Reference is also made to the major reporting frameworks used in estimating and comparing national income.

3.2 BACKGROUND TO NATIONAL ACCOUNTING AND INTERNATIONAL INCOME COMPARISONS

The foundations of national economic accounting can be traced to Petty (1623-87), Quesnay (1694-1774) and Colbert (1619-83) (Gross, 1966: 12-23; Bos, 1997: 173-174). Paul Studenski in his 1950s classic *The Income of Nations* presents an overview of this early history of national accounting. So, for example, efforts at estimating national income for Germany and India were respectively attempted as

early as 1805 and 1857 (Kendrick, 1994: 457-459). Economists such as Marshall (1842-1924) and Keynes (1883-1946) also contributed to formulating the framework within which national income and other economic accounting identities are defined today (Gross, 1966: 12-23; Bos, 1997: 173-174). Stone (1941, as quoted in Kendrick, 1994: 457), however, was the one who drafted the basic national accounting framework which became the foundation of modern national accounts. The Great Depression, World War II and postwar reconstruction and expansion, by inducing a greater need to quantify development efforts, provided further impetus to the refinement of national economic accounting (Gross, 1966: 12-23; Beckerman, 1968: viii). The accounts fulfil a dual purpose. National accounts provide economists with a useful tool for analysing and predicting changes in economic activity, whilst at the same time describing the magnitude of economic activity in terms of aggregates such as GDP (Marin, 1978: 415). These, in fact, include the main aims of measurement described in Chapter 2 (pages 18 to 19). The empirical advances of the 1970s and the advent of globalisation during the 1980s (Rao and Salazar-Carrillo, 1988: 19) heralded a further proliferation of comparative analyses of income and growth.

In terms of presenting an overview of these efforts, one needs to distinguish between theoretical foundations and empirical application. The measurement and comparison of national income and/or output were originally born from theoretical arguments presented by the likes of Pigou (1929) and Hicks (1940). Efforts at compiling income data involve the practical application and refinement of these theories. Most notable of the early efforts at comparing income, prices and output across nations were Kuznets (1954), Gilbert and Kravis (1954), Clark (1957), and Gilbert *et al.* (1957). Those of Kuznets (1954) and Clark (1957) stand apart from the others in that they compare income for a much larger sample of countries, i.e. fifty-

three and forty-three countries respectively. The other two efforts focused on comparisons between the handful of developed economies of Western Europe and the United States. This narrow focus can be explained in terms of the nature of the institution sanctioning and financing these efforts, i.e. the then Organisation for European Economic Cooperation (OEEC). Understandably, therefore, the focus was not drawn much further than Western Europe and the US, which at the time presented the only other really advanced economy as well as major trading partner of the Western European nations.

Today a number of standardised reporting frameworks are used in estimating and comparing national income. Most notable of these are the United Nation's System of National Accounts (SNA) and International Comparison Programme (ICP). Another is the Penn World Tables (PWT) based on the work of Kravis *et al.* (1978). The PWT employs both ICP and SNA statistics (Summers and Heston, 1991: 334). Social Accounting Matrices (SAMs) and National Resource Accounts (NRAs) are also at issue. These two type of accounts are often used in conjunction with conventional national economic accounts. The 1993 SNA, in fact, includes separate chapters on both SAMs and natural resources accounting (NRA). Both are listed as satellite accounts on which participating countries can voluntarily report. In essence, SAMs and NRAs were developed to deal with the inability of the conventional economic accounts to provide broader estimates of welfare, i.e. estimates of welfare not confined to the strict monetary boundaries of the conventional SNA (Van Heemst, 1985: 91-112; Mamalakis, 1996: 295). The central question, therefore, is what these accounting frameworks do that the SNA in its current format does not. Answers are posed to this question after briefly relating the nature of SAMs and NRAs. First, though, the SNA, ICP and PWT are brought into clearer perspective.

3.2.1 The United Nation's System of National Accounts (SNA)

The SNA was developed in order to provide a framework for the measurement of national income and economic growth rates across nation states[5]. GDP remains the most important of the national account aggregates (Harrison, 1990: 343; Reich, 1991: 242). An equally familiar economic indicator derived from the national accounts is GNP (Geary, 1973: 224, 239). The first edition of the SNA was based primarily on national economic accounting as it existed in the United States at the time. Accounting in the United States had its roots in the conceptual and empirical work done earlier this century, as well as in inputs by the likes of Kuznets, Gilbert, and Jaszi (Juster, 1973: 27-28).

The SNA only became a regular statistical series after World War II (Heston, 1994: 29-32). The first UN report on international guidelines for national acccounting were published in 1947 (Kendrick, 1994: 459). Richard Stone, the father of national accounting (page 40), was primarily responsible for this effort (Geary, 1973: 221). The first complete series of national accounts was published in 1953 as a set of six accounts recording the main economic flows relating to production, consumption, accumulation and external trade (Ruggles, 1994: 77-79). Its main purpose was to provide a 'uniform basis for reporting national income statistics' (Ruggles, 1994: 77).

[5] The SNA not only allows one to estimate aggregate levels of income; it also presents in detail the division of aggregate income into some of its main subcomponents, e.g. consumption, investment and government expenditure, as well as other identities embodied in national accounting frameworks (Gross, 1966: 14). In this sense, as Bos (1997: 187) puts it, national accounting can rightly be considered the 'statistical language of macroeconomic theory'. The accounts are based on five common macroeconomic algebraic identities. The five identities respectively describe the product, income, external, consumer, and capital accounts (Geary, 1973: 224).

Later years witnessed a number of revisions and the issuing of new questionnaires, handbooks, manuals and guides for international dissemination[6]. In the 1968 revision, for example, the national income accounts, input-output tables and flow-of-funds balance sheets were integrated into a coherent system. The SNA, which was originally developed for application to developed economies, was also modified so as to be applied to LDCs (Ruggles, 1994: 77-79). These special provisions made for LDCs in Chapter IX of the 1968 *Blue Book* were scrapped in the 1993 SNA (Ruggles, 1994: 77-79). In the 1993 SNA the accounts were also further disaggregated and data collection and methodologies harmonised to a greater extent (UN Economic and Social Council, 1993; Ruggles, 1994: 77-79). Other changes to the 1968 SNA included SAMs being included as sattelite accounts, minor changes to the production boundary, changes to the treatment of specific types of activities and transactions (e.g. capital military expenditure and financial leasing), and the re-sectorisation of activities along institutional lines (Harrison, 1990: 336-351).

Yet, as the UN's Economic and Social Council (1993) and Ruggles (1994) point out, and the United Nations Statistical Division (UNSD) admits (UNSD, 1996), there is still a number of issues that need to be addressed in future revisions of the SNA[7]. This need for continued research is recognised in the 1993 SNA. The UNSD points out that the '1993 SNA, like its predecessors, represents (only) a stage in the

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[6] The 1953 version of the SNA was later replaced by the 1968 and 1993 SNA revisions. The latter revision, for which the UN Statistical Commission received a mandate in 1983, was only promulgated in 1993 following the consensus reached in the early 1990s as to the adjustments to be made to the 1968 version (Heston, 1994: 29-32; Ruggles, 1994: 77-79; UNSD, 1995). Although more recent writings on the SNA only refer to these three versions, earlier writings present the original 1947 guidelines and the 1953 version as two separate versions of the SNA.

[7] These issues include (i) the classification of formal and informal production activities, (ii) the appropriate treatment of market and non-market production, (iii) the still unsatisfactory analysis of sector savings and capital formation, and (iv) the harmonisation of household sector macrodata with household survey microdata (Ruggles, 1994: 79-83). These issues can only be addressed in a satisfactory manner through increased cooperation between the various international and national statistical agencies and research bodies involved in research on national accounting issues (UN Economic and Social Council, 1993).

evolution of national accounting' (UNSD 1993: xiii, as quoted in UNSD, 1997)[8]. The Inter-Secretariat Working Group on National Accounts (ISWGNA), in fact, has submitted proposals to the Working Group of the Statistical Commission for an updating mechanism which would allow changes to the 1993 SNA to be made continuously (UNSD, 1998)[9].

3.2.2 The United Nation's International Comparison Programme (ICP)

The purpose of the ICP is to compare 'GDP and its components across countries by converting national currency estimates into a common currency, e.g. US $, by PPP[10] rather than exchange rates' (Ahmad, 1994: 53). Income estimates are based on benchmark surveys performed in individual countries (Summers and Heston, 1988a: 267-273)[11]. These surveys entail the collection of national annual average consumer prices for some 400-800 comparable items classified under 154 basic headings (Locker, 1984: 137; Ahmad, 1994: 53-59)[12]. This list of items was

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[8] The 1993 SNA includes an agenda for future research. Many of the issues highlighted by Ruggles (1994: 97-83) are covered in this agenda. Discussions and research since 1994 have also raised new issues. Postner (1995: 459), for example, raises four issues not included in the 1993 SNA research agenda. These issues include accounting for the costs of institutional change and treating information as an economic commodity in the accounts. For a summary of the issues on the original research agenda, new issues and feedback on existing research, consult UNSD (1995-1997).

[9] The proposal distinguishes between four types of amendments. Amendments may be necessary due to editorial error, a need for improved conceptual clarification, revised interpretations of new economic situations, and changes to the basic concepts and mechanics of the SNA resulting from changes in the macroeconomic environment. Each entails an increasing level of complexity and it is suggested should be updated with the aid of a different type of procedure (SNA, 1998).

[10] Purchasing Power Parity (PPP$) represents the amount of 'goods and services (that) can be purchased with the recorded income per capita of different countries (in this case the US) depending on the relative prices of similar products (and services)' in different countries (Todaro, 1994: 698). PPPs are the 'currency converters' or 'price deflators' employed in converting broad aggregates such as GDP to a comparative basis across countries (Hill, 1984: 128, 132).

[11] The respective ICP benchmark surveys are dated 1967 (phase I), 1970 (phase II), 1975 (phase III), and 1988 (phase IV) (Kravis *et al.*, 1975: 1-16; Summers and Heston, 1988a: 267-273).

[12] Selection can be performed using either a multilateral or bilateral procedure. In the case of multilateral selection, only products that are highly representative of the whole group are selected. Bilateral methods, however, select representative products from each country, either one product most characteristic of consumption patterns in each possible pairing of countries or one product most

expanded over the years to accommodate the diverse production and consumption patterns of an ever-increasing sample of countries (Kravis *et al.*, 1975: 1-16). These surveys also require a careful matching of commodities and services, the selection of a sample of representative goods and services, and a common classification of similar goods and services across countries (Kravis *et al.*, 1975: 17-25; Hill, 1984: 125-127; Locker, 1984: 136-138). PPPs are then derived from these price data and national accounts expenditure data. The estimation process consists of two parts. Transitive PPPs are first estimated at the basic heading level, after which national PPPs are estimated from the set of PPPs (Locker, 1984: 135). The ICP employs the Geary-Khamis (GK) formulae for the aggregation of price and expenditure data (Ahmad, 1994: 53-59)[13].

In later phases of the ICP the World Bank also developed a 'shortcut' method in order to estimate income using less than the full set of ICP data (Ahmad, 1988: 75-91). This need arose due to the high data requirement burden of the ICP with which LDCs could often not deal (Ahmad, 1988: 75-91), as well as the increasing costs and complexity of employing conventional ICP methodology (Kravis *et al.*, 1975: 1-16)[14].

3.2.3 The Penn World Tables (PWT)

The PWT saw the light as researchers came to recognise the inadequacy of exchange rate-based income comparisons and the poor availability of PPP-based

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characteristic of consumption patterns in each individual country (pages 67 to 68) (Locker, 1984: 11-145).

[13] This is not the only aggregation method for deriving income estimates from price and quantity data. Other aggregation methods include the EKS, Van Yzeren, and Walsh formulae (Ahmad, 1994: 53-59). These methods are related in more detail in the discussion on method and technique (pages 65 to 68).

[14] The items included in this reduced sample were selected using two methods, i.e. (i) using regression analysis to find the smallest set of items best explaining category PPPs (126 items) and (ii) a group of experts identifying a best sample of items (129 items), each from thirty-one categories of commodities.

estimates across both time and space (Summers *et al.*, 1980: 19-21). The PWT is a companion rather than a replacement of the SNA. The PWT employs both SNA and ICP data (Summers and Heston, 1991: 334). Estimates are based on 'shortcut' methods devised to derive real GDP from certain available data (Kravis *et al.*, 1978; Summers *et al.*, 1980; Summers and Heston, 1984).

The PWT estimates real GDP for non-benchmark years for countries covered in ICP benchmark surveys (Stollar *et al.*, 1987: 468). There are four options for deriving these estimates (Summers and Heston, 1991: 339-344). Firstly, one can extrapolate real GDP figures from real GDP reported in ICP surveys using real growth rates reported in the SNA[15]. Secondly, real GDP estimates can be derived from per capita GDP in current international prices as reported in the ICP survey employing the current and constant component price indices for the particular countries available from the SNA. Thirdly, one can, in the former method, use a chain index of price ratios (i.e. linking the price indices of different countries) where price indices for each pair of countries are not available. Finally, there is the option to derive real GDP estimates from available real per capita GDP figures using current and constant price indices but adjusting the final estimate for international differences in terms of trade and production[16].

The PWT also estimates real GDP for countries not covered in ICP benchmark surveys (Summers *et al.*, 1978). This 'shortcut' method requires quantity and PPP estimates for non-benchmark countries (Summers and Heston, 1991: 339-344).

This method was refined by experimenting with and testing the two methods individually as well as in combination (Ahmad, 1988: 75-91).

[15] This technique is founded upon the Stone *et al.* (1942) 'intertemporal identity' which requires that income in any other period must equal the available period's income estimate adjusted by the real growth rate reported in that country's national accounts over the said period.

[16] This is done by valuing the net foreign balance (NFB) at current prices and domestic absorption (DA) at constant prices. This adjustment allows for changes in well-being brought on by lower import and/or higher export prices (Summers and Heston, 1991: 339-344).

Estimates of the former are based on the relation between consumption, investment and government expenditure in benchmark countries. The latter estimates are calculated in terms of the allowance required to supplement civil servant and business executive salaries in non-benchmark countries to equalise real income[17].

These methods were refined with the passage of time as ICP benchmark surveys were improved and expanded, new methodologies were devised, and more detailed data became available to estimate differences in structural relations and to allow for exchange rate variability (Summers and Heston, 1984: 207-216; Summers and Heston, 1988b: 1-5; Summers and Heston, 1991: 344-348). Real GDP estimates reported in different PWT editions, therefore, are not comparable[18]. Summers and Heston (1988b: 5-9), for example, found relatively low error in higher income and relatively high error in lower income nations' real GDP estimates after comparing the PWT mark III and mark IV results.

3.2.4 Social Accounting Matrices (SAMs)

SAMs are based on the matrix accounting principles employed in input-output analysis (Round, 1991: 1). Although Stone already in the early 1960s laid the analytical foundations for SAMs, the SAM framework as it is known today was only developed in the 1970s (Keuning, 1991: 1; Round, 1991: 1)[19]. Pyatt and Thorbecke (1976) first used SAMs in analysing issues such as income distribution, basic needs

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[17] These estimates are based on capital city price surveys conducted by the US State Department, a British firm serving an association of international business, and the UN's International Civil Service Commission (Summers and Heston, 1991: 339-344).

[18] The four published PWT editions are dated 1978 (mark I) (Kravis *et al.*, 1978), 1984 (mark III) (Summers and Heston, 1984), 1988 (mark IV) (Summers and Heston, 1988b), and 1991 (mark V) (Summers and Heston, 1991). The mark II results were never published (Summers and Heston, 1991: 367).

and poverty in a developing country context. Many developed countries have since taken up SAMs in their national accounting frameworks to report on similar issues (Round, 1991: 1).

SAMs present a summary of the value of economic transactions between different role players in the economy in a matrix format (Van Heemst, 1985: 91-112)[20]. This requires the actors and the rules governing their behaviour and their interaction to be clearly specified. These role players include producers, households, government, and the rest of the world. Three different types of transactions are included in SAMs: (i) monetary transfers matched by real transfers of goods and services; (ii) monetary transfers matched by transfers of ownership of financial assets; and (iii) voluntary and involuntary monetary transfers not matched by corresponding transfers of the previous kind (e.g. tax and social security payments). The expenditure and receipt accounts of each of the economic actors are reported in a particular row and corresponding column in a square matrix. The rows and columns add up in the tradition of double-entry bookkeeping. SAMs, accordingly, can be defined as 'complete account(s) of the circular flow of income (and expenditure) in an economy' (Hanson and Robinson, 1991: 1-2)[21].

Each of the main SAM accounts can be further disaggregated. The household account can be subdivided according to the social, demographic and/or geographic characteristics of households[22]. The production account can be subdivided by type of labour and/or enterprise. Such disaggregation is especially evident in SAMs

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[19] For a detailed description of the differences between Stone's original framework and the present-day SAM framework, see Round (1991: 3-4).

[20] For an example of a basic SAM matrix, see Pyatt (1991: 182).

[21] Attempts have also been made by the likes of Reinert *et al.* (1993) at developing SAMs for regional economic groupings based on Stone's (1961) original exposition of SAMs as regional rather than national accounts.

employed in analyses of poverty and unemployment (Hanson and Robinson, 1991: 6; Keuning, 1991: 1-2). According to Moss (1980: 4-11), SAMs present a measurement framework equally useful for economists and sociologists.

Unlike the SNA, SAMs are not geared towards the consistent measurement of national income and economic growth rates. The aim rather is to focus on the analysis of contemporary, national policy issues (Keuning, 1991: 1; Pyatt, 1991: 177-183). Roxas (1989: 182) accordingly calls it a 'community-based accounting system'. The SNA employs a closed system in attempting the consistent measurement of national income and economic growth rates across nation states. SAMs, however, employ an open system in which (i) social performance and economic performance are integrated, (ii) the focus is on both outputs and inputs, (iii) different valuation techniques are employed, (iv) transactions are not necessarily tied to specific time frames, and (v) transactions are presented in a systemic fashion (Moss, 1980: 4-11). Countries are also allowed a choice as to the classification framework and valuation principles employed in specific modules of the SAM (Hanson and Robinson, 1991: 2; Keuning, 1991: 1). Consequently, SAMs are not comparable across nation states like SNA-based aggregates of economic activity (Van Heemst, 1985: 91-112).

There has been considerable debate as to whether SAMs should be fully integrated into or remain addenda to the SNA. Geary (1973: 251), for example, argued in favour of complete integration on the grounds that the resulting accounts will in one coherent framework report all those statistics in which national statisticians are normally interested. Keuning (1991) and Hanson and Robinson (1991: 1) concur. At this stage, though, the option of fully integrating SAMs into the national accounts is open only to a select group of developed countries in Nothern

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[22] Roxas (1989: 182-183), for example, employs a SAM in reporting on the Gross Value Added (GVA)

America and Europe with adequately disaggregated national accounts and well-developed SAMs (Hanson and Robinson, 1991: 3; Round, 1991: 8). Most developing countries are currently in no position to effect such integration, given the substantial and diverse resource requirements of the two reporting systems (Van Heemst, 1985: 91-112). According to Keuning (1991: 1), integration can only be partially accommodated. He suggests that a number of internationally comparable, core SAM accounts be included in the SNA and that those SAM modules dealing with specific domestic issues and which are not internationally comparable remain addenda to the SNA. Moss (1980: 1-4), furthermore, completely opposes the integration of SAMs into the SNA. He is of the opinion that such integration will undermine the main objective of the national accounts, i.e. one of providing a coherent framework for estimating national income and economic growth rates.

3.2.5 Environmental accounting and Natural Resource Accounts (NRAs)

National resource accounting in its original form consists of balance sheets showing how the opening and closing stocks of certain natural resources changed over the accounting period. New discoveries of resources and known reserves becoming economically exploitable during the accounting period are added to the opening stock of proven reserves. Reserves actually extracted and becoming uneconomical to exploit during the accounting period are subtracted from the opening stock of proven resources (Thage, 1993: 326)[23]. Figures on these balance sheets are expressed in physical units, e.g. 1000 solid cubic metres of wood of forestry resources. Such

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accruing to households from four different sources, i.e. local enterprise, other households, local government, and sources outside their locality.

[23] Allowance is also made for the effect of price revaluations during the accounting period where the closing stock of resources is expressed in monetary terms (page 58) (Thage, 1993: 326).

accounts represent a natural resource inventory system of sorts (Kolttola, 1993: 457-474). Another example of environmental accounts expressed in physical units is where the environmental impacts emanating from economic activity are reported, e.g. linking CO_2 emissions to specific types of industry (Stahmer, 1993: 511-540).

Some environmental accounts report on environmental issues in monetary terms. There are two possibilities here. Firstly, the accounts may simply report on economic transactions related to the environment, e.g. expenditure on pollution abatement by industry, households and government. Secondly, there are those accounts in which imputation techniques are used to put a value on natural resources and environmental activities expressed in physical units. So, for example, the value of the stock of forestry resources can be estimated by multiplying the physical stock with an actual or estimated market price (Stahmer, 1993: 511-540). Other examples include the use of travel costs incurred by people visiting national parks as a proxy of the relative value they put on the environment and the use of changes in house prices in areas adjacent to urban industries to estimate the demand for a clean or pollution-free environment (Turner *et al.*, 1993: 108-128)[24].

Thus, one can distinguish between environmental accounts expressed in physical units, in monetary terms, or in terms of both physical and monetary units (Stahmer, 1993: 511-540)[25]. The proposed System of Integrated Environmental and Economic Accounting (SEEA) described in the 1993 SNA suggests that member

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[24] For a discussion of the variety of imputation techniques used for this purpose and examples of their application, see Turner *et al.* (1993: 108-128). According to El Serafy (1995: 63-67), imputation techniques can be employed only in cases where environmental impacts initiate or affect market activities. As a result, imputation can not be employed in valuing the life support and aesthetic services rendered by the environment. For this reason, Kolttola (1993: 458-474) doubts the extent to which qualitative aspects of the environment can be discounted in environmental accounting.

[25] Environmental accounting, in its widest possible interpretation, also includes the GIS-based type of accounting systems employed in environmental feasibility studies (Young, 1993: 117-123).

countries employ both of these types of environmental accounting techniques (Aaheim and Nyborg, 1995: 57).

There has been considerable debate as to whether environmental accounting should be standardised internationally. Some have argued that environmental accounting should focus on those types of accounts required to address environmental issues of specific national importance. So, for example, industrialised nations may have more use for environmental accounts reporting on industrial pollution, whilst LDCs may require accounts reporting on the depletion of mineral resources of strategic economic importance (El Serafy, 1995: 68). Norway subscribes to this approach. National resource accounts are developed only in those areas where data are required for better-informed decision making (Kolttola, 1993: 458-474; Lone *et al.*, 1993: 446-457). According to Stahmer (1993: 511-540), such an approach still allows for standardised environmental accounts insofar as the general accounting rules provide a consistent framework for reporting on these issues. In terms of content, though, these accounts will be relatively unique insofar as they will report on different issues. Others have been calling for a standardised international framework for environmental accounting. In this sense, environmental accounting has the objective of developing a coherent framework for reporting on environmental issues (Kolttola, 1993: 457-474). The System of Integrated Environmental and Economic Accounting (SEEA) proposed in the 1993 SNA, although still being 'work in progress', ultimately has this as its objective (Stahmer, 1993: 511-540).

Disagreement also exists as to whether environmental accounts should be intergrated into the SNA or remain satellite accounts to the SNA. The popular arguments against integration, i.e. that the national accounts were never intended to put a value on the environment and that any such integration will threaten its character

427-445; Peskin, 1993: 34-35)[28]. The System of Integrated Environmental and Economic Accounting (SEEA) proposed in the 1993 SNA envisages such a step-wise process of integration (Stahmer, 1993: 511-540)[29]. The immediate and complete integration of NRAs into the national accounts is problematic for a number of reasons. Integration in the first instance requires valuation methods to be used in putting a monetary value on the environment. At this stage there is no consensus as to which of these methods are preferred in valuing certain environmental aspects of the economy. Imputation is also complicated by the fact that at this point in time there exist no standard definitions of the type of environmental transactions to be monetised. So, for example, it is not always clear what the true value of goods and services employed in environmental protection efforts is. Where environmental awareness is increased via media and education efforts, it is unclear to what extent a proportion of expenditure on advertisement and education can be counted as contributing towards environmental protection. Where imputation is possible, the availability of data over space and time may also be of such a nature that reliable economic valuations of environmental degradation cannot be performed so as to arrive at a meaningful total estimate thereof (Fickl, 1993: 406-425). For these reasons, those in favour of

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[28] Integration may initially simply require a separate listing of expenditures aimed at environmental protection. As a next step, complete satellite accounts reporting on the physical flows of resources, material and energy underpinning economic activity may be required. Once these balance sheets are in place, the depreciation of commercial natural resources like hardwood can be accounted for, followed by allowances for the depreciation of non-marketed resources. The depreciation of natural resources resulting from environmental degradation (e.g. decreasing specie diversity) will be accounted for next. In the final phase, complete accounting systems will be used to integrate these environmental accounts into the SNA (Li, 1993: 427-445; Peskin, 1993: 23-28).

[29] The process will move towards full integration from the existing extremes of purely physical environmental accounting and purely economic accounting. On the environmental side, the availability of environmental data will be improved after which the accounting systems employed in reporting on the state of the environment will be standardised. On the economic side, economic transactions related to the environment will be identified and duly noted in the national accounts. Following this, economic values will be put to non-market related environmental transactions using imputation techniques (Stahmer, 1993: 511-540).

and purpose, remain prominent (Harrison, 1989: 385-388; Peskin, 1993: 34-35; Stahmer, 1993: 511-540; El Serafy, 1995: 71)[26]. Austria, for example, supports this idea, arguing for the continued co-existence of the national and environmental accounts (Fickl, 1993: 406-425). As a result of the market-based character of the SNA, most environmental issues, by definition, cannot be included in the SNA since no real monetary transactions are involved (Stahmer, 1993: 511-540). This perhaps explains why the status quo of using the environmental accounts as supplements to the national accounts has not changed over the years. The only meaningful alternative may be to compare the physical trends reported in the NRA with the changes in economic aggregates reported in the SNA (De Haan and Keuning, 1996: 131-146). Such comparisons are particularly useful in determining the extent to which increased capital accumulation may be accompanied by increasing levels of environmental degradation (El Serafy, 1995: 66-67; Keuning, 1995). The Netherlands has employed this approach to great effect. A conventional national accounts matrix (officially dubbed NAMEA) is used to directly compare conventional economic flows with environmentally-related economic flows and changes in the physical impact of environmental degradation (Keuning, 1995)[27]. So, for example, De Haan and Keuning (1996: 131-146) found that pollutive emissions are growing at a lesser rate than GDP and expenditure on environmental protection at a faster rate than GDP.

Others have suggested a partial, step-wise integration which will ultimately result in the complete integration of environmental accounts into the SNA (Li, 1993:

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[26] Marin (1978: 421-427), for example, proposed that a separate environmental account be introduced to the SNA without in any way changing its existing structure.

[27] Three physical accounts were added to the conventional national accounting matrix, i.e. a substances account, an account for global environmental issues, and one for national environmental themes. Physical flows are expressed in CO_2 equivalents, kilograms and petajoules (Chapter 6, page 194). Where applicable, the conventional accounts are disaggregated to reflect environmentally-related economic transactions, e.g. household expenditure on cleansing services and catalytic converters (De Haan and Keuning, 1996: 131-146).

complete integration always put particular emphasis on the need for a step-wise process of integration.

3.3 CONTENT OF INDICATORS OF NATIONAL INCOME AND ECONOMIC GROWTH

National income represents 'that part of social welfare that can be brought directly or indirectly into relation with the measuring-rod of money' (Pigou, 1929: 11, as quoted in Kuznets, 1954: 192-215)[30]. Hicks (1940: 105) defines it as 'a collection of goods and services valued in terms of money'. The SNA attempts to measure precisely this. National income, as estimated in the national accounts, excludes all transfers of goods not matched by a corresponding transfer of money in order to match receipts and expenditure as prescribed in the national income identities (Clark, 1957: 7-16). Economic growth rates are derived from national accounting estimates of aggregate income and represent a sustained increase over time in aggregate income, allowing of course for the effect of inflation. Growth in per capita income, moreover, also allows for the effect of population (Kuznets, 1966: 1). Juster (1973: 26) relates these two concepts in terms of the aim of economists to record both differences and changes in the material well-being of society. Since economic growth rates are derived from estimates of national income, the discussion in the subsequent pages focuses exclusively on the measurement of national income. Where applicable and appropriate, the facts gleaned from the literature on comparisons of economic growth rates were integrated into these pages.

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[30] Pigou (1929, as quoted in Abromowitz, 1959: 1-4) considers economic welfare (national income) an adequate proxy of social welfare insofar as any change in economic welfare will affect social welfare in the same direction.

The ongoing debate as to the supposed meaning of national income and changes therein rests on two main hypotheses. On the one hand, there are those, such as Juster (1973) and Harrison (1989), who argue that national income as measured in the national accounting framework is valid insofar as it measures exactly what it proposes to measure. Although these efforts may present an inadequate measure of welfare since increases in national income do not necessarily imply increases in social welfare (Abromowitz, 1959: 1-4), it was never the intended purpose (Harrison, 1989: 377; Reich, 1991: 238; Bos, 1997: 185). Proponents of this hypothesis describe the SNA as a 'reasonably satisfactory way to measure the change from time to time in the provision of satisfaction-yielding commodities and services' (Kravis *et al.*, 1975: 17). It therefore measures welfare only indirectly in a very strict market-based economic sense (Mamalakis, 1996: 293-295).

On the other hand, there are those who have pointed out the numerous shortcomings of national income estimates as embodied in the SNA, ICP and PWT[31]. As a result of the growing concern with the environment, not only in economics but in policy making in general, this debate has focused largely on the inability of national income estimates to account for environmental issues, as will become clear in the subsequent discussion. However, national income estimates also have other shortcomings. One line of criticism highlights the inability of national income estimates to distinguish between income and distributional issues (Whynes, 1974: 97; Sen, 1975; Morris, 1979: 7; Ram, 1982: 227). An increase in aggregate income does not necessarily imply an improvement in living standards or societal well-being (Nordhaus and Tobin, 1973: 512; Morris, 1979: 7).

[31] For a detailed theoretical discussion of the differences between the concept of income as defined by Hicks and as employed in the national accounts, see Reich (1991: 235-246).

Another line of criticism focuses on the extent to which income estimates either do or do not adequately quantify certain aspects of economic activity (Kuznets, 1966: 367-390; Srinivasan, 1994a: 5-10). The main types of activities listed as being excluded include informal sector output, subsistence agriculture and household services (Kuznets, 1954: 192-215; Geary, 1973: 246; Morris, 1979: 7-14; Lind, 1992: 93-94). The accepted definition of national income also fails to put a value to things such as asceticism, religion, slavery, art and technological advance (Gilbert and Kravis, 1954: 61-95; Kuznets, 1966: 16-28).

There are also numerous instances in which certain types of economic activities are inadequately valued or incorrectly treated in estimating national income. One of the most-often cited shortcomings of national income estimates is the failure to monetise the environmental effects of pollution and correctly price natural resources in terms of their scarcity (Nordhaus and Tobin, 1973: 522-525; Whynes, 1974: 97-99; Marin, 1978: 416). The SNA in its conventional form treats environmental resources as free gifts of nature. The SNA needs to treat environmental assets similarly to man-made capital if it is to provide a more complete estimate of welfare (De Boo *et al.*, 1993: 143). This requires an adjustment of aggregates such as GDP and GNP (Bartlemus and Van Tongeren, 1993: 488; Peskin, 1993: 18-28; Thage, 1993: 314-336; Hamilton, 1996: 15)[32]. These aggregates need not always decrease when environmentally adjusted, as is generally assumed. So, for example, Young (1993: 117) found that Australian GDP increased in certain years due to net additions to mineral stocks. Examples of this type of adjusted measure of national income include Thage's (1993: 322) Environmentally Adjusted Net Income

[32] Harrison (1989) lays particular emphasis on the distinction between gross and net accounting aggregates. Accordingly, only the NNP can be adjusted for the depreciation of natural resources, environmental degradation and expenditure aimed at environmental protection. GDP and GNP remain

(ENI) and Hamilton's (1996: 13-32) five different Measures of Economic Welfare (MEW) adjusted for the effects of pollution.

Environmental adjustments to national accounting aggregates primarily involve three issues[33]. Firstly, there is the question of depreciation. The national accounts normally make no provision for the depreciation of environmental resources (Dasgupta *et al.*, 1994: 42-44). The national accounts are therefore inflated, which requires the depreciation of natural resources to be subtracted from NNP (El Serafy, 1995: 63-67). Estimates of the depreciation of resources are usually based on the balance sheet-type of environmental accounts (page 50). Li (1993: 427-445), for example, adjusted China's GNP and NNP by allowing for the depreciation of forestry resources using a special pricing method to price the resources and then allowing for increases and decreases in the stock of forestry resources. This, however, requires knowledge of the exact nature of the relationship between economic activity and the environment. It also requires one to put a monetary value on natural resources using imputing techniques. Although the availability of physical resource accounts has increased markedly, considerable empirical work remains to be done on pricing these resources. This perhaps explains the little progress that has been made in fully integrating environmental accounts into the SNA (Thage, 1993: 314-336).

Secondly, there is the question of how environmental degradation should be treated. The generally accepted rule is that the value of environmental damage is subtracted from GNP because environmental degradation decreases the level of social welfare (Hamilton, 1996: 13). The valuation, however, of environmental degradation is problematic. Though the availability of physical data on environmental degradation

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gross aggregates of economic activity for which no adjustments of this kind are required (Harrison, 1989: 386-387).

has improved markedly, national accountants often lack the monetary parameters required to put a value on environmental degradation. Willingness-to-pay measures, for example, are estimated infrequently and remain ambiguous (Peskin, 1993: 28-33). These estimates may also reflect 'people's willingness to give to good causes' rather than their willingness to pay to improve environmental quality (Aaheim and Nyborg, 1995: 57-69).

Finally, there is the question of how expenditure aimed at environmental protection should be dealt with[34]. As in the case of environmental degradation, the generally accepted rule is that such expenditure be subtracted from GNP (Hamilton, 1996: 13). The argument is that this type of expenditure preserves existing levels of welfare and does not increase total welfare. Thus, it cannot be included in final demand (Kravis *et al.*, 1975: 17-25; Bartelmus and Van Tongeren, 1993: 488)[35]. Total environmental spending also includes purchases of intermediate goods and services. Since these purchases will only in future accounting periods contribute to environmental protection, the magnitude of environmental protection actitivies is normally overstated (Nestor and Pasurka, 1995: 265). Estimates of expenditure on

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[33] A fourth issue which has featured less prominently in estimates of environmentally-sensitive GDP/GNP figures, is that of accounting for the disposal service currently being provided free of charge by the environment (Marin, 1978: 416-417).

[34] The 1993 SNA distinguishes between five categories of environmental protection (EPA) activities. External EPAs include the water treatment, sewerage, and solid waste management services provided by nature to the entire community, which represent the 'disposal services' referred to in footnote 33 above. Internal EPAs include those moneys firms spend on the purchase of factor inputs, goods and services aimed at pollution abatement, as well as any environmentally-related indirect taxes paid by firms. EPAs also include fixed capital formation. This consists of the accumulation of fixed assets such as septic tanks and catalytic devices used in curbing environmental degradation. The EPAs households are involved in include direct private expenditure on emission devices as well as the indirect costs of using these devices, e.g. maintaining the devices and paying a penalty in terms of poorer fuel economy. Finally, there are the EPAs government is involved in. These include all the above-mentioned types of activities in which government is directly (e.g. provision of sanitation services) or indirectly involved (e.g. environmental taxes levied on businesses) (Nestor and Pasurka, 1995: 265-285).

[35] Certain types of expenditure on environmental protection should supposedly not be substracted from GNP. So, for example, Marin (1978: 416-421) does not subtract legally enforced environmental expenditure which could actually reflect improvements in environmental quality. Vanoli (1995: 114-117) includes fixed capital formation aimed at environmental protection in GDP.

environmental protection also remain only approximations of the true extent of such expenditure. There are various reasons for this. These include responses to this kind of surveys being relatively poor, it often being difficult to separate such expenditure from other types of expenditure, and the indirect costs incurred in making these purchases rarely being accounted for (Peskin, 1993: 28-33).

Aaheim and Nyborg (1995: 57-67), though, are sceptical of the usefulness of 'greened' estimates of GNP and GDP. They identify two specific problems. In the first instance, it is unclear how these estimates should be interpreted. These measures can be interpreted as improved measures of welfare, as estimates of the magnitude of economic activity in the abscence of environmental degradation, or as estimates of economic output when taking into account the cost of restoring observed environmental degradation. Each of these interpretations, however, implies different data requirements and measurement methodologies (Nyborg, 1993: 337-347).

Aaheim and Nyborg (1995) also dispute the value of 'greened' estimates of national income in policy-making. As a result of different valuation methods being employed in environmental accounting (page 51), the consequent adjustments of national income may lead to misleading policy recommendations (Aaheim and Nyborg, 1995: 60). This point can best be illustrated with the aid of a number of examples. Where the maintenance cost approach is employed in 'greening' GNP (i.e. determining the value of economic activity in the abscence of environmental degradation), the adjusted figure may be relatively close to the unadjusted figure when only the relatively low direct costs of avoiding pollution are subtracted from national income. When maintenance costs are interpreted as the expenditure required to restore the actual damage, adjusted national income may approach minus infinity since one can never hope to restore all environmental damages. If maintenance costs

are taken to represent that 'part of current economic activity which could have taken place without degrading the environment' (Aaheim and Nyborg, 1995: 62), the production of entire sectors may have to be omitted from GNP to arrive at an adjusted estimate of national income. The adjusted figure may even be zero if no economic activity is possible without incurring environmental damage. Where resources are allocated away from those sectors which are the primary agents of environmental degradation and towards more environmentally friendly sectors, such adjustment will yield yet another estimate (Aaheim and Nyborg, 1995: 60-67). Thus, depending on the meaning ascribed to maintenance costs, adjusted national income can send any number of signals. It is also impossible to interpret a higher NNP as environmentally sound since the increase may simply be the net result of an increase in the market price of natural resources accompanied by a continued deterioration of the stock of resources (Peskin, 1993: 28-33; Aaheim and Nyborg, 1995: 60-67). In this sense, the 'environmental correction (of national income estimates) can take on almost any value (one) like(s), if (one) just defines "the environmental value" in the right manner' (Aaheim and Nyborg, 1995: 61).

Another shortcoming of national income estimates is the inability to put a value on human capital. Income estimates are not adjusted for differences and changes in labour quality (Whynes, 1974: 97-99) and working conditions[36] (Gilbert and Kravis, 1954: 61-95) which affect the value of human capital. Estimates of national income also fail to put a value on public services such as health care, education and policing not traded through the market (Kuznets, 1954: 192-215; Morris, 1979: 7-14). Income estimates have also been criticised for valuing goods and services in terms of market prices rather than in terms of their relative importance

in maintaining living conditions (Gilbert and Kravis, 1954: 61-95; Kuznets, 1954: 192-215). A last example of this type of inadequacy of national income estimates relates to their inability to reflect inter-country differences in factor productivity and the quality, variety and availability of goods and services (Kravis *et al.*, 1975: 17-25).

Thus, national income estimates need to be adjusted to allow a more comprehensive measurement of economic welfare. Hicks (1940), Kuznets (1954), Clark (1957), Abromowitz (1959), Gross (1966) and Juster (1973) hold a similar view, arguing for the further refinement of national accounts and/or development of complementary measures. A popular example of such effort is that of Nordhaus and Tobin (1973: 512-521)[37]. Their 'measure of economic welfare' (MEW) adjusts the national accounts for discrepancies between GNP and real economic welfare by allowing for differences in the nature of expenditure, the contribution to welfare of capital services, leisure and non-market work, and the disamenities of urbanisation. So, for example, expenditure on policing and defence are treated as 'regrettable necessities' to be subtracted from the national product (Thage, 1993: 314-336). Dasgupta *et al.* (1994) suggest that the Net National Product (NNP) be based on the shadow prices of the 'social worth' of all goods and services. This requires that the value of the net changes in human and natural capital and the value of current environmental damages respectively be added to and subtracted from NNP (Dasgupta *et al.*, 1994: 42-44).

Amendments of this kind have been incorporated into revised versions of the SNA. So, for example, household production has been included in the central

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[36] Assuming that work is a disutility and economic progress is accompanied by less physical labour and better working conditions (Kuznets, 1954: 192-215).

[37] Other examples of similar efforts include Zolotas's (1981) 'index of the economic aspects of welfare' (IEW), Eisner's (1988) 'Total Income System of Accounts', Jorgenson and Fraumeni's (1988) 'Full Gross Private Domestic Product', and Kendrick's (1989) 'Adjusted Gross Product'. For a

framework of the 1993 SNA. Given the problems in measuring and valuing household services, measurement is confined to the value of physical produce (e.g. butter) and services rendered to other households (e.g. tailoring). Thus, personal services for the household's own final consumption are excluded. Countries, however, are provided with the option of extending the definition of household production in the satellite accounts by including the monetary and/or imputed value of services for the household's own consumption (UNSD, 1995).

3.4 TECHNIQUE AND METHOD OF MEASURING NATIONAL INCOME

In terms of the distinction between quantitative and qualitative methods (Chapter 2, page 24), it is evident that these measures are primarily of the former type[38]. The quantification of national income entails a number of issues. *Firstly*, there is the question as to what macroeconomic identity one employs to measure national income. There are three alternatives. Total economic activity can be measured as the value of total income, consumption or production (Paige and Bombach, 1959: 15-28; Bos, 1997: 181; Sloman, 1997: 456). These three aggregates are embodied in the SNA (Heston, 1994: 36-38). In terms of macroeconomic theory these three approaches should yield the same result (Samuelson and Nordhaus, 1989: 102-117). In practice, though, these three estimates are not always comparable or

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detailed discussion of the adjustments to NNP and/or GDP proposed in each of these studies, see Mamalakis (1996: 298-311).

[38] These quantitative measures have in select cases been supplemented with qualitative ones. The reliability ratings provided in the PWT series of income estimates is one such example. These ratings range from A (best) to D (fair) and were first presented in the mark III PWT (Summers and Heston, 1984). Ratings are based on three perceived main sources of imprecision. These are (i) imprecision in the ICP benchmarks as qualified in Kravis *et al.* (1982), (ii) imprecision resulting from the use of cross-section regression in non-benchmark estimates, and (iii) imprecision due to the difficulty in selecting the year used for base pricing (Summers and Heston, 1984: 216). An earlier attempt at providing reliability ratings for national accounts was made by the UK Central Statistical Office in 1956. The US

equally reliable[39]. Production statistics, for example, exclude illegal trade, whereas the price and quantity data used in valuing total output are often based on partial investigations (Stone *et al.*, 1942: 115-124). Hence, the income and expenditure approaches will yield different and perhaps relatively more reliable estimates of national income than the production approach. Final SNA results are, accordingly, adjusted to arrive at an acceptable estimate of national income. The ICP, on the other hand, employs expenditure data only, while the PWT, being based on both SNA and ICP data, relies on a mixture of expenditure, production and income data.

Secondly, one needs to decide on the nature of goods and services to be included in this measurement effort, or, in other words, define the nature of the production boundary. According to Walras (1984: 65, as quoted in Mamalakis, 1996: 296), there are two fundamental criteria determining this choice. In the first instance, production should be useful, i.e. have the ability to contribute to welfare through the satisfaction of needs. Usefulness may be either independent of or dependent on the specific nature of the need or commodity. This represents respectively the strong and the weak usefulness criterion. In the second instance, production should be costly, i.e. either priced in the market (strong cost criterion) or produced at some cost (moderate cost criterion) (Mamalakis, 1996: 296-308). National accounting in the early years focused primarily on goods and services for final consumption produced in the private sector (Hicks, 1940: 105-124). Kuznets (1948: 1-16), however, criticised Hicks's

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Office of Statistical Standards and UN Statistical Office in 1958 also attempted to appraise the relative objectivity of the national accounts of sixty-four nations (Novak, 1975: 323).

[39] In earlier years, the discrepancy between these estimates of GDP was used to assess the reliability of national accounting data. These discrepancies were tested statistically for normality, trend, cyclical fluctuations and autocorrelation. Analysts concluded that these discrepancies could be considered random disturbances which do not significantly bias GDP estimates. Another method employed in estimating the reliability of national accounting data, was the extent of the discrepancy between preliminary and final estimates of GDP. Preliminary estimates were found to be predominantly underestimated (Novak, 1975: 324, 334-335).

(1940) exclusion of public sector output and capital goods. Accordingly, the nature of the goods and services included in the 1993 SNA has been expanded (page 62).

Thirdly, there is the choice of measuring national income in market prices as opposed to factor prices. The SNA, ICP and PWT estimates of national income are all based exclusively on market prices. Hicks (1940: 105-124), though, argues for a valuation in factor rather than market prices since market prices (i) do not allow for price distortions introduced by government intervention (also refer Gilbert and Kravis, 1954: 61-95) and (ii) fail to correctly value newly produced goods not priced before and also public activities falling outside the market sphere. Kuznets (1948: 1-16) claims that the valuation of public output is not an insurmountable problem. He suggests that the valuation of public output be based on factor prices and that of private sector output on market prices. Yet, most analysts argue that consumption and production decisions are determined by market rather than factor prices (Kravis *et al.*, 1975: 17-25), thus settling for a market price approach. Therefore, as Kuznets (1954: 192-215) pointed out, income estimates based on market prices, despite being neither ideal nor feasible in theoretical terms, remain the only viable option. Such an approach, however, requires one to assume (i) a constancy of human wants and (ii) that markets correctly judge the social worth of goods and services (Kuznets, 1954: 192-215). These two assumptions, as will be explained in subsequent pages, threaten the comparability of national income estimates.

Fourthly, once the necessary data have been collected, one needs to decide on a method of aggregation for comparison. Given the availability of any two sets of price, quantity and expenditure data, one can derive price-quantity indices using the classic Σ p.q approach which assumes that price multiplied by quantity equals

expenditure[40]. This entails either dividing total expenditure by quantity to get price indices, using price data to derive quantity indices from expenditure data, or deriving the latter using price indices adjusted for differences in quantity and quality (Gilbert and Kravis, 1954: 51-59). The purpose of these index numbers is simply to 'enable the quantitative treatment of useful composite commodities' (Hansen and Lucas, 1984: 26). As the practice of national income comparisons expanded, a plethora of possible aggregation methods was devised to compile these price-quantity indices. Fisher, for example, listed as many as 125 possible index formulae before using his so-called Fisher tests to arrive at his 'ideal' index (Hansen and Lucas, 1984: 27)[41]. Hill (1997), in his taxonomy of aggregation methods, distinguishes between some thirty variants of multilateral aggregation methods. Dreschler (1973: 18) puts this down to a lack of central principles and coordination in research in this field. This proliferation of aggregation methods has contributed to the subject insofar as different methods suite different sets of data in terms of structure, quality and availability (Kravis *et al.*, 1975: 1-16; Rao and Salazar-Carrillo, 1988: 19).

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[40] More details on the Σ p.q approach to welfare comparisons, built on the foundations of welfare theory laid by the likes of Pareto, Lerner, Bergson and Pigou, can be found in Hicks (1940), Kuznets (1948), Little (1949), Samuelson (1950), Gilbert and Kravis (1954), and Beckerman (1968). The basic idea is that intertemporal and interspatial comparisons of economic welfare can be made on the basis of price and quantity indices. So, for example, Hicks (1940: 105-124) argues that intertemporal welfare decreases if $\Sigma\ p_1.q_1 > \Sigma\ p_1.q_2$ and that it increases if $\Sigma\ p_2.q_2 > \Sigma\ p_2.q_1$, where prices reflect constant prices with either period 1 or 2 as base year and the respective quantities reflect output for periods 1 and 2. Yet, as Beckerman (1968: 202-232) and Ram (1982: 227) point out, one here encounters the so-called 'index number' problem in terms of deciding whether to use the prices as in period 1 or 2. This is because the use of different sets of prices implies a different outcome in terms of the estimated distance between the indifference curves. The Paasche price index (current-weighted price index) and the Laspeyres price index (base-weighted price index) respectively underestimate and overestimate the 'true' gap between these curves (Beckerman, 1968: 202-232; Novak, 1975: 336). Gilbert and Kravis (1954) and Beckerman (1968) suggest that one use the geometrical mean of these two price indices for determining the eventual price-quantity indices for welfare comparisons.

[41] The original Fisher index is the geometric mean of two indexes, one the harmonic mean of price (or quantity) relatives weighted by the numerator country's expenditures, the other, the arithmetic mean of price (or quantity) weighted by the denominator country's expenditures (Kravis *et al.*, 1975: 288). The harmonic mean is a summary statistic used in analysing frequency data and is calculated as $H = n * 1/\Sigma(1/x_i)$, where n represents the sample size and x_i the price index of each of the countries (Statsoft, 1999). Each country's index and the combined index looks at the cost of a specific basket of goods and services (Pigou, 1929, as quoted in Clark, 1957: 16). For other examples of binary index formulae, see Hansen and Lucas (1984: 28).

While early efforts at income comparisons used binary indices, the expansion of comparisons to still larger samples of countries required multilateral indices. Binary indices compare income for only two countries at a time regardless of the consistency of this comparison should these two countries be compared with others (Kravis *et al.*, 1975: 54-55). The Fisher index described in footnote 41 (page 66) is an example of a binary index (Hansen and Lucas, 1984: 27). Income comparisons based on such indices suffer from base-country variance since results vary when a different country is used as base (Kravis *et al.*, 1975: 1-16).

Multilateral indices entail the simultaneous comparison of income across more than two countries (Ahmad, 1994: 53-59). These comparisons produce consistent results among all pairs of countries by fulfilling the so-called 'circular test'[42] (Ahmad, 1994: 53-59) and not being sensitive to the choice of base country (Kravis *et al.*, 1975: 1-16). Many of these multilateral indices are adjusted Fisher indices. Examples of relatively well-known multilateral indices include the Walsh[43], Geary-Khamis (GK)[44], Elteto-Koves-Szuls (EKS)[45], Gerardi[46], Rao[47], and Economic

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[42] Fisher's 'circular test' stipulates that $I_{j/k} = I_{j/l}/I_{k/l}$, where I represents a price or quantity index and j, k and l represent three different countries (Kravis *et al.*, 1975: 54-55, 287).

[43] A geometric method requiring only price and expenditure data. Quantity indices are based on the relative share of different commodities in expenditure in the respective countries. Price indices are multiplied by these quantity indices to directly estimate income (Rao and Salazar-Carrillo, 1988: 19-37).

[44] International prices for product categories and country PPPs are estimated from a system of linear equations (Kravis *et al.*, 1975: 288; Rao and Salazar-Carrillo, 1988: 19-37). This entails solving a set of $(m + n + 1)$ simultaneous equations for m product headings and n countries, one of which is the base (Ahmad, 1994: 54). For a detailed discussion of how Khamis developed this index with reference to Geary's (1953) earlier work, see Khamis (1984: 185-191).

[45] This method employs a system of binary Fisher indices to derive multilateral index numbers used in directly estimating income levels (Rao and Salazar-Carrillo, 1988: 19-37).

[46] An indirect estimation method and Geary-Khamis (GK) variant measuring international prices as an unweighted geometric mean of those prices prevailing in different countries (Rao and Salazar-Carrillo, 1988: 19-37).

[47] An indirect estimation method based on a log-linear system of equations employing expenditure-share weights (Rao and Salazar-Carrillo, 1988: 19-37).

Commission of Latin America and the Caribbean (ECLAC)[48] methods of income comparison. Of these methods, the Geary-Khamis (GK) method is the most widely used and is employed in the ICP (Hill, 1997: 58). These methods are all of the star-type, meaning that countries are compared by linking bilateral indices using a 'star' spanning tree. Thus, a choice must be made as to which actual country or artificially created 'average' country is placed at the centre of the star to facilitate the comparison between each pair of countries. These two groups of methods are respectively described as asymmetric and symmetric star methods. The EKS method is of the asymmetric type. The other methods listed above are all variants of symmetric-type methods (Hill, 1997: 53-66)[49].

Multilateral aggregation methods employ either direct or indirect estimation techniques. Direct estimation entails the comparison of actual quantities across nations using relative expenditure weights, whereas indirect estimation involves the derivation of quantity ratios from available price and expenditure data (Kravis *et al.*, 1975: 17-25). The footnotes describing each of the most prominent multilateral indexing methods also make reference to the direct or indirect nature of the resulting estimate (footnotes 41 to 48). Direct comparisons are feasible only in the case of relatively homogenous product categories. Kravis *et al.* (1975: 17-25) favour the indirect method given the heterogeneous nature and quality of goods and services, the frequent lack of price data, and the existence of substantial sampling variances.

Aggregation methods can be evaluated by way of certain statistical properties. These are characteristicity (the price/quantity weights are characteristic of the countries being compared), base country-invariance (the particular choice of a base

[48] This method employs a common vector of quantities in computing price index numbers to directly estimate income levels (Rao and Salazar-Carrillo, 1988: 19-37).
[49] Hill (1997) presents a very useful taxonomy of some thirty different star-type methods.

country does not significantly influence the final results), transitivity (pairwise comparisons between the indices of any two countries stand in a similar relation to a third country), additive consistency (quantity indices are directly comparable between countries using a single vector of prices), statistical efficiency (indices are relatively insensitive to underlying sampling errors), and equality in treatment (differences in the representativeness of data across countries do not significantly influence the final results) (Dreschler, 1973: 18-23; Kravis *et al.*, 1975: 54-55; Hill, 1997: 50-51).

The different aggregation methods do not equally and simultaneously satisfy all these properties. The Fisher index, for example, performs poorly in terms of transitivity and additivity (Locker *et al.*, 1988: 93-97). The Geary-Khamis (GK) method, according to Ahmad (1994: 53-59), best satisfies the conditions of transitivity, additivity and base country-invariance. However, it is particularly vulnerable to the so-called 'Gerschenkron effect' (Ahmad, 1994: 53-59)[50]. Thus, there is no absolute best method of aggregation. According to Dreschler (1973), the choice is dependent on the aims and circumstances of the specific comparison. Three main distinctions are drawn. Comparisons may be closed or open (i.e. the set of participating countries being known in advance or not), of a full or limited scale (i.e. each pair of countries being directly compared as opposed to countries being indirectly compared using star-type methods of aggregation, page 68), and may have a weak or strong central interest (i.e. comparisons in relation to one specific country being the focus as opposed to the total comparative picture being of importance). In

[50] The 'Gerschenkron effect' arises because expenditure patterns change as relative prices change (Hill, 1997: 51, 56). As a result, the GDP of countries whose price structures differ significantly from the price structure assumed in calculating average 'international' prices, may be overvalued (Ahmad, 1994: 56). Goods and services normally fetch higher prices in more affluent nations. Since the output of poorer countries is estimated by multiplying their unique quantity index by a higher than realistic price index, the resulting estimates represent an overvaluation of GDP (page 77). This problem has been addressed by calculating average prices for regional groupings of economies so as to arrive at more representative sets of 'average' prices for estimating national output (Ahmad, 1994: 56).

each case, a different aggregation method better suits the particular type of comparison (Dreschler, 1973: 26-34).

Fifthly, there is the question of converting these results into comparable units. To perform meaningful comparisons one requires a 'justifiable and scientific way to reduce this heterogeneous collection of data to a common monetary denominator' (Hicks, 1940: 105). If not, the resulting indices will not consistently and meaningfully estimate differences between nations over time (Beckerman, 1968: 202-232). The earliest efforts at comparison were based on domestic market prices. These conversions failed to allow for inter-country differences in exchange rates, relative prices and consumption patterns (Pomfret, 1997: 7-10). This practice was succeeded by exchange rate-based and later PPP-based income comparisons (Patel, 1964)[51]. The exchange rate method entails the conversion of income estimates into a common currency using prevailing exchange rates, whereas the PPP method utilises PPP estimates[52].

The reliance in earlier years on official exchange rate conversions was motivated by the universal availability of exchange rate data and the lack of timely and universal data on PPPs. Another cited possibility is the mistrust of PPPs in LDCs for which income estimates remained an important yardstick of their eligibility for international development aid (Murphy, 1988: 289). The mistrust emanated from the fact that exchange rate-based income estimates systematically understate the income of LDCs and overstate that of developed nations (Kuznets, 1966: 367-390; Meier,

[51] PPP did not present a new doctrine at the time. Its origins date back to the Napoleonic wars and it was supposedly christened by Chistel during World War I. Yet, it only regained emphasis following World War II (Balassa, 1964: 584-595).

[52] Where the US is employed as the reference country, as is the case in conventional practice, the PPP estimate represents that 'number of units of a country's currency required to buy the same amount of goods and services in the domestic market as one US dollar would buy in the United States' (Stern, 1991: 243-250, as quoted in Meier, 1995: 13-19).

1995: 13-19)[53]. Since this income gap will shrink when PPPs rather than exhange rates are employed in income estimation, the favourable treatment LDCs gained in trade negotiations and in the allocation of foreign aid and loans was perceived to be under threat (Economist, 1998: 75). Exchange rates, furthermore, are distorted by government intervention in foreign exchange markets (Nafziger, 1997: 21-25). Exchange rate-based estimates also preserve price level differences between countries and fail to adjust for the effect of expectations and premiums/discounts on investment climate on exchange rates (Murphy, 1988: 289-291).

The PPP method, however, allows for inter-country differences in price and consumption patterns. It therefore outperforms the former method in terms of international comparability (Balassa, 1964: 595-596; Meier, 1995: 13-19). It is important to note that various methods exist for estimating PPPs. In the early attempts at allowing for differences in consumption patterns income estimates were weighted in terms of either European or US quantities or a combination of the two (Gilbert *et al.*, 1958: 29-33)[54]. The ICP employs PPPs obtained via the so-called country-product-dummy (CPD) method (Kravis *et al.*, 1975: 75-77; Rao and Salazar-Carrillo, 1988: 19-37)[55]. EKS aggregation formulae are also frequently employed in estimating PPPs (Locker, 1984: 140-152).

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[53] Empirical analyses on this subject include the work of Balassa (1964: 595-596), David (1972: 989; 1973: 1261), Kravis *et al.* (1978: 216), Summers *et al.* (1980: 27), Ram (1982: 227), Lopez (1988: 295-298), and Summers and Heston (1991: 334-339). So, for example, the share of the developing economies in world output is estimated to increase from eighteen to thirty-four per cent and that of industrialised countries to drop from seventy-three to fifty-four per cent should one employ PPP rather than exchange rate conversions. The balance of the share in world output consists of the contribution of the centrally planned economies of Eastern Europe and the former Soviet Union (Economist, 1998: 75).

[54] Another earlier attempt at developing a measure reflecting differences in purchasing power can be found in Usher (1968, as quoted in Whynes, 1974: 90-105). See also Balassa (1964; 1973) and David (1972) for some of the alternative theoretical approaches to PPP estimation.

[55] The CPD method employs regression analysis to obtain PPPs from available ICP data (Kravis *et al.*, 1975: 288). Missing prices are first estimated, after which PPPs are calculated as the unweighted geometric average of all binary parities between the price indices of each pair of countries (Locker, 1984: 141).

There is also the issue of price weighting. As Gilbert *et al.* (1958: 17) point out, the 'construction of index numbers to express in a single indicator the average of the movements in production or price' requires a choice to be made as to which country's prices will be used to weight the value of production for inter-country comparisons. Income estimates were initially weighted in terms of prices prevailing in dominant economies such as the US and UK (Gilbert *et al.*, 1958: 17-20) and later on 'international prices' based on the price and quantity structures of a sample of countries and expressed in dollar terms (Kravis *et al.*, 1975: 1-16). According to Gilbert *et al.* (1958: 17-20) the latter efforts tend to be very complex and are not necessarily an improvement on the former.

Finally, one needs to recognise that since most of the price and quantity data on which these estimates are based are collected via questionnaires, such data entail certain measurement errors and shortcomings (Novak, 1975: 325-329). Webster (1974: 41-49) points out that the resulting income estimates may not be reliable sources for decision-making, data analysis, forecasts, target-setting, or aid justifications, especially in the case of LDCs. These data inadequacies, he claims, originate from a number of sources:

- the lack of checks and balances to cross-verify figures
- not all items within the SNA being covered in all countries
- administrative inadequacies
- the poor reliability of survey data as a result of inadequate coverage across economic sectors and subsectors, the biased or uneducated responses of respondents, poorly constructed questionnaires, and failure always to control for influencing variables

- the use of proxy data rather than data collected via expensive and time-consuming field surveys
- the incorrect categorisation of income, expenditure and production data as a result of difficulties in clearly defining the boundaries of economic activity
- problems of data comparability resulting from intertemporal differences in concepts, procedures and methods of data collection and calculation.

The 1993 SNA addresses some of these problems by minimising the burden of response. Since 1998, for example, countries are required only to complete a single questionnaire from either the UNSD, OECD or Eurostat. These three sets of questionnaires are compatible insofar as the UNSD and OECD forms are subsets respectively of the more detailed OECD and Eurostat questionnaires (UNSD, 1995).

The enormous data requirements and methodological complexities related in the previous pages also encouraged analysts to develop alternative estimation techniques. These attempts include (i) Bennett's (1951) and Beckerman and Bacon's (1966) income estimates based on certain broad indicators of consumption and/or production, (ii) Stoikov's (1967) use of production function type equations to derive GNP estimates from labour market data such as the size and quality of the labour force, and (iii) Duggar's (1969) income estimates based on the functional relationship between national income, the nominal stock of money and a surrogate for transaction volatility. Some of these efforts, notably that of Bennett (1951) and Beckerman and Bacon (1966), were forerunners of what have become known as composite development indicators (Chapter 7, page 240).

The preceeding pages focused exclusively on the quantitative nature of measures of national income and economic growth. These measures can be classified

as follows in terms of the three remaining dimensions of technique and method (Chapter 2, pages 24 to 27). In terms of Perez's (1989) perception of objectivity in measurement (Chapter 2, page 25), national income estimates reported in the SNA, ICP and PWT can be considered to be relatively objective. These efforts do, however, entail some elements of subjectivity. Some writers claim that the resulting estimates are biased due to the lack of educated and skilled enumerators to collect and process national accounts data, and the incentives to over- or understate data (Novak, 1975: 327; Pomfret, 1997: 7-10). Novak (1975: 323) makes a similar point, arguing that the objective methods employed in national accounting often need to be supplemented by subjective judgements. Clark (1957: 16-17) claimed that the Fisher index was 'impossibly objective' since such simplistic formulae could not accurately compare the economic welfare of different people across both time and space.

In terms of the theory of national income comparisons, the tools (e.g. indifference curves, budget lines and transformation curves) are ordinal rather than cardinal in nature (Beckerman, 1968: 202-232; Marin, 1978: 420). These tools can only reflect the relative position of different nations. In terms of practical application, though, national income estimates are cardinal in nature. International comparison projects provide income estimates expressed in some common monetary denominator (Whynes, 1974). So, for example, the SNA, ICP and PWT provide income estimates expressed in US dollars (PPP). Cardinal measures more importantly require the meaningful interpretation of differences in income estimates (Chapter 2, page 26). These estimates do allow one to meaningfully interpret the differences in income, i.e. to determine exactly how much nation A is better off than nation B or C, either on aggregate or in per capita terms.

The efforts at estimating and comparing national income discussed here are uniform as opposed to composite in nature. Despite the variety of methods, each is uniform insofar as it represents a specific, standardised technique for measuring this one specific aspect of economic development.

3.5 COMPARATIVE APPLICATION OF MEASURES OF NATIONAL INCOME AND ECONOMIC GROWTH

Sen (1975: 32) distinguishes between a number of levels at which comparisons of national income can be performed. In essence this boils down to intertemporal (time-series) as opposed to interspatial (cross-section) comparisons. These comparisons are crucial in understanding economic development (Chenery and Syrquin, 1975: 1).

3.5.1 Interspatial comparison of estimates of national income

Firstly, one needs to take cognisance of the difficulties, resulting from differences in method and technique, in interspatial comparisons. These difficulties can best be related in terms of the various elements of method and technique discussed in pages 60 to 71. Income estimates are not always comparable due to the fact that different studies employ different macroeconomic identities for estimating income[56]. In this regard, Paige and Bombach (1959: 15-28) argued that the expenditure-based estimation method is biased in favour of high income countries, whereas the production-based method is biased in favour of low income countries.

Ahmad (1994: 57-66) claims that inconsistencies can be addressed only via the improvement of available expenditure data and an increased focus on expenditure rather than production-based estimates, as is the current trend in national economic accounting.

The variety of aggregation methods employed in national income estimation also limits interspatial comparison (Novak, 1975: 323; Nafziger, 1997: 21-25). A number of authors have compared income estimates across the different aggregation methods. The results are mixed. Hansen and Lucas (1984: 33-34), after comparing the instrumental error in indices based on thirteen different formulae, conclude that indices are 'enormously robust with respect to formula'. Stollar *et al.* (1987: 467-478) found that the PWT 'shortcut' method is not consistently outperformed by a number of alternative methods. Ahmad (1994) concludes that the ICP's regional income comparisons are not significantly influenced by the use of different aggregation methods. Others, though, conclude that results differ significantly across the various methods of aggregation (Kravis *et al.*, 1975: 75-77; Khamis, 1984: 196; Locker *et al.*, 1988: 99; Rao and Salazar-Carrillo, 1988: 19-37). So, for example, David (1972) and Balassa (1973) point out that PPP-based income estimates may differ significantly since there exists a variety of techniques for estimating PPPs (page 71). Locker (1984) offers some evidence of this. He compares the GDP estimates of twelve European countries across three variants of PPP estimation techniques. The discrepancies in GDP ranged between -3.68 and 1.49 per cent (Locker, 1984: 147-152). As a result, one needs to take special care in establishing the basis of PPP estimates before attempting to compare PPP-based income estimates across different studies.

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[56] Gilbert *et al.* (1958) refer to the need to compare income estimates in terms of their macroeconomic

Interspatial comparison may also suffer as a result of inherent differences in the unit of comparison. Interspatial comparisons are concerned primarily with comparing income estimates across countries. Income estimates are converted into comparable units of comparison using either exchange rates or PPPs. The former method ignores inter-country differences in purchasing power and interspatial comparisons of exchange rate-based estimates are therefore misleading (Kravis *et al.*, 1975:1-16; Morris, 1979: 7-14; Lopez, 1988: 295). Estimates are also biased insofar as international prices are weighted in terms of prices prevailing in different countries. The earlier focus on prices prevailing in developed countries meant that the gap between rich and poor countries was consistently overestimated and the degree of catch-up required from LDCs exaggerated (footnote 50, page 69) (David, 1972: 979-990). Gilbert *et al.* (1958: 28-33), Paige and Bombach (1959: 15-28), and Summers and Heston (1993, as quoted in Felipe and Resende, 1996: 187-190) highlight the vast differences between exchange rate-based and PPP-based income estimates.

Secondly, despite Kuznets' (1966: 16) claim that nation states are the best unit of comparison to 'reveal significant similarities and differences without obscuring others'[57], inter-country comparisons are problematic due to inherent economic and social differences. Existing methods do not adequately allow for differences in the nature of economic activity. A general characteristic of LDCs is the substantial economic activity in the informal and subsistence sectors. Both of these sectors are not adequately covered in the SNA (McGranahan *et al.*, 1972: 8; Heston, 1994: 38-45)[58]. Centrally planned economies do not place a premium on the market mechanism. Yet the SNA, ICP and PWT value national income in terms of market

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basis, e.g. expenditure, production and income-based estimates of national income.

[57] Kuznets (1966: 16-28) bases his argument on the idea that (i) national identities are based on a common history and cultural heritage, (ii) policy-making power settles at the national level, and (iii) conflict is best resolved at the national level.

prices. It therefore remains difficult to value the output of these nations accurately in the absence of well-developed market structures (McGranahan *et al.*, 1972: 8). Bloem *et al.* (1998) present a discussion of the problems encountered in implementing the 1993 SNA in the former centrally planned economies. The authors distinguish two main sources of incompatibility. The distinction between the activities of government and government-owned enterprise is unclear, which complicates the process of allocating activities to the correct accounts. The use of list prices inclusive of subsidies and taxes, and, more recently, of prices inclusive of allowances for anticipated delays in payment also impedes the market-based evaluation of economic activities (Bloem *et al.*, 1998: 2-13)[59].

Consumption patterns, furthermore, differ according to climatic conditions (Nafziger, 1997: 21-25) and the composition of populations (Whynes, 1974: 97-99). Goods and services are not equally valued across communities in terms of the relative importance of the specific needs they attempt to fulfil (Gilbert and Kravis, 1954). LDCs, for example, may put a higher value on preventive health services and public transport for commuting purposes than do high income economies (Gilbert and Kravis, 1954: 61-95; Kuznets, 1954: 192-215). Thus, comparisons of conventional income estimates may not always be meaningful. Ahmad (1994) accordingly argues for the harmonisation of price work in studies such as the ICP in order to improve results in terms of the representativeness of international expenditure patterns. Care, though, needs to be taken in ensuring item comparability, e.g. comparing long grain rice prices in informal markets with basmati rice prices in city supermarkets (Ahmad,

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[58] For empirical work on this subject, see Blades (1975 and 1980).

[59] The centrally planned economies employed the so-called Material Product System (MPS) up to 1990. Although different from the SNA in respect of its production boundary, sectorisation and structure, it has the same main aim as the SNA, i.e. presenting a 'coherent description of the economic process' (Ivanov, 1987: 1-3). For a detailed discussion of the differences between the SNA and MPS, see Ivanov (1987: 3-17).

1994: 57-66). This ideally requires items to be comparable in terms of unit, quality, packaging and conditions of sale (Ahmad, 1994: 57-66). Earlier attempts at unbiased income comparisons include those of Bennett (1951)[60], Clark (1957)[61], and Beckerman (1968).

Thirdly, due to conceptual differences (Nafziger, 1997: 21-25), income estimates may not be entirely comparable across different data sets. The PWT, for example, lists income estimates for a variety of price concepts, e.g. constant international prices for certain base years, current international prices, and prices adjusted for differences in terms of trade (footnote 16, page 46) (Summers and Heston, 1984: 207). Any comparison of the income estimates reported in different data sets needs to take care in establishing the exact definitions and parameters of price, expenditure, and the like. Ahmad (1994: 57-66) emphasises the need for detailed definitions and descriptions of those items and variables employed in comparison programmes so as to improve comparability.

Fourthly, international comparability is often hampered by the asymmetrical quality and availability of data (Novak, 1975: 325-329, Hansen and Lucas, 1984: 34-35). On the one hand, there is the lack of reliable data needed to support comparison programmes, e.g. population, trade and international finance statistics (Whynes, 1974:90-105; Heston, 1994: 38-45). On the other hand, the price, quantity and expenditure data required for estimating national income are equally weak in many

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[60] Bennett (1951) estimated national income in terms of the production or consumption of nineteen 'key' goods and services, selected so as to avoid cultural bias.

[61] This allowed for differences in the needs of rich and poor countries by comparing national income in terms of two distinct units of comparison, namely International and Oriental Units of comparison. One IU represents the quantity of goods and services exchangeable in the US for $1, whereas one OU represents the quantity of goods and services exchangeable for 1 rupee in India. IUs, argued to be less applicable to LDCs, were replaced by OUs. OUs exclude government expenditure and the costs of distributing food to urban populations, given the relatively low levels of such expenditure in LDCs (Clark, 1957: 18-74).

countries[62]. Heston (1994: 29-32) ascribes this to the lack of good baseline surveys of production, expenditure and prices, as well as to the limited availability of input-output surveys and then only after passage of some time. Price samples, furthermore, differ across countries and expenditure weights are not always available for all the items listed in the ICP (Ahmad, 1994: 57-66). Countries also have different and varying incentives for either over- or underreporting on supporting data and final income estimates (Heston, 1994: 38-45). These deficiencies are often greatest in LDCs (Wilson and Woods, 1982: 14). This was one of the reasons why Kravis *et al.* (1975) devised their ICP 'shortcut' method for estimating national income.

Finally, any comparison of national income estimates needs to control for a number of factors that critically influence the final results. Demographics are of great importance. Meaningful comparisons need to distinguish between estimates based on the total *versus* economically active population (Duggar, 1969: 109), and to allow for inter-country differences in the size and age structure of both populations and households (Kuznets, 1954: 192-215; Tabbarah, 1972: 57-75; Sen, 1975: 19-39; Sen, 1978: 1-3). Kuznets (1954: 192-215) places similar emphasis on international income differentials resulting from the biological and cultural characteristics of populations. Fertility and population growth are examples of such characteristics. Fertility rates affect population age structure which in turn affects consumption patterns and therefore income estimates (Nordhaus and Tobin, 1973: 526-532). Population growth influences productivity and urbanisation which in turn affect income and growth estimates (Kuznets, 1966: 16-34).

Physical or natural factors also have the potential to distort income comparisons. Thus, income estimates have to be adjusted to allow for differences in

[62] See Heston (1994: 32-45) for a detailed comparison and evaluation of the nature of SNA data and

climate, factor endowments, and country size if they need to be directly comparable (Kuznets, 1954: 192-215).

Qualitative differences are of equal importance (Beckerman, 1968: 161-201). Many goods and services are 'comparison-resistant' across nations insofar as it is impossible or extremely difficult to allow for differences in the quality of output. Example include services such as public administration, health and education (Nafziger, 1997: 21-25). Ahmad (1994) proposes addressing this issue via the estimation of quality adjustment factors. Yet another qualitative aspect of income comparisons entails the role of history, politics, culture, and also human capital and intellectual property in explaining international income differentials (Kuznets, 1954: 192-215).

3.5.2 Intertemporal comparison of estimates of national income

As was the case with interspatial comparisons, the first concern in intertemporal comparisons is with differences in method and technique (Nafziger, 1997: 21-25). The aggregation methods employed in estimating national income have individually evolved and have collectively been inconsistently applied over time (Novak, 1975: 323; Summers and Heston, 1984: 216). Thus, income estimates reported in the SNA, ICP and PWT differ substantially when compared across time (Summers and Heston, 1988a: 263-280; Ahmad, 1994: 53). A comparison of ICP survey estimates with PWT estimates extrapolated from income estimates of five years earlier yielded the following results. On average the ICP estimates for 1980 differ eleven per cent from the PWT estimates based on 1975 figures (n = 26). The

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GDP estimates submitted by developing and developed countries.

ICP estimates of 1985 and 1990, respectively, differ sixteen (n = 42) and seven per cent (n = 22) from the PWT estimates based on figures for 1980 and 1985 (Ahmad, 1994: 58-59). These discrepancies to some extent are the result of ICP benchmark surveys differing in terms of country coverage, expenditure weighting and aggregation formulae, as well as the continuous revision of estimates as data sources are updated (Summers *et al.*, 1980: 29-33; Summers and Heston, 1988a: 267-273; Ahmad, 1994: 58-59).

The intertemporal comparability of income estimates is also hampered by differences in PPP estimates and PPP estimation methods (Balassa, 1973). The PWT series of PPP estimates, for example, employs different base years and is based on different benchmark surveys (Summers and Heston, 1984: 216). In the final instance, the quality of data on which income estimates are based differs substantially in terms of sampling error, methodology, and the items sampled (Summers and Heston, 1988a: 267-273). This restricts the direct intertemporal comparability of income estimates.

Intertemporal changes in social and economic behaviour also hamper the comparability of income estimates. Kuznets (1947, as quoted in Morris, 1979), Lewis (1955: 9-10) and Abromowitz (1959: 1) recognised this inadequacy. Kuznets (1947, as quoted in Morris, 1979: 7) argued that 'as coverage includes more and more countries that differ markedly in their industrial structure and form of social organisation, investigators interested in quantitative comparisons will have to take greater cognisance of the aspects of economic and social life that do not now enter national income measurement'.

In terms of consumption patterns, Beckerman (1968: 161-201) highlights one important drawback of many of the early efforts at income comparisons, namely their assumption of similarity in tastes. Kravis *et al.* (1975: 267-286) analyse the relation

between consumption patterns and income estimates using similarity indexes[63]. They conclude that, although consumption patterns in developed countries tend to converge over time, there remains substantial differences in consumption patterns between LDCs and developed countries. Lewis (1955: 23-303) placed the emphasis on both social and economic behaviour. He focused on the importance of changes in productivity, the application of human capital and intellectual property, and the availability of investment and savings in explaining intertemporal differences in national income and economic growth.

There are also conceptual inconsistencies hampering intertemporal income comparisons (Nafziger, 1997: 21-25). These difficulties include changes over time in the unit of comparison from exchange rate to PPP-based estimates, changes in the items sampled in ICP benchmark surveys (Beckerman, 1968: 161-201), and changes in the production boundary as defined in various SNA editions (page 62) (Pomfret, 1997: 7-10). The harmonisation of the international financial statistics reported in the 1993 SNA with the IMF's Balance of Payments (BoP) System represents an effort at eliminating such conceptual inconsistencies (UNSD, 1996).

There has, with the passage of time, been an improvement in the quality and availability of data used in income comparison projects. Thus, recent estimates are not always comparable to earlier estimates of national income. Kuznets (1966: 31-33) highlights the lack of empirical work on economic growth analysis during the premodern era which precludes a meaningful comparison with growth rates achieved in the modern era. Heston (1994) argues that there has been an increasing focus on *growth* measures at the expense of *level* measures in recent years, despite the fact that the quality of growth measures is entirely dependent on the quality of income

[63] A similarity index represents the weighted 'raw' correlation coefficient between the expenditure-

estimates. This resulted in an increased inconsistency insofar as growth estimates do not correspond with the respective estimates of income levels (Heston, 1994: 36-38). Broad data bases with a wide variety of checks and balances are required to ensure consistency. Currently, however, this is not an affordable or practically viable option for the majority of developing countries (Heston, 1994: 36-38). Another shortcoming of earlier analyses includes the use of outdated and/or incorrect price deflators (Nafziger, 1997: 21-25). Earlier analyses, in fact, treated 'figures for income and population ... as broad orders of magnitude (and) rounded (these) to the nearest five or ten' (Patel, 1964: 119-131). For comparative purposes, therefore, the results reported in many of the early attempts at income comparisons are extremely inadequate.

Finally, in addition to growth estimates over time having to allow for the effects of cyclical as opposed to structural changes (Kuznets, 1966: 16-28), cognisance also needs to be taken of intertemporal changes in the same control variables identified in the case of interspatial comparisons (page 76).

3.5.3 Absolute *versus* relative nature of measures of national income

National income estimates are absolute measures insofar as they measure only actual levels of income. Although estimates allow meaningful comparisons of differences in income, the measures are not explicitly expressed relative to some desired level of income. It was precisely this characteristic of conventional national income estimates that became its Achilles' heel. To permit meaningful comparisons, income needs to be linked to the extent of need satisfaction it affords people (Whynes, 1974: 90-105; Tabbarah, 1972: 57-75), or, in other words, value similar goods in the

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weighted price (or quantity) vectors of two countries (Kravis *et al.*, 1975: 289).

hands of two entities differently (Sen, 1975: 19-39; Sen, 1978: 1-3). Conventional income measures, furthermore, were found to be relatively useless in adequately quantifying and evaluating income inequality, which is an entirely relative concept (Tabbarah, 1972: 57-75; Fields, 1980: 8). This resulted in the development of a variety of income-based measures of poverty and inequality. These measures are discussed in further detail in Chapter 5 (pages 129 to 177).

3.6 FOCUS OF MEASURES OF NATIONAL INCOME

Insofar as money represents a means to a number of ends, national income focuses on input rather than on output. Perthel (1981: 44), however, still considers national income to be an adequate and good indicator of the 'development stage a country has reached'. Lewis (1955: 421) reaches a similar conclusion, pointing to the increased control that higher levels of income afford communities.

Yet, similar levels of income need not represent similar levels of welfare or satisfaction (Beckerman, 1968: 161-201). On the one hand, this may be the result of the fact that national income estimates based on production statistics are misleading insofar as they do not focus on the ultimate goal of economic activity, i.e. consumption (Nordhaus and Tobin, 1973: 512-521). These estimates also exclude the environmental costs and illegal activities accompanying increases in aggregate production (Pomfret, 1997: 7-10).

On the other hand, the relative importance of the ends to which income are put in LDCs and developed countries differs. Thus, money does not equally satisfy human wants across societies (Abromowitz, 1959: 4-21). Conventional measures of national income include all national produce regardless of the relative desirability

thereof in the specific community. Social welfare may not always be aided by a growing production of luxury goods and services if primary needs are not adequately met (Seers, 1972b: 26-30). So, for example, the production of food and housing may initially be relatively more important in LDCs than the production of luxury vehicles (Thais, 1989: 171). This implies a possible underestimation of LDC's income, given the relatively low market value of primary goods and services (Kuznets, 1954: 192-215). According to Nafziger (1997: 21-25), the income of rich countries is overstated due to their high output of intermediate goods and their high expenditure on public goods relative to LDCs.

Per capita national income estimates, furthermore, are poor indicators since they represent but an average estimation of income which does not actually accrue to individual members of society. Such an average is misleading since it does not represent the average annual life-time earnings of individuals but measures only annual average income for a particular year. National income also does not actually accrue to individual members of society where it is partially spent on financing public debt and BoP deficits (Lind, 1993: 268).

3.7 CLARITY AND SIMPLICITY OF MEASURES OF NATIONAL INCOME

The nature of the method and techniques employed in the calculation of national income estimates renders this group of indicators extremely complex. The changing scope of the content of income measures and the various intricacies involved in interspatial and intertemporal comparisons further heighten the degree of complexity. National accountants therefore need to clearly circumscribe the nature

and boundaries of their measurement efforts to ensure relative clarity and simplicity amidst inevitable complexity.

3.8 AVAILABILITY OF ESTIMATES OF NATIONAL INCOME

The measurement of national income is currently a far cry from the early 'jigsaw puzzle of comparisons' which involved a multitude of organisations and which provided comparable income estimates for only a handful of developed nations (Kravis *et al.*, 1975: 1-16). Efforts have since been well disseminated across both time and space. According to the 1990 edition of the UN's National Accounts Yearbook, 168 countries provided SNA accounts for 1988 or earlier (Heston, 1994: 29-32). The 1993 SNA emphasises the need to include even more countries (UN Economic and Social Council, 1993). ICP surveys are currently conducted every five years and by 1990 covered over ninety countries in one phase or another (Ahmad, 1994: 53-57). The six nations covered in its first phase and the ten covered in the second (Kravis *et al.*, 1975: 1-16) stand in sharp contrast to the sixty covered in phase four (Locker *et al.*, 1988: 93-97). The PWT has evolved from reporting ten variables for 119 market economies in mark I (Kravis *et al.*, 1978) to listing twenty-eight variables for 152 countries in version six of mark V (National Bureau of Economic Research, 1998)[64]. The first series reports data for the period 1950-77 and the latest for 1950-92. An increasing number of centrally-planned economies are included in the most recent series.

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[64] A Standard of Living Index (STLIV) was added as twenty-eighth variable to the latest PWT series. Calculated as consumption plus government consumption minus military expenditure as a percentage of GDP (NBER, 1998), it attempts to present a better estimation of national income. This measure is

This dissemination has benefited from the development of specialised software, a decentralisation of measurement to the national level, and an increased usage of this data in public decision-making (Ahmad, 1994: 57-66). Murphy (1988: 291-293), in the latter regard, highlights international development agencies' increasing use of real per capita income for determining investment and aid allocations. According to him, dissemination was also aided by the lower cost and administration burden resulting from the use of 'shortcut' methods. Other contributing factors include the translation of manuals into a wide variety of languages, the ongoing training of those compiling and using such data, and increased technical cooperation between overseeing agencies and individual countries (UN Economic and Social Council, 1993). However, there are a few important aspects to be borne in mind when considering the availability of national income estimates across space and time.

3.8.1 Interspatial availability of estimates of national income

Despite concerted efforts since the early 1970s to implement the SNA as far and as widely as possible (Heston, 1994: 29-32), national accounts data are not equally detailed. An analysis of the SNA data reported by developing and developed countries found a total of ninety-two non-detailed submissions, mostly on the part of LDCs (Heston, 1994: 32-36). ICP and PWT data are equally fragile for LDCs. This is the result of LDCs often lacking the expertise and well-developed data bases required to drive these programmes (Pomfret, 1997: 7-10). In the case of national resource accounts (NRAs), the lack of detailed accounts for LDCs is even more

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similar to those devised by Nordhaus and Tobin (1973) and Beckerman (1978) in that it attemps to distinguish between economic activities in terms of their contribution to social welfare (page 60).

pronounced. According to UNEP (1991, as quoted in Tolba and El-Kholy, 1992: 709), only twenty-two developing countries by 1990 had published a 'state of the environment' report, the majority being high middle-income economies. This is unfortunate, given that LDCs are economically more dependent on natural resources than are most developed countries (UNPF, 1991: 3-9).

The United Nations recently established a set of 'six milestones' with which to assess and monitor the availability of SNA data (UNSD, 1996). Each of these milestones entails a further improvement of the detailedness of SNA data. The first two milestones relate to those basic statistics with the most immediate and general use in national policy-making, i.e. GDP indicators (milestone I) and Gross National Income and other primary indicators (milestone II). The other milestones focus on institutional accounts (milestones III to V) and satellite accounts and other supplementary balance sheets (milestone VI). Criteria for each of these milestones were defined by way of twenty-six key tables selected from the total of sixty national accounts tables (UNSD, 1997). According to these criteria, fifty-six of the total 184 UN member states were still in the pre-SNA phase, while forty-five had reached milestone I, fifty-six milestone II, and only twenty-seven milestone III or higher by 1990/95 (UNSD, 1997). This is a clear indication that the total international dissemination of the SNA is still some way off.

3.8.2 Intertemporal availability of estimates of national income

As is evident from details on the availability of SNA, ICP and PWT data series (page 87), the lack of intertemporal coverage highlighted by Ram (1982: 227) has since improved considerably. Intertemporal availability, however, is still often

hampered by delays in the production of national accounts data (Webster, 1974: 41-49). This lack of timeliness is worst in the case of LDCs. According to Heston (1994: 32-36), only half of LDCs provide recent SNA data and the time lag in some cases reaches five years[65]. The ICP performs even worse in this regard. The time lag between consecutive benchmark surveys is sometimes fifteen to twenty years, while the original benchmarks in other cases have never been revised (Heston, 1994: 32-36). Timeliness, though, also often suffers in developed countries. The USA, for example, by 1991 still only provided a 1986 input-output table in their national accounts (Heston, 1994: 38-45). These shortcomings, coupled with conceptual and methodological change, severely hamper the intertemporal comparability of such indicators (Kuznets, 1966: 31-33).

3.9 FLEXIBILITY OF MEASURES OF NATIONAL INCOME

Due to the complex nature of the methods and techniques employed in income analyses and their wide application, measures of national income are relatively inflexible. It requires considerable time to effect changes in the economic boundaries within which total income is measured and to disseminate updated techniques internationally (Abromowitz, 1959: 1; Pyatt, 1991: 186-193). The SNA, for example, has since its establishment only twice been revised. Smaller changes, though, are effected continually insofar as it may be possible without threatening the overall stability of the programme. The SNA also signifies the extent to which increased flexibility implies increased complexity. In line with Juster's (1973: 37-40) idea that the need to expand the content of national accounts will best be served via a number

[65] Timeliness as defined here allows for an accepted time lag of two years (Heston, 1994: 32-36).

of supplementary accounts[66], the 1993 SNA added various additional accounts to the basic national accounting framework carried over from previous editions.

3.10 CONCLUDING REMARKS ON MEASURES OF NATIONAL INCOME AND ECONOMIC GROWTH

It is obvious from the preceding discussion that national income estimates are inherently complex in terms of content, method and technique, and comparability. Heston (1994), in fact, concludes one of his analyses with a plea that the users of national accounts data, especially in comparative analyses, must always question their reliability. Although much improved, the availability of estimates of national income and economic growth across both time and space is also less commendable than perhaps generally thought. Despite these complexities and shortcomings, estimates of national income per capita and economic growth have remained the most important indicators of economic development. The World Bank, for example, have for decades employed real GNP per capita in order to distinguish between low, middle and high-income economies (Felipe and Resende, 1996: 187-190). However, national income per capita and economic growth rates are not very useful for determining the extent of unemployment and underemployment in an economy. For this reason, the focus now shifts to an overview of labour market indicators of economic development.

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[66] Juster (1973: 40-50) suggests that national accounts in future be expanded to include sub-accounts for reproducible tangible ('structures and durable equipment') and intangible ('stock of disembodied socially useful knowledge') wealth, human wealth ('stock of skills and knowledge embodied in persons'), natural physical resource wealth such as mineral, forest, water and climate, as well as socio-political wealth ('stock of personal and national security, freedom, equity and privacy').

Chapter 4

Indicators of Employment, Unemployment and Underemployment

4.1 SCOPE OF THIS CHAPTER

This chapter is concerned with indicators of employment, unemployment and underemployment, because the income-based measures of economic development discussed in Chapter 3 do not allow one to determine the extent of unemployment in the economy. As an introduction, there is a brief background to the measurement of labour-related development issues. It explains how and why different labour market indicators rose to prominence. Following this, prominent indicators of employment, unemployment and underemployment are discussed. This discussion is based on the different dimensions of measurement identified in Chapter 2.

4.2 BACKGROUND TO LABOUR MARKET INDICATORS

The measurement of employment can be traced back to the earliest population census attempts (Hauser, 1949: 338). Indicators of unemployment, though, achieved prominence only during the 1940s (Levitan and Taggart, 1974: 2; Clogg, 1979: 1). This is because the Great Depression of the 1930s disproved the neoclassical idea that markets always clear and that only voluntary and frictional unemployment exist (Levitan and Taggart, 1974: 1-18; Brun and Diaz, 1984: 4-7; Schettkat, 1996: 1-2). The Depression made it evident that a large number of people could be involuntarily

unemployed despite being willing and able to work. Subsequent decades witnessed the development of a range of unemployment indicators.

Historically, these indicators evolved and proliferated as the unemployment concept was refined, the nature of labour markets changed, new theoretical perspectives and public policy issues came to the fore, and the methodology of unemployment measurement developed (Levitan and Taggart, 1974: 1-18; Schettkat, 1996: 1-2). Examples of such public policy issues include the rise in female participation in labour markets, increasing unemployment amongst teenagers, organisational change, retrenchments and economic restructuring resulting from technological advance, and the formalisation of worker rights (Hill, 1976: 168-184; Entorf, 1998: 11; Bhalla and Lapeyre, 1999: 72). Labour market theory, on the other hand, saw a greater recognition of the structural and institutional determinants of unemployment (Levitan and Taggart, 1974: 1-18; Schettkat, 1996: 1-2).

As Bowers (1976) pointed out, developments in measurement also usually dawn when statistics behave out of the ordinary. So, for example, unemployment rates in the United States and Britain rose sharply during the 1960s and 1970s despite growing levels of output and relative macroeconomic stability (Bowers, 1976: 109-133; Taylor, 1976: 146-167). Consequent closer inspection precipitated a refinement of existing measures and the development of supplementary ones.

In fact, unemployment has continued to persist in the United States and Western Europe since the 1980s (Summers, 1990: xv; Entorf, 1998: 1). The resurgence, for example, of poverty in Europe in the 1980s has been attributed to persistent unemployment (Bhalla and Lapeyre, 1999: 55-64). As a result, labour market indicators continue to feature prominently in the measurement of economic development in the developed countries of Europe, as well as in the United States.

4.3 CONTENT OF INDICATORS OF EMPLOYMENT, UNEMPLOYMENT AND UNDEREMPLOYMENT

Historically, unemployment has been conceptualised in three general ways. Prior to the 1930s the so-called 'gainful worker' approach was used (Hauser, 1974: 1-2; Chernyshev, 1997: 62-64). Tiwari (1996: 107) defines the approach as the 'income concept ... for determining the gainful status of persons'. The term 'gainful workers' refers to 'people who earn money or a money equivalent from some or other occupation and who in terms of age comply with the set limitations' (Hauser, 1949: 338). This concept, over time, evolved to include all occupations rather than a specified list of occupations, saw the age limit adjusted from fifteen to ten years, and witnessed the inclusion of females and slaves in addition to free males (Hauser, 1949: 338-339). The focus, therefore, was on the measurement of employment (those reporting 'gainful occupation') rather than unemployment (those without jobs).

The 'gainful worker' concept was in 1940 supplemented with and by 1970 replaced by the 'labour force' approach to unemployment measurement (Hauser, 1974: 1-2). Following the economic depression of the 1930s, the focus shifted to determining the number of people within the labour force who were without jobs but were willing and able to work (Hauser, 1949: 340). The total labour force (or population of working age) was accordingly broken down in those who are voluntary unemployed ('economically inactive'), employed, or involuntary unemployed whilst actively seeking work (Clogg, 1979: 1-4; Chernyshev, 1997: 62-64). There are four possible methods for determining the total number of unemployed, each with its own particular advantages and shortcomings. These are related in detail in the discussion on method and technique (page 100).

Hauser (1949: 340) considered the 'labour force' approach an improvement on the 'gainful worker' concept, given its behaviouristic foundations (it focuses on the activity of either working or seeking work) and specific time reference (activity is confined to a certain period of time leading up to the interview). The 'labour force' approach also saw the age limit below which people are not supposed to be economically active and are therefore not classified as employed or unemployed, adjusted in an upward direction. The limit was changed from ten to fourteen years following the introduction of legislation prohibiting the exploitation of child labour (Hauser, 1949: 340). Subsequent legislation on compulsory school attendance witnessed a further upward adjustment of the age limit to sixteen years. Thatcher (1976: 83-94) and Standing *et al.* (1996: 103-110), however, criticise the 'labour force' approach as conceptually cluttered since it combines a condition (being without a job), a need (needing to earn an income), an attitude (desiring a job under certain conditions), a capacity (being able to work) and an activity (seeking a job).

According to Hauser (1974: 3), the 'labour force' approach served developed countries well but failed to provide developing countries with adequate information for formulating labour policy. This realisation dawned as analysts came to recognise that in developing countries underemployment may be a more severe problem than unemployment (Vietorisz *et al.*, 1975: 3). The 'labour force' approach ignores the importance of (informal) self-employment in countries where a much lower proportion of the labour force is absorbed into formal wage employment (Squire, 1981: 57-75; Koopmans, 1994: 575-581). It also fails to assess whether those actually employed earn an adequate income or work as many hours as they actually want to, and whether occupations and skills are correctly matched (Shiskin and Stein, 1975: 8-

10; Clogg, 1979: 1-4; Paul, 1992: 739). It furthermore provides little detail on the distribution of the unemployment burden (Sloman, 1997: 415-417).

These shortcomings of the 'labour force' approach saw the development of a third strand of labour market indicators during the 1970s. These indicators focus on underemployment and quantify characteristics of the employed and unemployed other than their employment status, i.e. being employed or unemployed. Accordingly, Chernyshev (1997: 74) claims that this approach is better equipped for dealing with the fact that employment is also a need, attitude, capacity, and activity (page 95). Bhalla and Lapeyre (1999: 54) describe such measures as indicators of inequality amongst the employed.

These measures rose to prominence because the nature of labour markets and unemployment had changed significantly. The relatively rigid 'lifelong full-time' work pattern made way for more flexible work patterns. These patterns could cope better with the greater flexibility, informality and fragmentation of production and labour relations (Chernyshev, 1997: 62-64; Bhalla and Lapeyre, 1999: 63-67). As a result, the focus in measurement shifted to the precariousness of jobs in terms of wages, tenure, employee benefits, and working conditions (Bhalla and Lapeyre, 1999: 63-67). Unemployment was also recognised to be inherently unstable, with brief employment spells and significant flows into and out of employment (Bowers, 1976: 109; Summers, 1990: 3-47; Schettkat, 1996: 1-2).

These dynamic aspects of the 'new' labour market are measured in terms of, amongst other things, the duration of unemployment spells and job tenure, the extent of involuntary part-time employment and informal sector activity, the quality of working conditions, and the extent of labour market mismatch (Summers, 1990: 3-47; Entorf, 1998: 1-3; Bhalla and Lapeyre, 1999: 54). These measures require statistics

on earnings, hours of work, and a variety of other labour market characteristics (Hauser, 1974: 4-6; Hauser, 1977: 10-20; Clogg, 1979: 1-4; Summers, 1990: 3-47).

The three approaches to unemployment described above signify the changing perspective on unemployment. The 'gainful worker' and 'labour force' approaches view unemployment as a predominantly economic phenomenon resulting from imbalances in labour markets (Thatcher, 1976: 83-94; Fallon and Verry, 1988: 193-194). The 'underemployment' approach recognises the economic hardship resulting from unemployment (Thatcher, 1976: 83-94). Reynolds *et al.* (1991) relate these two perspectives in terms of the different purposes of unemployment indicators. They distinguish between the broad goal of quantifying macroeconomic performance and that of reflecting the economic hardship induced by unemployment. The conventional, natural[67] and non-accelerating inflation[68] rates of unemployment are examples of macroeconomic parameters of unemployment. Underemployment measures focus on hardship issues such as the adequacy of earnings and hours of work, and the earnings effect of displacement (Reynolds *et al.*, 1991: 271-274).

The three approaches to unemployment can also be traced to the various theoretical explanations of unemployment and the different types of unemployment identified in the literature on labour market theory. The 'gainful worker' approach is based on the preconception that unemployment is purely voluntary and frictional by nature. The 'labour force' approach recognises the existence of widespread

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[67] The natural rate of unemployment is the rate at which there is neither excess demand nor excess supply in the overall labour market, in other words, the rate of unemployment where the expected and actual rates of inflation are equal (McConnell and Brue, 1995: 536).

[68] The non-accelerating inflation rate of unemployment (NAIRU) was an important parameter in macroeconomic analysis during the 1970s and 1980s. It rose to prominence because policy analysts feared that the use of expansionary Keynesian policies aimed at the reduction of unemployment would cause higher inflation (Fallon and Verry, 1988: 263-266). NAIRU is derived with the aid of equations that combine data on wages, labour mismatch, union power, labour taxes, and benefit replacement ratios. These equations recognise the links between unemployment and both demand and supply factors (Fallon and Verry, 1988: 263-266; Jenkinson, 1988: 365-375; Nickell, 1988: 378-385).

involuntary, demand-deficient (cyclical) unemployment. During an economic recession deficient demand coupled with downward wage rigidity forces firms to cut back on employment. The causes of downward wage rigidity include union activity, the tendency of firms to lay off workers rather than reduce the wages of existing workers, the importance of implicit contracts, and the inability and/or unwillingness of outsiders to bid down existing wages (McConnell and Brue, 1995: 539-552).

In the case of 'underemployment', Levitan and Taggart (1974) claim that underemployment indices were resurrected during the 1970s following the development of the segmented labour market theory. This theory argues that low earnings, unemployment, involuntary part-time work, and discouragement are causally linked (Levitan and Taggart, 1974: 26-30; McConnell and Brue, 1995: 448-473). Economic theory also draws a distinction between visible and invisible underemployment (Clogg, 1979: 1-4; Fallon and Verry, 1988: 193-194). Visible underemployment refers to situations in which people are employed for less than the standard workweek but prefer to work longer. Invisible underemployment can be traced to the structuralist theory of unemployment, which recognises the role of geographic and skills mismatches in the inadequate utilisation of workers (McConnell and Brue, 1995: 547)[69].

Entorf (1998) distinguishes between four explanations of labour market mismatch (i.e. imbalances between demand and supply), two of which he links to structural unemployment. According to him, mismatch is often attributed to

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NAIRU, though, is not a unique indicator of unemployment. It is derived from labour market indicators combined in an equation. Hence it is not included in Table 4.1 (page 107).

[69] Invisible underemployment is also sometimes referred to as 'disguised unemployment'. This concept has its theoretical roots in the 'disguised employment' concept introduced by Robinson (1936: 236-237). She argued that all people are necessarily occupied for twenty-four hours a day but that employment respectively rises or falls as people transfer their time to occupations where they are either more or less productive as effective demand changes, assuming that there are no unemployment benefits and/or poverty relief for the unemployed. Kalirajan (1995: 879) defines this as situations

temporary, short-run sectoral shocks. Another explanation of mismatch, he argues, is that it is caused by vacancies in some sectors coexisting with unemployment in others, which are the result of structural unemployment. There is also the point of view that mismatch can be attributed to price fluctuations, as represented by the difference between the actual unemployment rate and the natural rate of unemployment under price stability (NAIRU) (footnote 67, page 97). Others, moreover, have attributed mismatch to frictional unemployment, which they argue is unavoidable and a long-term, permanent characteristic of labour markets (Entorf, 1998: 2-3). These different perspectives on labour market mismatch resulted in the development of a variety of indices of mismatch (Table 4.1, page 110).

Yet, no measurement effort has as yet attempted to simultaneously break down total unemployment into its different theoretical categories, e.g. frictional, cyclical and structural unemployment (Standing *et al.*, 1996: 103-110). Given the conceptual overlap and the resulting difficulty in distinguishing between the types of unemployment during measurement, this remains a difficult task (McConnell and Brue, 1995: 548).

Different approaches to unemployment also have different policy implications. Ultimately, policy addresses either worker characteristics or job characteristics (McConnell and Brue, 1995: 468). The 'labour force' approach focuses on worker characteristics since it classifies someone as unemployed who is of a specified age and is currently without a job, but is actively searching for employment and is not disabled. Underemployment measures emphasise job characteristics since they quantify the extent to which people are underemployed in terms of the hours of work or income their jobs offer, or the degree to which skills and occupations are correctly

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where workers are employed at wages above their marginal productivity due to poor organisation and management.

matched. These two approaches to unemployment respectively place the policy emphasis on job creation, education, training, and unemployment insurance as opposed to improved information flows, regulation, and structural and institutional reform (Hauser, 1974: 6; Reynolds *et al.*, 1991: 291-299; McConnell and Brue, 1995: 468).

4.4 TECHNIQUE AND METHOD OF MEASUREMENT OF EMPLOYMENT, UNEMPLOYMENT AND UNDEREMPLOYMENT

There are four possible methods for determining the total number of unemployed persons in the economy as required in the 'labour force' approach to measurement (page 94). These four methods employ different sources of labour market statistics (Barker and Backer, 1992: 76-86).

The *first* and oldest of the methods utilised to determine the extent of unemployment involves the use of population censuses. This method was also used in determining the total number of 'gainful workers' within the economy. The United Nations World Census Programme is an example of population census-based measurement of unemployment (UN, 1964: 48; Hauser, 1974: 1-2). The census questionnaires included questions to determine the employment status of the members of every household (page 104). A major drawback of this method is the fact that questionnaires can include only a limited number of questions related to unemployment. Any census attempts also to quantify numerous other issues. These questions, therefore, tend to be of a relatively general nature. This may fail to adequately measure a complex phenomenon such as unemployment. Other shortcomings of this method include the inability of enumeration to be perfect in

terms of coverage, the role of recorders' instructions in influencing responses, the distortive effects of poor questionnaire design, the cost-intensiveness and time-consuming nature of censuses, and the considerable lags between enumeration, data processing and reporting (Whelpton, 1938: 20-27; UN, 1986: 14; Barker and Backer, 1992: 76-86).

The *second* alternative, which also employs census data, is to take the difference between the total number of employees in the formal sector and the potentially economic active population as total unemployment. This is the so-called residual method. This method considers those individuals employed within the informal and subsistence sectors as unemployed (Barker and Backer, 1992: 76-86). It therefore will always overestimate unemployment, especially in the case of LDCs where these sectors make a significant contribution to total economic activity[70].

With the rise of the welfare state a *third* method for measuring unemployment was developed. The registration method counts as unemployed the sum of individuals registered for the receipt of unemployment insurance and benefits (Barker and Backer, 1992: 76-86). Sloman (1997: 413) calls this 'claimant unemployment'. Of the approximately 120 countries for which the 1997 Yearbook of Labour Statistics reports unemployment statistics, some forty-four use employment office registration statistics in estimating unemployment (ILO, 1997: 437-454).

Standing *et al.* (1996: 103-110) consider this method the least accurate of the four in terms of unemployment estimates derived. There are various reasons for the under/overestimation of unemployment, all related to the widely divergent motives

[70] Koopmans (1994) makes a case for measures of informal sector activity as indicators of 'hidden labour' (Table 4.1, page 107). These activities include non-reported paid labour, people 'employed' as household members (housewives), economic activities with rewards on which no taxes are levied, and criminal activities (Koopmans, 1994: 575-581). Informal sector activity can be estimated via tax audits, special surveys, discrepancy methods, monetary methods, or the so-called unobserved variable

for and practices of unemployment registration. Admittedly, unemployment may be overestimated where double-counting occurs as a result of the existence of numerous registration agencies and the failure to ensure that individuals registered at more than one agency are counted only once (Barker and Backer, 1992: 76-86). Overestimation may also result when registration increases during phases of economic expansion but claimants are frictionally unemployed rather than permanently without jobs (Taylor, 1976: 146-167). Underestimation will result where not all the unemployed register. Failure to register may result from people being uninformed as to the existence of these structures, their chances of placement or benefits being negligible, conditions for eligibility changing frequently, registration not being compulsory, or social security and unemployment benefit structures being poorly developed (Barker and Backer, 1992: 76-86; Sloman, 1997: 413-414).

The *fourth* method is the current population or household survey (CPS) method. It involves a regular survey of a representative sample of households for the collection of labour statistics (Barker and Backer, 1992: 76-86). For this purpose, use is made of specially designed surveys called labour force surveys (LFS). As with the population census method, a certain employment status is assigned to individuals in order to determine the extent of unemployment. Labour force surveys also allow the collection of detailed labour-related statistics in both an aggregated and a disaggregated format (McConnell and Brue, 1995: 531-533). So, for example, detailed information on the reasons why people work certain hours, how much overtime they work, their reasons for absenteeism, the specific actions they take in job search, and their reasons for being unemployed are collected (Fleisher, 1970: 9-36; Chernyshev, 1997: 135-158).

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method. The former two are direct methods and the latter three indirect methods of estimation (Koopmans, 1994: 575-581).

Labour force surveys today represent the predominant method for collecting labour market statistics (Sloman, 1997: 414). Of the approximately 120 countries for which the 1997 Yearbook of Labour Statistics reports unemployment statistics, some seventy base their estimates on labour force surveys (ILO, 1997: 437-454). It outperforms the other methods in that it allows the collection of more detailed data, is uniform and consistent in terms of the sampling technique it employs, is less expensive, and the time lag between collecting and reporting results is relatively short (Barker and Backer, 1992: 76-86; McConnel and Brue, 1995: 531-533).

Labour force surveys are not without shortcomings. Respondents may provide false information so as to present a favourable picture of themselves (McConnel and Brue, 1995: 531-533). Given its inability to canvass whole populations, unemployment estimates based on this methodology could also include substantial sampling errors. Response errors, moreover, are inevitable, given problems with regard to survey design and operational procedures (Hauser, 1977: 20-23). Survey design, however, has been enhanced by the introduction by the ILO of standard recommendations and resolutions on labour statistics (Chernyshev, 1997: 32).

Another example of the early shortcomings of labour force surveys is their equal treatment of full-time and part-time employment (Hauser, 1949: 16-19; Shiskin and Stein, 1975: 5-8; McConnel and Brue, 1995: 531-533). Questionnaires employed in labour force surveys have since been adjusted to deal with this shortcoming (Shiskin and Stein, 1975: 3-4). The employment statuses assigned to individuals were changed from the conventional three (i.e. the unemployable, unemployed and employed) used in early surveys (Hauser, 1974: 4-13; Clogg, 1979: 4-14; ILO, 1982; Brun and Diaz, 1984: 4-7; Standing *et al.*, 1996: 103-110). The ILO, in their latest international standard classification of employment status (ICSE-93), allow for six

categorisations of employed workers. Workers may be classified as employees, employers, own-account workers (i.e. the self-employed), members of producers' cooperatives, contributing family workers, or workers not classified by status. Further divisions are, amongst other things, drawn between casual workers, workers in seasonal employment, contractors, franchisees, sharecroppers, and subsistence workers (ILO, 1993a).

Refinements were also required to address shortcomings with regard to the treatment of job search activity and discouraged workers (Shiskin and Stein, 1975). In order to avoid subjective judgements as to what constitutes acceptable job seeking activities the survey question on job search activity lists specific activities. These activities include being registered with an unemployment agency or union, having applied for a position either by mail, telephone or in person, having placed advertisements of availability for employment, or having checked with work sites and relatives for possible employment (Shiskin and Stein, 1975: 5-8; ILO, 1982; Chernyshev, 1997: 135-158).

Discouraged workers are not always treated uniformly during measurement. Discouraged workers are those individuals not participating in job search activities during the reference period because they perceive work to be unavailable, have searched previously but have been unsuccessful, or lack the necessary skills, training and experience. It may also be because they consider themselves unemployable in terms of their own perceptions of inadequacy or their perceived perceptions of any potential employer's perceptions of inadequacy (Shiskin and Stein, 1975: 5-8). In terms of the ILO recommendations for labour statisticians, discouraged workers are generally treated as unemployed (Table 4.1, indicator 15, page 108). It is possible, though, to distinguish between a narrow and a broad definition of unemployment.

This allows for the recognition of the problem of discouragement (footnote 75, page 108). The current inclusion, furthermore, in labour force surveys of specific questions related to discouragement allows for details on the reasons for discouragement to be reported separately (Shiskin and Stein, 1975: 5-8; Chernyshev, 1997: 135-158).

The need to quantify the extent of underemployment and other labour market issues (page 96) further refined labour force surveys as a measurement tool and also resulted in two other sources of labour market statistics gaining greater significance. These two sources are establishment surveys and administrative records. Establishment surveys are used mainly to collect data on wages, vacancies, labour turnover, employee benefits, and recruitment and training practices from employers. Occasionally special surveys are also employed to collect data on informal sector activity. Administrative records, previously used mainly as sources of registered unemployment (page 101), are now used for more varied purposes. Records frequently employed for such measurement purposes include employment exchange registers, unemployment insurance records, social security files, public sector payrolls, personnel records, tax records, labour inspection records, and records of labour unions and employer organisations (Chernyshev, 1997: 29-30, 67-74). Administrative records, as mentioned elsewhere (page 101), are generally acknowledged as the weakest source of labour market statistics. Its main shortcomings include limited coverage and content, rigid and inconsistent definitions of concepts, incompleteness, and restricted access to certain records (Chernyshev, 1997: 32).

According to Fleisher (1970: 9-36), in the early years few studies managed to combine data from these different sources of labour statistics meaningfully. Chernyshev (1997: 68) airs similar views. He argues that analyses are often

hampered by expecting too much from one data source, not using the most suitable source, or underutilising sources by not analysing records exhaustively. Yet, there is no shortage of labour market indicators. The most prominent labour market indicators, which are obtained from the sources of labour market statistics discussed above, are presented in Table 4.1 (page 107).

According to the International Labour Organisation (ILO), any national system of labour statistics should include statistics on employment, unemployment and underemployment, income from employment, hours of work, occupational injuries, labour disputes, informal sector activity, and labour productivity (Chernyshev, 1997: 28-29). These statistics are crucial in informing labour market policies aimed at improving labour mobility and productivity, restructuring employment, and overcoming vulnerability to unemployment (Chernyshev, 1997: 64). The ILO (1999b) has also summarised certain essential labour market indicators in a recent publication entitled *Key Indicators of the Labour Market*. These two references were used as a guideline for the choice of indicators included in Table 4.1. Indicators other than those included in these two references that do feature in Table 4.1 are ones that feature frequently in recent publications on labour market statistics and labour market analysis.

The indicators presented here are often disaggregated according to certain socio-demographic characteristics, e.g. gender, age, occupation[71], and educational attainment. The ILO, for example, reports national estimates of unemployment by age group, level of education, economic activity, and occupation (Chernyshev, 1997:

[71] The ILO's international standard classification of occupations (ISCO-88) includes ten major groupings, each with a large number of further subdivisions. The basic criterion for the classification is the 'skill level and skill specialisation required to carry out the tasks and duties of the occupations'. The ten major groupings are (i) legislators, senior officials and managers, (ii) professionals, (iii) technicians and associate professionals, (iv) clerks, (v) service workers and shop and market sales workers, (vi)

28-29; ILO, 1997: 428). These measures do not, as such, represent unique labour market indicators and are therefore not included in Table 4.1. The focus, furthermore, is on summary measures rather than baseline data generated in labour force surveys, e.g. the specific reasons why people are unemployed or choose to work less than forty hours per week.

Table 4.1: Fifty-four indicators of employment, unemployment and underemployment

Indicator(s)	Description	Source
1. Labour force participation rate	Measure of the relative supply of labour and overall level of labour market activity. Indicates what proportion of the working age population is economically active. Calculated as the total number of persons formally employed and unemployed (i.e. the labour force) as a percentage of the working age population (i.e. the population aged fifteen to sixty-four). Employed persons refer to individuals aged 15-64 who during the reference period were in paid employment or self-employment. The unemployed are those people aged 15-64 who are without work, currently available for work, and seeking work.	Standing *et al.* (1996: 103-110), ILO (1982, 1999b).
2. Employment-to-population ratio	Indicator of labour market status, i.e. the proportion of the population actually employed. Calculated as total employment as percentage of total population.	ILO (1999b)
3. Employment by status	Percentage share of (i) wage and salaried workers, (ii) self-employed workers and employers, and (iii) own-account workers and unpaid family workers in total employment.	ILO (1999b)
4. Employment by sector	Percentage share of primary (e.g. agricultural), secondary (industrial) and tertiary (service) sector employment in total employment.	ILO (1999b)
5. Involuntary part-time employment	Calculated as number of workers employed on part-time basis as percentage of total employment[72].	Abraham and McKersie (1990: 88-92), Bhalla and Lapeyre (1999: 55-82), ILO (1999b).

skilled agricultural and fishery workers, (vii) craft and related trades workers, (viii) plant and machine operators and assemblers, (ix) elementary occupations, and (x) armed forces (ILO, 1987).

[72] Normally this indicator counts as part-time workers those persons with jobs whose weekly working hours total less than a certain standard. There is no agreed upon standard but most countries employ a forty hour work week as standard (ILO, 1999). Some countries, though, have based the measure on respondents' own interpretation of their situation, e.g. workers who work part-time but who prefer to work full-time, or temporary workers who cannot find permanent employment. Bhalla and Lapeyre (1999: 55-82), for example, employ the percentage full-time workers who prefer part-time jobs and the percentage part-time workers who prefer full-time jobs in their analysis of labour markets.

Indicator(s)	Description	Source
6. Hours of work	a. Percentage of persons in paid employment who (i) work less than ten hours per week ('marginal hours') and (ii) work more than forty hours a week ('excessive hours'), excluding workers absent from work during the reference period.	ILO (1998a, 1999b)
	b. Average annual number of hours worked per employed person.	
7. 'Moonlighting'	Percentage of employed occupying a second job.	Bhalla and Lapeyre (1999: 55-82)
8. Labour turnover rate	Measure of worker flows in the economy. Calculated as new contracts plus existing contracts, divided by level of employment or labour force and expressed as percentage.	Schettkat (1996: 14-20)
9. Job turnover rate	Measure of job flows in the economy. Calculated as job gains plus job losses, divided by level of employment or labour force and expressed as percentage.	Schettkat (1996: 14-20)
10. Job security	Measure of job duration or tenure. Percentage of jobs with tenure less than one year, one to two years, two to five years, and ten to twenty years.	Bhalla and Lapeyre (1999: 55-82)
11. Skill mobility	Share of labour force (i.e. sum of employed and unemployed) that changed their occupation never, once, or more than once during the reference period[73].	Stevens *et al.* (1994: 603-605), Entorf (1998: 16).
12. Employee benefits	Percentage of employees who receive specific employee benefits, e.g. holiday pay, thirteenth cheque, sick pay, pension, and social security.	Abraham and McKersie (1990: 103), Bhalla and Lapeyre (1999: 55-82).
13. Employee ownership	a. Percentage of company stock directly or indirectly owned by non-managerial employees.	Abraham and McKersie (1990: 70-71)
	b. Description of nature of offers of profit-sharing to non-managerial employees and managerial participation plan for non-managerial employees.	
14. Informal sector employment	Informal sector employment as percentage of total employment[74].	Bhalla and Lapeyre (1999: 55-82), ILO (1993b, 1999b).
15. Unemployment rate	Measure of the utilisation of labour. The total number of unemployed persons as a percentage of the total labour force, i.e. the sum of employed and unemployed persons. Unemployed persons are 'those individuals without work, seeking work in a recent past period, and currently available for work'[75].	Reynolds *et al.* (1991: 271-274), ILO (1999b).

[73] The question asks respondents, 'After finishing your school or professional education did your professional activity change once or more than once to such a degree that one could refer to it as a change of occupation' (Stevens et al., 1994: 603-605).

[74] The informal sector is broadly defined as 'consisting of units engaged in the production of goods and services with the primary objective of generating employment and incomes to the persons concerned'. These units have the broad characteristics of household enterprise, i.e. low level of organisation, small scale production, little or no division between labour and capital, and relatively informal labour relations For the purpose of more detailed analysis, surveys of informal sector activity also collect data on the kind of economic activity these production units are involved in, the type of workplace, its location, the type of ownership, and its relation with other enterprises (ILO, 1993b).

[75] This is the so-called narrow definition of unemployment, which requires the unemployed to be actively seeking work (page 104). This use of this definition is prescribed by the ILO in its international recommendations on labour statistics. There is, however, also a broad definition of unemployment, which recognises the importance of discouragement. This definition requires persons

Indicator(s)	Description	Source
16. Youth unemployment	a. Youth unemployment as percentage of youth labour force. Youth constitutes persons aged fifteen to twenty-four.	ILO (1999b)
	b. Ratio of youth unemployment rate to adult unemployment rate.	
	c. Youth unemployment as percentage of total unemployment.	
	d. Youth unemployment as percentage of youth population.	
17. Long-term unemployment	a. Long-term unemployment rate. Calculated as persons unemployed one year or longer as percentage of the labour force, i.e. sum of employed and unemployed.	Bhalla and Lapeyre (1999: 55-82), ILO (1999b).
	b. Incidence of long-term unemployment. Calculated as percentage of total unemployed that has been unemployed for longer than certain periods of time, e.g. one year, two years, or longer.	
18. Duration of unemployment	Mean incomplete duration of unemployment. The average length of unemployment spells of currently unemployed persons, i.e. spells in progress during the poll date of the survey.	Akerlof and Main (1981: 1003-1011), Paul (1992: 739-741), Stevens *et al.* (1994: 603-605), Corak and Heisz (1996: 63-73).
	Mean complete duration of unemployment. The average expected complete duration of unemployment for a group of individuals who begin their spell of unemployment at the same time.	
	Terminations-weighted spell length of unemployment (S_{TW}). The average length of all unemployment spells terminated during a given period, normally a year.	
	Experience-weighted spell length of unemployment (S_{EW}). The average length of all unemployment spells either in progress or terminated during a given period, normally a year.	
19. Index of unemployment severity	Calculated by combining measures of the extent of unemployment with measures of the duration of unemployment. The unemployment rate, for example, is multiplied by the mean duration of interrupted unemployment spells[76].	Paul (1992: 739-741)
20. Time-related underemployment	Measure of visible underemployment. Calculated as number of persons in time-related underemployment as percentage of either labour force or total employment[77].	ILO (1998a, 1999b)

either to be available for work or seek work actively. Hence those not actively seeking employment are also counted as unemployed. As a result, estimates of unemployment based on the broader definition will necessary yield higher estimates of unemployment than estimates based on the standard, narrow definition (Fallon and Lucas, 1998: 5-13).

[76] This type of indicator has also been referred to as a so-called 'illfare' index of unemployment (Paul, 1992: 739-741). The early literature reports two alternative versions of this type of measure. The conventional index of unemployment severity is calculated by multiplying the unemployment rate by the mean duration of unemployment measured in number of days (Moore, 1973, as quoted in Hauser, 1949: 19-22). In the case of Gilroy's (1975) weighted index of unemployment severity, the total weighted man-hours lost is indexed in relation to a year for which the total weighted man-hours lost is assigned a value of 100. Man-hours lost are calculated as the number of unemployed multiplied by the mean duration of unemployment in weeks multiplied by the average work week of forty hours for full-time and twenty hours for part-time workers (Gilroy, 1975: 20).

[77] According to Merriam (1968: 737), the most important determinant of income adequacy is whether people are employed full-time as opposed to part-time. The following three criteria are applied to all persons in employment to determine the extent of time-related underemployment. These workers must be willing to work additional hours, available to work additional hours, and have worked less than a certain threshold relating to work time in the reference period (ILO, 1998a).

Indicator(s)	Description	Source
21. Adequacy of earnings	Also referred to as the 'exclusion' or 'inadequacy' index. Calculated as the number of individual workers or households earning less than an adequate individual or family income during the previous year, divided by the total number of individual workers or households within the labour force, including discouraged workers[78].	Levitan and Taggart (1974: 33), Vietorisz *et al.* (1975: 5-10), ILO (1998a).
22. Mismatch indices[79]	a. Lilien's (1982) turbulence index. Based on unemployment growth and calculated as $M_t = [\Sigma_i L_{it}/L_t(\Delta\log L_{it}-\Delta\log L_t)^2]^{1/2}$, where L represents the aggregate unemployment rate over two consecutive periods of time.	Entorf (1998: 18-24)
	b. Mismatch represents ratio between vacancies and unemployment, which is calculated for each sector or region in the economy and then aggregated into one index value. Index is calculated as $M = 1/2\Sigma_i \lvert u_i-v_i \rvert$, or alternatively as $M = 1-\Sigma_i(u_i v_i)^{1/2}$, where u_i and v_i respectively represents the unemployment and vacancy rate in each sector or region. M = 1 indicates that unemployment is concentrated only in one sector or region of the economy, while all vacancies are concentrated in another sector or region. M = 0 means that there exists no mismatch in labour markets and that unemployment and vacancies are equally distributed across all sectors or regions of the economy.	
	c. Lambert's (1988) measure of mismatch is derived from microeconomic data on labour markets using a so-called rationing model. The level of unemployment is calculated as $L_t = [D^{-pt}_t+S^{-pt}_t]^{(-1/pt)}$ and pt represents the measure of mismatch derived with the aid of this formula. D represents labour demand, S labour supply and L unemployment, and each is summed across *n* micro labour markets. D is calculated by adding labour demand to vacancies, and S by adding supply of labour to unemployment[80].	
23. Labour force inactivity rate	Proportion of the working-age population that is not in the labour force. Calculated as the voluntary unemployed as percentage of the total labour force, i.e. the sum of employed and unemployed persons[81].	ILO (1999b)
24. Real manufacturing wage indices	Measure of trends in average real wages paid in the manufacturing sector. Real wages are the 'goods and services which can be purchased with wages or are provided as wages'[82].	ILO (1999b)

[78] Adequacy of earnings is often based on poverty lines estimated with the aid of the techniques and methods of measurement described in Chapter 5 (pages 134 to 155).

[79] Mismatch is defined as 'mismatch between vacant jobs and unemployed workers such that if the latter were available with different skills and/or in different places, the level of unemployment would fall' (Turvey, 1977, as quoted in Entorf, 1998: 5).

[80] The conceptual advantage of this measure of mismatch is that it can be employed to determine a 'structural unemployment rate at equilibrium' (SURE), i.e. the level of unemployment that exists in labour markets despite a hypothetical general equilibrium where demand equals supply. $SURE_t = 1-2^{(-1/pt)}$ (Entorf, 1998: 18-24).

[81] Measurement is normally limited to prime-age workers, i.e. those aged twenty-five to fifty-four. These individuals are most likely to be active labour market participants having completed their education and not being eligible for early retirement (ILO, 1999b).

[82] The ILO draws a distinction between earnings, which are employed in calculating wage statistics, and labour costs, which are used in estimating labour productivity (Table 4.1, indicator 27, page 111).

Indicator(s)	Description	Source
25. Compensation costs[83]	a. Hourly compensation costs expressed as percentage of US wage rate.	Abraham and McKersie (1990: 101-251), Bhalla and Lapeyre (1999: 55-82)
	b. Ratio of non-wage labour costs to total compensation costs.	
	c. Annual percentage change in total compensation costs.	
26. Displacement effect measures[84]	The percentage change in earnings following displacement[85].	Stevens *et al.* (1994: 603-605)
27. Labour productivity	a. Output ('value added') per unit of labour. Reported as real GDP (PPP$) per person employed[86].	ILO (1999b)
	b. Labour costs per unit of output. Reported as labour compensation costs per dollar of GDP (PPP$) produced	
28. Occupational safety and health	a. Frequency rate, i.e. number of accidents, injuries or cases of disease occurring within a specified time frame, normally a calendar year (twelve months)[87].	ILO (1998b, 1999a), Takala (1998: 29-39; 2000)
	b. Incidence rate, i.e. incidence per 100 000 workers of reported fatal occupational accidents, injuries and disease (so-called fatality rate)	
	c. Share of reported cases of accident, injury or disease that result in workers being absent from work for three or more days.	

Earnings include all payments to employees for time worked or work done together with remuneration for time not worked, such as annual vacation pay, other paid leave or holidays (ILO, 1973).

[83] Compensation costs include only compensation for work and exclude labour costs such as recruitment, employee training, and facilities such as cafeterias, medical clinics and welfare services (Bhalla and Lapeyre, 1999: 52-82). Wage differentials, which are often employed in studies of inequalities in labour markets, simply employ wage and/or earnings data disaggregated by socio-demographic characteristics such as gender, age, racial group, occupation, industry, qualification, temporary/full-time work, and size of establishment.

[84] Stevens *et al.* (1994: 603-605) define displacement as a 'concentrated, and presumed permanent, reduction in the labour force'. The conceptualisation of displacement has been problematic. A number of definitions exist. Crosslin *et al.* (1986), for example, define displacement as a decline in the two-digit SIC employment figure for the particular local labour market the individual is employed in, whereas Sabelhaus and Bednarzik (1985) add that such reduction should not be followed by a rebound to the same or higher employment levels (Stevens *et al.*, 1994: 605).

[85] Two alternative methods of estimating pre- and post-displacement earnings are (i) the autoregressive model of Ashenfelter (1978) which derives post-dislocation earnings from pre-dislocation earnings and other control variables on personal and labour market characteristics such as age, race, gender and education, and (ii) the time-varying fixed effects model of Bloom (1984) which separately estimates the earnings of dislocated and non-dislocated samples of individuals to determine the net displacement effect (Stevens *et al.*, 1994: 604-605).

[86] Labour cost is the total cost incurred by employers when employing labour. These costs, in terms of the ILO's current international standard classification of labour cost, include direct wages and salaries, remuneration for time not worked (e.g. sick leave), bonuses and gratuities, payments in kind, cost of workers' housing borne by employers, employer's social security expenditure, cost of vocational training, cost of welfare services, labour costs not classified elsewhere, and taxes regarded as labour cost (ILO, 1966).

[87] Frequency and incidence rates are sometimes reported separately for occupational accidents at the workplace, accidents in traffic at work, commuting accidents, and deaths due to occupational as opposed to work-related diseases. Statistics are also broken down per type of occupational injury or disease, as specified in the ILO's standard classification of occupational injuries (ILO, 1998b; 1999a; Takala, 1998: 29-39; 2000). The ILO's classification system allows for accidents to be classified by location. Injuries are classified according to their consequences, the particular work process and specific work activity, as well as the deviation, cause, and material item involved. Commuting accidents are classified by place of accident, and mode of transport and transport role of the injured and the counterpart (ILO, 1998b).

Indicator(s)	Description	Source
28. Occupational safety and health (continued)	d. Severity rate, i.e. hours of work lost due to accident, injury or disease per million hours actually worked.	ILO (1998b, 1999a), Takala (1998: 29-39; 2000).
	e. Working days lost per case of injury, i.e. the median number of days lost per case of occupational injury. Lost days are counted from and including the day of the accident.	
	f. Ratification status of ILO conventions on occupational safety and health[88].	
29. Union density	Percentage of non-agricultural, private sector employees with labour union membership.	Abraham and McKersie (1990: 24), Alberta Statistical Office (1998).
30. Labour disputes and collective bargaining	a. Number of strikes and lockouts and number of workers involved in strikes and lockouts.	ILO (1996: 1009), Alberta Statistical Office (1998).
	b. Annual person-days lost due to labour disputes per 10000 person-days worked. Disputes include legal strikes and lockouts. Calculation of annual person-days lost allows for newly initiated and carried over disputes..	
	c. Status of collective bargaining agreements. Calculated as percentage of agreements settled and outstanding and percentage of employees covered by agreements.	
	d. Average duration in months of collective bargaining agreements. The duration of each settlement is weighted by the number of employees covered by the agreement when calculating the average.	
	e. Average annual percentage change in wages agreed upon in settlements. Average is calculated by determining the compound increase or decreases in wages for each agreement, weighting this figure by the number of employees covered by the agreement, and averaging these figures across all agreements received in the reference period.	
	f. Employment claims or disputes by type, e.g. non-payment of wages, vacation pay, termination pay, overtime, holiday pay, etc.	
31. Labour migration	a. Annual inflow and average annual percentage change in inflow of employed immigrants or migrants.	ILO (2000)
	b. Annual outflow and average annual percentage change in outflow of employed nationals.	

In terms of the four aspects of method and technique related in Chapter 2 (pages 24 to 27), these indicators can be adjudged as follows. Firstly, the indicators are of a *quantitative rather than qualitative* nature. All the indicators listed in Table 4.1 are expressed in numerical terms. Qualitative judgements (as to the relative worth of unemployment), however, may be argued to enter during (i) the selection of age

[88] There are twenty-six of these conventions. The conventions on Occupational Safety and Health (no. 155, 1981) and Occupational Health Services (no. 161, 1985) are accorded special status in this type of measure.

limits and workforce status definitions, (ii) the calculation of income thresholds, and (iii) the determination of the length of the work week (Levitan and Taggart, 1974: 39-45).

Secondly, the indicators can be considered *objective rather than subjective* insofar as they involve external evaluation and measurement. As recognised in Chapter 2, though, even externally-based methods involve subjectivity. Examples of methodological subjectivity include (i) the choice of income adequacy standards, (ii) the occasional use of the income of household heads as the sole determinant of household's income inadequacy, and (iii) the equal weighting of currently unemployed persons regardless of their prior work experience and preferences regarding part-time or full-time employment (Levitan and Taggart, 1974: 39-45; Shiskin and Stein, 1975: 8-10). Moll (1986) goes even further. He claims that labour and employment statistics are necessarily subjective and value-laden given the ongoing conceptual disputes characterising research, the prominent role of governments (and therefore political objectives) in driving measurement programmes, and the express or inadvertent omission of details as to the weaknesses and relative accuracy of measurement results (Moll, 1986: 123-128).

Thirdly, the indicators are *cardinal rather than ordinal* measures. The indicators listed in Table 4.1 report the magnitude of unemployment, underemployment and labour utilisation in terms of a variety of figures and ratios given in percentages, numbers of people, working days, or man-hours. It therefore is possible to establish the exact difference in magnitude between nations, industries and other entities for specific, individual and consistently applied indicators.

Finally, there is the distinction between *uni-dimensional and multi-dimensional indicators*. Most of the measures presented in Table 4.1 are uni-

dimensional. These measures focus on singular dimensions of unemployment, such as the total number of unemployed, the average duration of unemployment, and the number of man-hours lost as a result of unemployment. Certain measures, though, are multi-dimensional insofar as they simultaneously combine different aspects of employment, unemployment and underemployment in measurement. Examples include the indices of unemployment severity, earnings adequacy and labour market mismatch (Table 4.1, pages 109 to 110).

4.5 COMPARATIVE APPLICATION OF INDICATORS OF EMPLOYMENT, UNEMPLOYMENT AND UNDEREMPLOYMENT

4.5.1 Interspatial and intertemporal comparison of indicators of employment, unemployment and underemployment

For comparative purposes economists and labour statisticians require both time-series and cross-section data (Standing *et al.*, 1996: 103-110; Sloman, 1997: 415-416). In fact, time-series data on unemployment rates have become an important parameter of progress on economic development (Levitan and Taggart, 1974: 67, Corak and Heisz, 1996: 63). Analysts, however, face a number of difficulties in attempting to compare labour market indicators across time and space.

Firstly, as far as intertemporal comparisons go, indicators are not equally comparable due to methodological complexities. The design of questionnaires and procedures employed in household and labour force surveys has evolved over time so as to allow for the quantification of new labour issues (such as discouragement and underemployment) and to deal with certain shortcomings of early measures of

unemployment (pages 103 to 105) (Hauser, 1949: 342; Chernyshev, 1997: 72). Thus, even intertemporal comparisons within individual countries are complicated (Tiwari, 1996: 107). Other complexities include changes over time in standards of income adequacy and the standard definition of unemployment (Levitan and Taggart, 1974: 67-70; Vietorisz *et al.*, 1975: 3-5; Chernyshev, 1997: 74). Indicators of skill-occupation mismatch need to be interpreted in relation to changes over time in general levels of education and the nature of personal choices regarding education (Hauser, 1977: 20-23). Underemployment indices of income inadequacy may also be misleading. Annual household earnings are employed to determine a household's poverty status, regardless of whether or not certain household members are unemployed or underemployed (Levitan and Taggart, 1974: 39-45; Vietorisz *et al.*, 1975: 3-5).

Time-series indicators, in fact, can only accurately measure unemployment if surveys are repeatedly and consistently applied over time (Hauser, 1977: 20-23). The intertemporal comparability of estimates has improved insofar as many national and regional statistical agencies have adopted set timetables and consistent methodologies in their measurement efforts. The Labour Force Survey (LFS) format employed by the European Communities' Statistical Office and prescribed by the ILO in their resolutions on labour statistics is one case in point (Harris, 1976: 95-106; ILO, 1999b). There is, however, still much room for improvement. Analysis, for example, of the duration of unemployment is crucial in determining the extent of inequalities in unemployment. Yet, in South Africa, as in many developing countries, such analysis is hampered by a lack of longitudinal panel data on unemployment and underemployment (Fallon and Verry, 1988: 248-250).

Secondly, there is the interspatial comparison of labour market indicators. Shiskin and Stein (1975: 8-10) have proposed that governments and statistical agencies develop unemployment measures that suit their specific goals. Countries and statistical agencies, in fact, do employ those methods that best fit their needs and resource constraints. The 1997 Yearbook of Labour Statistics distinguishes four different sources that individual countries employ in estimating unemployment, i.e. labour force sample surveys, social insurance statistics, employment office statistics, and estimates based on a combination of the former three sources. These sources differ considerably in terms of coverage and scope (ILO, 1997: 427-428). Similarly, local statistical agencies often employ different sources of labour statistics when estimating the extent of unemployment in specific urban locations, regions and/or provinces. Buss (1986: 1-18) argues that measurement practices in the United States are biased insofar as federal measurement efforts are used to derive estimates of state and local unemployment rather than confining measurement efforts to the particular state or local jurisdiction. These diverse practices in measurement have serious implications for comparability.

On the one hand, one cannot directly compare unemployment statistics derived with the aid of different methods of measurement (Thatcher, 1976: 83-94; Barker and Backer, 1992: 76-86). The shortcomings and advantages of each of the four methods used to identify the total number of unemployed hamper their relative comparability (pages 100 to 106). The registration method, for example, performs excellently in terms of the relative ease of collection of unemployment data. Estimates based on this method, however, are not comparable with those based on alternative methods since not all unemployed persons may register for unemployment benefits (page 102). The residual and population survey methods perhaps present a

more accurate picture of the overall level of unemployment. Yet, the former ignores the contribution of informal sector activity to employment and the latter inevitably includes sampling errors.

Tiwari (1996: 110) found discrepancies when comparing population census and household survey-based estimates of India's labour force participation rates. Thomson (1985: 39-48) highlighted the differences in unemployment estimates based on data obtained from the population census and a labour force survey. In the case of South Africa, unemployment estimates based on different methods also differ substantially. The 1997 October Household Survey (OHS) puts the unemployment rate at 22.9 per cent. The 2.2 million people that are unemployed according to this method contrasts sharply with the 200 000 to 300 000 unemployed persons that are registered with the placement centres of the Department of Labour (Barker, 1999: 170-174).

On the other hand, comparisons between countries that do employ similar methods can be equally confusing. A comparison of registration-based estimates are problematic insofar as national social security systems differ in terms of conditions for eligibility and the compulsory or noncompulsory nature of registration (Barker and Backer, 1992: 75-76; ILO, 1999b). Motives for registration also differ widely across societies (Barker and Backer, 1992: 75-76). Response rates to labour force surveys vary greatly across countries. De Heer (1999: 131-134), for example, found that the response rate in sixteen European countries ranges from as low as fifty-six per cent (Netherlands) to as high as ninety-eight per cent (West Germany). This implies that measurement efforts based on these statistics need not be equally reliable. Estimates of unemployment are therefore not always directly comparable.

Household surveys also employ definitions of unemployment that differ in terms of age limits, reference periods, job search criteria, and the treatment of new entrants and those temporarily laid off (ILO, 1997: 427). The age limit above which persons are counted as employed or unemployed ranges from six years (Cameroon) to sixteen years (ten countries). Thirty per cent of the countries included in the ILO's 1990 Yearbook of Labour Statistics employ a lower limit of fifteen years and above (Tiwari, 1996: 108). Age limits used to determine the size of the labour force, which acts as the denominator when calculating unemployment rates (Table 4.1, page 108), also differ widely. Despite the ILO prescribed limit being 15-64 years (ILO, 1999b), limits range from 15-60 to 16-74 to 18-60 years (UN, 1996: 266). The reference periods used during surveys to determine employment status range from daily to annually (Tiwari, 1996: 108). Standing *et al.* (1996: 103-110), for example, show how for one country thirty justified changes in the definition of unemployment yielded twenty-nine different estimates of unemployment for the same year.

The unemployment rate, though, is not the only labour market indicator that is susceptible to such problems. The following is a brief overview of the problems encountered when attempting to compare some of the other labour market indicators across space. Similar to aggregate unemployment rates, estimates of youth unemployment may not be directly comparable due to differences in the lower age limit that countries employ to calculate these measures. The minimum age for leaving school is normally employed as age limit. This limit differs across countries and ranges from fourteen to sixteen (ILO, 1999b).

Where measures are disaggregated by occupation, interspatial comparability is hampered by country-specific classifications of occupations not being reconcilable with the ILO's standard classification of occupations (footnote 71, page 106) (ILO,

1987). Disaggregations by educational attainment are equally problematic. So, for example, countries employ different guidelines with regard to the number of grades included in primary and secondary education levels (ILO, 1999b).

The comparability of measures of part-time employment is problematic because of the lack of an international standard with regard to the length of the work week. The OECD has standardised this indicator for their member countries using a thirty hour cut-off (ILO, 1999b). Measures of informal sector employment are based on different definitions of informal sector activity. So, for example, some countries include small-scale agricultural activities in the informal sector while others exclude them (ILO, 1993b, 1999b).

A comparison of underemployment indices of income inadequacy and skills-occupation mismatch needs to take special cognisance of inter-country differences in the standard hours of work, standards for income inadequacy, and the relative quality of data on educational qualifications (Hauser, 1974: 10-12; Vietorisz *et al.*, 1975: 3; Squire, 1981: 57-75). The same goes for time-related measures of underemployment. Here the problem is that some countries employ actual hours and others usual hours in identifying persons who work less than the normal duration. Furthermore, there is no standard guideline as to how the normal duration with which actual or usual hours are compared is to be determined (ILO, 1999b). Hauser (1977: 10-20), for example, compared estimates of underemployment for the US and seven Southeast Asian countries. He concluded that the great variations reflect methodological differences rather than differences in actual levels of underemployment.

Care also needs to be taken in comparing labour cost-based measures of productivity (Table 4.1, indicator 27, page 111). In certain countries labour cost items such as social security and vocational training are financed by government and not by

the employer. Consequently, these cost items are excluded from labour costs, although they are included in labour costs where no such public funding of social safety nets exists (ILO, 1966). Displacement effect measures are 'currently not sufficiently stable to guide policy decisions' since they conceptualise displacement differently and employ different methods in quantifying the earnings effect of displacement (footnote 84, page 111) (Stevens et al., 1994: 605-608).

Interspatial comparisons of measures of occupational safety and health are equally problematic. Underreporting and the imperfect coverage of compensation schemes, as well as non-harmonised accident-recording and notification systems hamper international comparisons of these estimates. Statistics are also not directly comparable insofar as differences in industrial structure, because of the resulting difference in the hazardousness of the production process, critically influence fatality rates. So, for example, countries in which relatively more workers are employed in mining and construction necessarily have higher fatality rates than countries with service-dominated economies (ILO, 1998b; Takala, 1998: 29-31).

Lastly, the current ILO project on the compilation of an international database of labour migration has brought to light wide differences in statistical sources, coverage and periodicity amongst countries. Unlike with the unemployment rate, the international standardisation of concepts, definitions and methods of data collection on labour migration is in its infancy, hence the interspatial comparability of these measures is relatively weak (ILO, 2000).

Thus, any interspatial comparison of labour market indicators needs to take special care in establishing the exact underlying methodologies before analysing the results of such comparison.

4.5.2 Level of measurement of indicators of employment, unemployment and underemployment

The indicators listed in Table 4.1 (page 107) measure employment, unemployment and underemployment at either an individual or a household level. This is evident from their respective descriptions, as well as the fact that the measures are estimated from data sources that record statistics at the individual and/or household level (page 116). Indicators, furthermore, are often further disaggregated by region, industry, occupation, gender, age, or educational attainment (ILO, 1997: 428; 1999b).

4.5.3 Absolute versus relative indicators of employment, unemployment and underemployment

Most of the indicators listed in Table 4.1 (page 107) are relative measures. There are, however, a number of exceptions. These include the two mean-duration-of-unemployment measures, the two spell-length-of-unemployment indicators (page 109), the ratification status of ILO conventions on occupational safety and health, the number of strikes and lockouts and number of persons involved in these actions, the number of labour disputes, and estimates of the aggregate inflow and outflow of immigrant or migrant workers (pages 111 to 112). These eight indicators each measure a specific aspect of labour markets independently of anything else, i.e. not as a percentage or ratio of some other aspect. The remainder of the indicators in Table 4.1 (page 107) measure employment, unemployment and underemployment relative to either one or a combination of other aspects. These include the size of the labour

force, the number of workers, the average duration of unemployment, the standard work week, some standard of income adequacy, and pre-displacement earnings. Care needs to be taken in establishing the exact nature of the numerator and denominator when interpreting relative measures. Inconsistencies may exist where, for example, members of the labour force included in the denominator are by definition excluded in the numerator, thus inflating the index (Levitan and Taggart, 1974: 39-45).

4.6 FOCUS OF INDICATORS OF EMPLOYMENT, UNEMPLOYMENT AND UNDEREMPLOYMENT

Given the lack of clarity regarding conceptual interpretation (page 95), the focus of unemployment indicators can be interpreted as either a 'means' or an 'end' to development. Insofar as unemployment, on the one hand, may be considered a need (needing to earn an income) or an attitude (desiring a job under certain conditions, e.g. working full-time rather than part-time, earning an adequate income, or matching one's skills and occupation) (Thatcher, 1976: 83-94; Standing *et al.*, 1996: 103-110), unemployment represents a lack of means to develop. The income earned from a particular job can thus be considered a means to subsistence or a certain standard of well-being, or a correct match of occupation and skill as a means to job satisfaction and self-realisation. If unemployment, on the other hand, is considered a condition (being without a job), an activity (seeking a job) or a capacity (being able to work) (Thatcher, 1976: 83-94; Standing *et al.*, 1996: 103-110), employment represents an end in itself. The focus here is on the job itself rather than on the income or opportunity for self-realisation it affords the particular individual or household.

4.7 CLARITY AND SIMPLICITY OF INDICATORS OF EMPLOYMENT, UNEMPLOYMENT AND UNDEREMPLOYMENT

The discussions on content (page 94), methodology (page 100), comparative application (page 114) and focus (page 122) bear testimony to the fact that measures of employment, unemployment and underemployment are anything but simple. None of the indicators illustrates the point as well as the measures of mismatch in labour markets (Table 4.1, page 110). Lilien's turbulence index of mismatch is simpler to compute than that based on the rationing model, which has considerable data requirements. The former calculation does not require unemployment data by industry like the latter (Entorf, 1998: 18-24). Furthermore, the unemployment and vacancy rates used in estimating these measures remain imperfect estimates of what actually happens in labour markets. Unemployment rates cannot accurately reflect the dynamics and flexibility of the matching process. Workers constantly change their patterns of participation, commuting, migration and retirement as labour markets change. These rates also cannot adequately summarise the diverse and continuous flows in labour markets, e.g. quits, layoffs, hirings, new entries, retirements, and flows between jobs. Vacancy rates, moreover, are based on data that often only include vacancies registered at official employment offices. These agencies more often than not mediate only in filling higher level positions. Their role of mediation is also confined mostly to vacancies in larger firms within certain sectors (Entorf, 1998: 24-26).

Greater clarity regarding the content, methodology, comparative application, and focus of labour market indicators can only be obtained after close investigation

and perusal of the particular sources. This remains the most important prerequisite for any meaningful comparison of such indicators (page 120).

4.8 AVAILABILITY OF INDICATORS OF EMPLOYMENT, UNEMPLOYMENT AND UNDEREMPLOYMENT

Today most countries report annual estimates of their labour force participation and unemployment rates (Table 4.1, page 107). Data on employment by sector are also available for most developed and developing countries (ILO, 1999b). In developing countries, though, the frequency and detailedness of these estimates tend to be less than in developed countries (ILO, 1997: 425-624), primarily due to resource constraints. So, for example, unemployment by educational attainment is not readily available for countries from Africa and the Middle East (ILO, 1999b).

The ILO annually reports unemployment estimates in its Yearbook of Labour Statistics. These estimates are reported in aggregate and by age, level of education, type of economic activity and occupation (ILO, 1997: 428). In 1997, the Yearbook reported estimates for 122 countries for the years 1987 to 1996. Labour force statistics reported in the 1995 World Development Report, which featured a special issue on labour markets, are confined to estimates of the size of the total labour force and of labour force participation rates. Figures are reported for 138 countries (World Bank, 1995: 143-148). The World Tables include national estimates of the size of the labour force (World Bank, 1996), while the UN Statistical Yearbook reports the number and percentage unemployed (UN, 1996). Estimates reported in the latter two sources are taken from the ILO's Yearbook of Labour Statistics.

Other labour market indicators are not reported as widely or as frequently (Vietorisz *et al.*, 1975: 11). Estimates of employment by status are available for most developed countries. In the case of developing countries, coverage is relatively good for East Asia, Latin America and the Caribbean. Yet, estimates are not available for large developing counties such as China and India. In the case of Africa, estimates are available only for a few countries (ILO, 1999b).

Data on informal sector employment are available for a relatively large number of countries for select years. Time-series data, though, are available only for a few select countries. The data, furthermore, apply only to urban areas, specifically major metropolitan areas or capital cities in which special informal sector surveys have been conducted (ILO, 1999b).

Estimates of underemployment indices, such as those of Levitan and Taggart (1974) and Vietorisz *et al.* (1975), are especially weak in terms of their intertemporal and interspatial availability, especially in the case of LDCs. This is because these countries lack the comprehensive data on earnings, man-hours worked and educational qualifications required to calculate these indices (Shiskin and Stein, 1975: 8-10). This severely hampers their usefulness for meaningful comparative analyses.

The Groningen Growth and Development Centre has since 1983 run an International Comparisons of Output and Productivity (ICOP) project. The project reports comparably estimates of labour productivity for some thirty countries in Asia, East and West Europe, and North and South America (Groningen Growth and Development Centre, 2000). As in the case of other labour market indicators, data for developing countries are not readily available. According to the ILO (1999b), the reason for this is that the systems of national accounts (SNA) employed in these countries generally do not report labour compensation costs.

Underreporting and the imperfect coverage of compensation schemes, as well as non-harmonised accident-recording and notification systems restrict the availability of international estimates of occupational injuries. Accident reporting schemes in developed countries normally cover a much higher percentage of the employed than in developing countries. Even in developed countries, however, statistics are not recorded for those employed in the agricultural and informal sectors and who are self-employed (Takala, 1998: 29-31; 2000). The ILO, in their 1997 Yearbook on Labour Statistics, reported data on occupational injuries for 113 countries (ILO, 1998b). According to Takala (1998: 29-31), however, reasonably reliable data on occupational safety and health are available for only approximately one third of the 174 ILO member countries.

The availability of statistics on labour migration is equally problematic. The ILO's International Labour Migration Database (ILM) reports different estimates of international labour migration for only some ten to thirty countries (ILO, 2000). As in most of the above cases, data are not generally available for developing countries.

4.9 FLEXIBILITY OF INDICATORS OF EMPLOYMENT, UNEMPLOYMENT AND UNDEREMPLOYMENT

This group of indicators can be considered relatively flexible in terms of content and methodology. Conceptually, this group of indicators has evolved to expand understanding of unemployment, albeit over a period of many years. On the one hand, the number of employment statuses assigned to people has been expanded. This allows for a better conceptualisation of both unemployment and underemployment (page 104). On the other hand, alternative indicators have been

devised to quantify other problems related to employment and unemployment. These include indicators focusing on the duration of employment and unemployment, the degree of income adequacy and mismatch between skill and occupation, occupational safety and health, and labour disputes.

Methodologically, early but flawed methods of measurement, such as the residual and registration methods, were swopped for labour force surveys (pages 100 to 106). Although the latter technique is not without shortcomings, it outperforms the others in terms of detailedness, uniform and consistent sampling, cost-effectiveness, and the timeliness of data (Barker and Backer, 1992: 76-86; McConnell and Brue, 1995: 531-533).

With regard to purpose, these indicators may also be argued to be flexible insofar as a collection of diverse labour market measures exists today. The variety of indicators fulfils different purposes, e.g. determining the total number of unemployed, using the labour force participation rate as a proxy of economic activity, measuring the average length of unemployment spells, quantifying the earnings effect of displacement, or monitoring occupation safety and health (Table 4.1, page 107).

This, however, does not apply to the comparative application of these measures. The ILO is continuously moving towards the standardisation of labour statistics by adopting specific resolutions and putting forward recommendations with regard to measurement (ILO, 1997: 427; 1999b). However, standards have not been accepted for many of the labour market indicators listed in Table 4.1 (page 107). Moreover, the former attempts at standardisation have not completely ironed out all problems with regard to interspatial and intertemporal comparisons of indicators (pages 114 to 120).

4.10 CONCLUDING REMARKS ON INDICATORS OF EMPLOYMENT, UNEMPLOYMENT AND UNDEREMPLOYMENT

Measures of employment, unemployment and underemployment are relatively complex in terms of content, methodology and comparative application. Despite these complexities, the labour force participation and unemployment rates have achieved considerable prominence as indicators of progress on economic development. Other indicators, however, have not achieved such status. These measures tend to be confined to the academic literature, or where they have gained prominence beyond this, to a limited number of national indicator programmes, and then mostly in developed countries. Hence, much work remains to be done to make available readily comparable labour market indicators other than labour force participation and unemployment rates, especially for developing countries. Furthermore, the labour market indicators presented in this chapter and the income-based measures of economic progress described in Chapter 3 are insufficient insofar as they cannot be employed to determine the extent of poverty and inequality in the economy. As a result, Chapter 5 focuses on measures of poverty and inequality.

Chapter 5

Measures of Poverty and Inequality

5.1 SCOPE OF THIS CHAPTER

Poverty and inequality are common features of modern society, both in developed and developing countries. Measures of poverty and inequality are central in the measurement of economic development to supplement measures of per capita income, economic growth, employment, unemployment and underemployment. These indicators are discussed here in terms of the different dimensions of measurement identified in Chapter 2. This discussion is preceded by a brief overview of the context within which indicators of poverty and inequality gained prominence in development studies.

5.2 BACKGROUND TO MEASUREMENT OF POVERTY AND INEQUALITY

Poverty analysis can be traced back as far as the middle of the nineteenth century. These early analyses focused mainly on household budgets and the estimation of minimum subsistence income and 'living wage' levels (Townsend, 1962: 211-215; Rainwater, 1974: 41-63). Poverty analyses, though, took a back seat to growth studies during the nineteenth and much of the twentieth century. This was because of the general consensus that sustained economic growth will alleviate poverty and inequality. By the 1970s this changed as the realisation dawned that

economic growth had failed in this regard (Rainwater, 1974: 41-63)[89]. Other signs of the balance shifting towards analysis of inequality and poverty include the renewed debate as to whether national income is correctly measured or in itself a correct measure of well-being (Chapter 3, pages 56 to 63), Robert McNamara's celebrated Nairobi speech[90], the re-emphasis of the social side of economic growth, and the increasing calls for 'redistribution with growth' amidst the failure of trickle-down (Fields, 1980: 1; Lipton and Ravallion, 1995: 2562-2566).

This brought about a proliferation of studies on poverty and inequality. The empirical developments of the 1970s and 1980s acted as further impetus by improving researchers' analytical capabilities (Lipton and Ravallion, 1995: 2562-2566). Analyses generally aim at defining and describing inequality and poverty, understanding its causes[91], and informing policy-making (Lipton and Ravallion, 1995: 2553). Our concern is with the first of these goals.

5.3 CONTENT OF MEASURES OF POVERTY AND INEQUALITY

As in the case of other development indicators, measurement is wholly dependent on definition (Meeting of Minds, 1993: 51-52). Lipton and Ravallion (1995: 2553) describe 'poverty' as where 'one or more persons fall short of a level of

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[89] Kuznets' (1954; 1959, as quoted in Patel, 1964; 1966) analysis of inequality between nations stands central in this regard. Kuznets (1954, 1966) emphasised the extent of disparity between economies, not only in terms of national income and production, but also in terms of consumption of specific types of goods, e.g. energy consumption, daily per capita food supply, and net annual per capita consumption of textiles.

[90] McNamara (1972: 487), then president of the World Bank, argued that 'our duty for the remainder of this decade is to face up to mass poverty for what it really is, determine its dimensions, locate its whereabouts, set a limit beneath which we will not accept its continuance, and make our first priority a threshold of human dignity and decency which is achievable within a generation'.

[91] Such analyses attempt to identify those factors (macroeconomic, social or demographic) best explaining poverty or to develop models explaining poverty. Examples include the work of Rainwater (1974), Pitt *et al.* (1990), Ropers (1991), and Balke and Slottje (1993). Some of these analyses, such as

economic welfare deemed to constitute a reasonable minimum, either in some absolute sense or by the standards of a specific society'. A variety of terms other than 'poverty' have been employed in quantifying the extent of inequality. These include welfare, well-being, distribution, standard and level of living, subsistence, and life-style (Sharif, 1986: 556; Bliss, 1993: 427). It is possible to reduce these to a common definition. Poverty and inequality here represent situations where there exists disparity between entities, such as individuals, households and nations, in terms of the distribution of resources. This conceptualisation corresponds closely to Townsend's (1971: 1) view of poverty as relative deprivation resulting from a maldistribution of resources[92].

The extent of disparity is determined relative to some point of reference. Resources may be insufficiently distributed according to the reference group's own judgement, or their position relative to that of other entities or some set standard (Drewnowski, 1977: 183-184; Ropers, 1991: 35). Standards may be set with reference to that amount of resources required to maintain one's health and working capacity, or that is required to achieve certain capabilities and functionings (Rein, 1971: 46-63; Jäntti, 1993: 16)[93].

The following guideline was used to distinguish between those indicators included in this chapter and those discussed in the next. This chapter is concerned with the utility approach to measurement. Poverty and inequality are interpreted in

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that of Balke and Slottje (1993), employ the poverty indicators discussed here as dependent variables by using regression analysis to develop explanatory models of poverty.

[92] This conceptualisation can be viewed from either a welfarist or non-welfarist perspective. For welfarists an increase in resources in itself represents an increase in welfare, but for non-welfarists it is but an instrument to improve welfare (Ravallion, 1994b: 4-10).

[93] Stewart (1985: 2-5) describes these extremes as the 'three acres and a cow' or 'chicken in every pot' as opposed to the 'full-life objective' view of poverty. Donnison (1982: 7-8) ascribes to the latter of these approaches. He argues that people require those resources needed not to be 'exclude(d) from the community in which they live, e.g. people should be able to keep themselves reasonably fed, well enough dressed to maintain their self-respect, able to read newspapers, and retain their television sets and their membership of trade-unions'.

terms of the command over commodities that resources afford people via income and consumption (Lipton and Ravallion, 1995: 2553-2567). The concern here, therefore, is with 'poverty proper' (i.e. resource adequacy); not with the physiological, sociological or political dimensions of poverty (Kgarimetsa, 1992: 8; Woolard and Leibbrandt, 1999: 3). A variety of vicious cycles of poverty have been used to highlight these multiple causes and symptoms of poverty. Low income features in all these cycles. Thus, it represents one of the most important root causes of poverty in all its different manifestations (Burkey, 1996: 13-24). In this sense, the predominant focus on 'poverty proper' in this chapter is not entirely misplaced.

Indicators related to Sen's (1981) capability approach to poverty and inequality are not considered here. The capability approach focused on the extent to which the consumption of certain goods and services affords people certain capabilities, e.g. health, literacy and sanitation (Sen, 1984: 315). This approach at the time represented an alternative to the conventional practice of measuring 'poverty ... in terms of income, wealth and utilities in an informational way' (Sen, 1992: 9; Bliss, 1993: 417)[94]. Measures of functioning capability such as life expectancy, literacy and calorie intake are independent social indicators of development[95]. These indicators are discussed in Chapter 6 (page 178), which deals with social indicators.

Lipton (1997: 1004) endorses such separate analysis of utility and capability-based measures of economic development. There is, in fact, a clear distinction between the measurement of resource adequacy as opposed to functioning capability.

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[94] Sen's principal contribution to economics is his work on the measurement of poverty (Blaug, 1983: 346). In his *Poverty and Famines: An Essay on entitlement and deprivation* he concludes that the alleviation of poverty goes beyond ensuring people of an adequate income and involves the distribution of a wider range of functioning capabilities (Sen, 1981: 1-4; Blaug, 1985: 224; Chowdury and Islam, 1993: 229-230).

[95] Nutritional requirements (calorie intake) are often employed in setting poverty lines (page 147). It is used only as a tool to determine that level of resources required to meet basic nutritional requirements and is not employed as an independent measure of poverty.

People commanding an adequate level of resources to afford them to be fed adequately or to be educated, are not necessarily fed adequately or educated (Drèze and Sen, 1989: 42-45; Sen, 1992: 107-114; Sen, 1993: 40-42). Consequently, capability measures and other social indicators greatly complement the type of measures of poverty and inequality discussed in this chapter (Greeley, 1994: 56; Ravallion, 1994b: 4-10). Social indicators, for example, provide the basis for the construction of poverty profiles (page 161). These indicators are indispensable in describing living conditions within households, something which aggregate measures of poverty cannot do if not decomposed into poverty profiles (Ravallion, 1994b: 27).

Participatory poverty assessments (PPAs) also complement conventional poverty measures. PPAs are crucial in what Burkey (1996: 12) calls the first step in poverty alleviation, i.e. analysing the 'causes of poverty affecting a particular people in their own particular situation' in a participatory manner. This allows policy makers a 'better understanding of both the dynamics of poverty and the coping strategies adopted by the poor' (Brocklesby and Holland, 1998: 1-5). These assessments are useful in verifying the conclusions drawn from the type of poverty comparisons described in this chapter. Woolard and Leibbrandt (1999: 39), for example, relate the higher incidence of poverty amongst female-headed households in South Africa to the large amount of time these women spend in unpaid labour according to a recent PPA, thus leaving them with less time to spend earning income.

5.4 TECHNIQUE AND METHOD OF MEASURING POVERTY AND INEQUALITY

Before attempting to summarise and discuss the variety of measures of poverty and inequality, it is necessary to distinguish between the identification and aggregation aspects of measurement (Sen, 1976: 227; 1981: 9-23; Hagenaars, 1991: 134). Identification is aimed at determining who the poor are and how poor they are, whereas aggregation is concerned with determining how much poverty there is (Ravallion, 1994b: 3). Woolard and Leibbrandt (1999: 2) present an alternative typology of measurement. They distinguish between the ranking of households, poverty line selection and the profiling of poverty. The former two aspects are elements of the identification process. The construction of poverty profiles can best be described as a method of comparison that follows on aggregation. For the purposes of this discussion, therefore, a distinction is drawn between identification, aggregation and comparison. These three aspects of the measurement of poverty and inequality are now discussed in more detail.

5.4.1 Identifying the poor

Studies of poverty and inequality are essentially survey-based. In practice, measures of poverty and inequality are normally estimated from either unit-recorded data in machine-readable format or from tabulated data in statistical publications (Ravallion, 1994b: 53). Before attempting, therefore, to identify the poor with the aid of poverty lines, one needs to specify the survey requirements or describe the characteristics of secondary data used for this purpose. The sample frame must be

appropriate for drawing inferences about the specific group of people being studied. One must also be clear about whether poverty will be measured at the household level or at the individual level. There furthermore is the option of either a cross-sectional or a longitudinal analysis of poverty and inequality. Lastly, there is the choice of welfare indicator employed to distinguish between the poor and the non-poor. In practice, poverty analyses are normally based on a 'single cross-section for a nationally representative sample, with the household as the unit of observation, and (which) includes either consumption or income data' (Ravallion, 1994b: 10-12). The choices of unit of analysis and welfare indicator (resource base) are crucial in the interpretation of measures of poverty and inequality. Consequently these two aspects of measurement are discussed in greater detail before focusing on the methods used to estimate the poverty line(s) employed to identify the poor.

(a) Unit of analysis

Measurement can take place at either the international (between countries or groups of countries), national (between subgroups within countries), inter-household (between households within countries), intra-household (between members within households), or individual (personal) level (Elliott, 1972; Berry, 1985; Yotopoulos, 1989; Hagenaars, 1991; Lanjouw and Ravallion, 1995; Ringen, 1996). The focus has only in recent years shifted towards intra-household inequality (Thomas, 1990; Lipton and Ravallion, 1995). Analyses of intra-household inequality are concerned with the distribution of earnings, decision-making power and control over resources amongst household members (Woolley and Marshall, 1994).

Ringen (1996: 422-423) considers the individual the first-order unit of analysis. He claims that any analysis needs to start out at the individual level and then proceed to the household and the national level. His arguments are based on three generalisations:

- Firstly, that national and household well-being is ultimately dependent on the well-being of the individual members of that nation and household.
- Secondly, that nations and households are aggregates or collections of individuals.
- Finally, that social well-being can only be determined if individual members of households are weighted equally.

In practice, though, researchers do not always subscribe to this suggested order of aggregation. It is not always possible to apportion all consumption, e.g. household appliances like a TV and fridge, between different household members. As a result, poverty analysis normally starts out at the household level and then apportion total household consumption or income between household members.

(b) Resource base

Generally, a single monetary indicator, such as income or consumption, is employed in assessing the extent of poverty and inequality (Ravallion, 1996: 1328-1334; Burkhauser *et al.*, 1997: 154-161; Sahn and Younger, 1998: 2). Income is argued to reflect consumption opportunities and is therefore a popular measure of poverty (Bentzel, 1971: 253-260; Hagenaars, 1991: 135-146). 'Full income' represents the sum of monetary income, income-in-kind (including the production of the household enterprise and government services), and the value imputed to services

derived from endowments and assets such as durables, housing and time owned by the household (Grootaert, 1983: 3-10; Ravallion, 1994b: 13-14). The income from these sources accruing to each household member has to be recorded to arrive at an accurate estimate of total household income. There are, however, various reasons why income represents an inadequate measure of poverty. Income, on the one hand, cannot reflect the extent to which actual consumption is aimed at poverty alleviation (Sen, 1993: 40-42). This problem becomes even more pronounced in the case of intra-household inequality. Although household income is generally assumed to be spent so as to benefit the whole family, this may not necessarily be the case (Woolley and Marshall, 1994: 422-429). On the other hand, levels of income and consumption often differ as a result of saving/dissaving and the cross-subsidisation of consumption via taxes and transfers, i.e. consumption smoothing (Morgan, 1968: 33-35; Abel-Smith and Bagley, 1971: 91-99; Bentzel, 1971: 253-260). Possibilities for consumption smoothing also vary across time, depending on the circumstances of the specific household or individual (Lipton and Ravallion, 1995: 2573). This complicates the identification process since particular households and individuals may continuously move in and out of poverty (Townsend, 1971: 100-112).

Consumption is considered by many to be a better resource base for measuring poverty and inequality (Lipton, 1997: 1003). It represents a better proxy of current living standards and long-term average well-being than income because it (i) reveals information about both past and future incomes in terms of including consumption financed from saving/dissaving and (ii) is less volatile over time than income as a result of consumption smoothing (Lipton and Ravallion, 1995: 2573). According to Lipton (1997: 1004), consumption-based measures are intuitively more appealing, stable and accurately measurable than income-based ones. Ravallion (1994b: 15)

argues a similar point. As a result, consumption is normally preferred above income when estimating poverty and inequality (Kuznets, 1955: 1).

As with income (page 136), total consumption should include 'all monetary expenditures on goods and services plus the monetary value of consumption from income in kind, such as food produced on the family farm, and the value of owner-occupied housing' (Ravallion, 1994b: 13-14). Yet, individuals and/or households rarely record expenditure data in detail. Surveys used for the purpose of poverty analysis generally collect data only on total household consumption, normally from only one respondent. Detailed information on the specific consumption of individual household members is normally not recorded (Woolard and Leibbrandt, 1999: 23-24). Poverty analysis, however, relies on these estimates of observed consumption. This may result in substantial inaccuracy (Abel-Smith and Bagley, 1971: 89-91).

Consumption-based measurement, moreover, requires judgement on how public consumption is to be dealt with or whether measured consumption will be confined to the private sphere (Bentzel, 1971: 253-260). Measurement also requires assumptions to be made as to what needs are basic, what goods fulfil these needs, how their costs are to be monetised, and how differences in consumption are to be related to inherent differences in circumstances and personal characteristics (Bentzel, 1971: 253-260; Hagenaars, 1991: 135-146). Given differences in age, gender, working hours, working capacity and a host of other characteristics, consumption requirements are bound to differ across households and/or individuals (Bentzel, 1971: 253-260). Differences in household size and composition are of particular importance. Households with the same level of consumption do not necessarily enjoy the same level of well-being. The larger the household, the lower the level of well-being at similar levels of household expenditure. Measures of equivalent income or

expenditure are employed to allow for these differences in well-being related to household characteristics (Abel-Smith and Bagley, 1971: 91-99; Lipton and Ravallion, 1995: 2574; Burkhauser *et al.*, 1997: 154-161). 'Equivalent income or expenditure' represents minimum total income or expenditure adjusted for differences in household size and composition using a suitable equivalence scale (Ravallion, 1994b: 17; Woolley and Marshall, 1994: 419; Ringen, 1996: 424).

Equivalence scales are factors employed to adjust income, consumption and/or specific poverty line estimates for differences in household size and composition to obtain better comparable poverty estimates (Buhmann *et al.*, 1988: 115-142; Conniffe, 1992: 429; Ravallion, 1992: 17-25). An equivalence scale represents the number of adult males that a household of specific size and composition is equivalent to in terms of consumption needs. Adult females and children are normally assigned an adult male equivalence of less than one (Ravallion, 1994b: 22-23).

Various methods are employed in estimating equivalence scales. Each of these methods requires assumptions regarding (a) the choice of those characteristics according to which households and/or individuals are to be distinguished as different, e.g. household size and composition, (b) the manner in which households and/or individuals are to be ranked relative to other households and/or individuals, and (c) the manner in which the relative disparity between different households and/or individuals is to be quantified (Grootaert, 1983: 6; Jenkins and Lambert, 1993: 337-338). The variety of methods employed in estimating equivalence scales each deals differently with these three issues.

Nelson (1992: 295-310) identifies four methods often employed in estimating (household) equivalence scales. Firstly, there is the option of using equivalence scales determined on an ad hoc basis. An example of this method is the OECD three-

value scale. The consumption of secondary adults and children is valued at 0.7 and 0.5 respectively of that of the primary adult or household head (value = 1).

Secondly, there is the so-called Engel method. According to Woolard and Leibbrandt (1999: 16), this method represents the 'most well-known method of measuring child costs and economies of scale'. Equivalence scales are determined by examining the share of income that different types of households spend on food. Different empirical techniques are employed to estimate Engel curves. The Working-Leser method, for example, estimates an Engel curve by regressing the food ratio on the log of per capita expenditure and the number of individuals in the household belonging to certain demographic categories. A reference food ratio can then be used to determine 'how much total consumption must differ in order that a household be exactly compensated for its different composition relative to another household' (Woolard and Leibbrandt, 1999: 16). Using these estimates of required consumption for different households, an equivalence scale of the form $(A+\alpha K)^{ø}$ is fitted to the data, where α refers to the proportion of adult costs required for a child, ø to the extent to which economies of scale affect household expenditure, and A and K to the number of adults and children in the particular household (Woolard and Leibbrandt, 1999: 16-22).

In the third instance, the Rothbart method derives equivalence scales from the proportion of household income spent on goods consumed only by adults, e.g. adult clothing, alcohol and tobacco. Such expenditure is considered a good basis for distinguishing between households of different size and composition. The equivalence scale is found by dividing the income (or total expenditure, X) of households with children by the income (or total expenditure, X_A) of the childless household found to have the same level of expenditure on these adult-specific goods

as households with children. So, for example, a household with no children and one with two children may have an income of R500 and R1000 respectively but they spend R500 on adult-specific goods each. In this case the equivalence scale will take on a value of 2, i.e. R1000/R500. This means that the larger household requires twice as much income as the childless household to afford the same level of consumption of adult-specific goods.

Finally, there is the demand function method of estimation. This method assumes (i) that observed demand patterns reveal consumer preferences for market goods, (ii) that the consumer maximises utility, and (iii) that a utility function can be derived which is consistent with observed demand behaviour by relating consumption to price, income, and household size and composition (Lipton and Ravallion, 1995: 2574). The equivalence scales reported by Merz *et al.* (1993, as quoted in Burkhauser *et al.*, 1996: 382-383) and Lyssiotou (1997) are examples of scales estimated with the aid of demand function-based techniques. In this method, also referred to as the Barten method, the quantity consumed of each commodity i (q_i) is divided by a function $m_i(a)$, where a is a vector describing household characteristics such as size and composition and m_i represents the equivalence scale. So, for example, m_i will assume a value of one if children do not consume the particular commodity. If parents consume half the household expenditure on the particular commodity, m_i will be two (Nelson, 1992: 295-310). Deaton and Muellbauer (1986, as quoted in Nelson, 1992: 295-310) interpret the q_i/m_i terms as 'the consumption of i that actually reaches the parents when an amount q_i is purchased for the family as a whole'. The m_i factors are employed as equivalence scales which are independent of quantities consumed, price and income.

The conventional practice has become one of using a certain equivalence scale and then testing the sensitivity of results for scales based on alternative techniques and/or assumptions (Burkhauser *et al.*, 1996: 382). Burkhauser *et al.* (1996) and Woolard and Leibbrandt (1999), though, found that aggregate measures of poverty, with the exception of estimates for more homogeneous groups (e.g. the elderly), are not particularly sensitive to differences in equivalence scales when compared with poverty estimates based on per capita income or consumption, i.e. where all household members carry equal weight.

Equivalence scales, furthermore, are normally derived from observed household expenditure (page 138). Yet, child costs may be financed from savings rather than consumption, thus affecting household consumption at a later stage. Observations of total household expenditure also require assumptions about the way in which allocations are made within households. The particular allocation depends on real differences in the needs of different household members, the magnitude of economies of scale in household consumption, and the bargaining power of household members (Ravallion, 1994b: 22-25). Despite these shortcomings, though, Ravallion (1994b: 28) claims that a 'suitably normalised and comprehensive consumption measure is still the best single indicator of material well-being' employed in poverty comparisons.

A case has also been made for using wealth as a basis for measuring poverty and inequality. The problem, though, with using wealth as resource base is that it is extremely difficult to measure in terms of covering all sources of wealth. The monetisation of wealth in the absence of market evaluation also remains problematic (Hagenaars, 1991: 135-146), particularly in LDCs. The most important sources of wealth of the poor, i.e. natural resources, informal sector output, subsistence

agriculture and household production, are not priced in markets (Chapter 3, pages 56 to 62).

The choice of resource base determines the data requirements of the particular analysis. Poverty analysis has traditionally relied on single household surveys of income and/or consumption (Ravallion, 1992: 8-17). The increasingly wider scope and application of such analysis, coupled with the need for estimates of equivalence scales (page 138), have increased data requirements. This has meant that household surveys have had to be expanded to collect additional data and run more frequently to enhance the data base available for poverty research (Ravallion, 1996: 1338-1340).

As mentioned elsewhere, household surveys are not a foolproof means of data collection (page 138). Data collection is especially problematic in the poorest and richest households (Townsend, 1971: 100-112). The poorest households, on the one hand, tend to keep poor records, if they keep record at all, because they are often uneducated, old, sick or face severe time constraints. The intricate consumption patterns and income of the very rich, on the other hand, make it difficult to accurately enumerate consumption and income in a relatively short survey interview. Respondents may also think that they stand to benefit from over/understating their income and/or consumption. The poor normally understate both their income and their consumption. The rich, however, apart from understating their income, may also respectively overstate and/or understate their consumption of necessities and luxury items (Townsend, 1971: 100-112). Consequently, estimates of poverty and inequality should always be interpreted with reference to the inherent imperfections of the underlying survey data.

(c) Poverty lines

According to Johnson (1996: 110), poverty lines have two roles. On the one hand, poverty lines provide a yardstick with which to compare the circumstances of individual households or persons. On the other hand, poverty lines are an important aspect of measuring poverty. In fact, aggregate measures of poverty cannot be estimated without a poverty line (page 158). Poverty lines have over time been set with the aid of a variety of techniques, depending on the level of application and the type of survey used.

There has also been some debate as to the level of need in terms of which poverty lines must be defined. In general, early practice was concerned mostly with physical need and especially food (Atkinson, 1987: 755)[96]. Pigou (1946: 758-767) made a case for expanding the focus to include other subsistence needs such as health care, housing, education, sanitation and safety. The focus, however, need not remain at the subsistence level. Poverty lines can also be defined in terms of that level of resources required to maintain a certain level of dignity or to realise one's full potential (Franklin, 1967: 271-294; Sharif, 1986: 560; Lipton and Ravallion, 1995: 2575). Ornati (1956, as quoted in Rainwater, 1974) defines these three levels of need as that of subsistence, adequacy and comfort. Yet, as Sen (1990: 18) points out, the identification of poverty lines in terms of these higher level needs introduces greater complexity in measurement. Households and individuals often differ substantially in terms of the value they put on these needs and thus require vastly different quantities of resources to fulfil them. So, for example, some individuals may require only

[96] Food poverty remains an important measure in itself but is also a good proxy for total poverty because of its operational advantages. It simplifies the definition of poverty lines, requires less data, and employs food expenditure data, which are relatively accurate and widely available (Greer and Thorbecke, 1986a: 61).

enough resources to obtain a secondary education whilst others are in need of tertiary education. Physical and especially nutritional needs, however, are relatively similar in terms of demand. As is evident from the following summary of methods employed in poverty line estimation, general practice has continued to focus on physical needs rather than including a broader range of sociological needs (Greeley, 1994: 50).

The methods employed in poverty line estimation all entail the linking of needs for commodities to resources (Sharif, 1986: 563). Sen (1984: 315) calls this the utilitarian approach to measurement, i.e. goods affording people utility through their consumption. Generally speaking, it involves determining that level of income or consumption that affords the particular reference household or individual the level of utility required to meet its basic subsistence needs (Lipton and Ravallion, 1995: 2567; Johnson, 1996: 111). Johnson (1996: 111) refers to this as the benchmark component of the poverty line. Essentially there are four types of methods:

- *Firstly*, the cost of that bundle of goods required for meeting subsistence needs can be objectively estimated (Ali, 1998). This approach, commonly known as the *cost-of-basic-needs (CBN) approach*, is the most common approach to poverty line estimation (Lipton and Ravallion, 1995: 2576-2577; Thorbecke, 1998)[97]. It is objective insofar as resources are empirically linked to the attainment of specific capabilities (Ali, 1998) and poverty lines are determined independently of existing resource levels (Hagenaars and Van Praag, 1982). This type of poverty line is determined by estimating the amount of resources required to purchase or consume a specific bundle of goods. This requires a selection, conceptualisation and

valuation of the needs to be included in such a bundle (Lipton and Ravallion, 1995: 2576-2577). Allowances for waste and inefficient expenditure can also be built into the poverty line estimated in this manner (Woolard and Leibbrandt, 1999: 9).

Most prominent of this type of effort at poverty line estimation is that of Rowntree (1901, as quoted in Ali, 1998), whose work has been the basis of many subsequent poverty analyses (Franklin, 1967: 272-285). Rowntree determined his poverty line relative to the cost of a subsistence food basket plus an allowance to cover other items listed under headings such as fuel, clothing, and housing (Townsend, 1962: 215-218; Hagenaars and Van Praag, 1982: 140-148)[98]. The final cost of this bundle of goods was determined on the assumption that goods were purchased in the cheapest markets (Franklin, 1967: 272-285). Orshansky (1965, as quoted in Hagenaars and Van Praag, 1982) took Rowntree's approach one step further by expressing the poverty line in terms of income rather than of consumption. He did so by multiplying the estimated cost of the subsistence bundle by an estimate of the average income-food expenditure ratio (Hagenaars and Van Praag, 1982: 140-148; Alcock, 1993: 66-69)[99].

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[97] Alcock (1993: 63-66) refers to this group of methods of poverty line estimation as 'budget standards', while Woolard and Leibbrandt (1999: 9) call it the 'income approach'.

[98] Rowntree's (1901) final budget split consumption between food (39%), clothing (15%), housing (18%), personal sundries (17%), fuel and light (8%), and sundries (3%). Subsequent analyses based on Rowntree's (1901) methodology of poverty line estimation came up with different budget splits. While food always took up a substantial part of the total budget (ranging from 32 to 75 per cent), later analyses saw many changes as to the other categories of needs budgeted for, e.g. cleaning materials, health care, transport to work, education, entertainment and culture, vacation, taxes and insurance (Franklin, 1967: 272-285).

[99] Estimates of income-food expenditure ratios are derived from Engel curve functions (Hagenaars and Van Praag, 1982: 140-148). A similar effort to that of Orshansky (1965) is the iso-proportional index developed by Watts (1977). Watts (1977) estimates factors by which family income is multiplied to adjust for differences in household characteristics by determining the relationship between these characteristics and household expenditure on food and other necessities. These characteristics include

These efforts at poverty line estimation are often criticised for their arbitrary selection of those goods included in the subsistence bundle and the use of relatively unreliable price data in its valuation (Ravallion and Bidani, 1994: 75-82).

- In the second instance, there is the method of determining the resources required to meet certain minimum nutritional requirements. These methods determine a food poverty line based on the cost of that food bundle required to match the daily calorie intake requirements determined by the World Health Organisation (WHO) (Ravallion and Bidani, 1994: 75-82; Ali, 1998). Although heralded by Lipton and Ravallion (1995: 2576-2577) as different from the cost-of-basic-needs (CBN) approach, these methods are only variations of the CBN method (Thorbecke, 1998). They only employ a more scientific base than other CBN methods in determining that level of consumption required to meet subsistence needs. They also have a narrower focus than other CBN methods in that they focus only on nutritional needs. This, however, does not imply that people live by food alone but rather that people optimise their distribution of resources amongst calories and other nutrients. In fact, allowances for non-food consumption are usually made when employing this type of method to estimate poverty lines.

  The optimal distribution of resource to meet food needs can be determined in either of the following ways. The *food-energy-intake (FEI) method* requires observations of actual food consumption patterns

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household size, rural/urban location, regional location, age of the household head, and home ownership

(Thorbecke, 1998). There are specific reasons for employing observed consumption patterns rather than nationally determined reference diets when estimating poverty lines. Few households may actually consume this reference food bundle. Tastes and preferences may also differ substantially from those implied in the reference diet (Franklin, 1967: 286-294; Thorbecke, 1998). Observed consumption patterns also allow for differences in relative prices (Thorbecke, 1998). Regression analysis is employed to link food consumption to calories consumed (Greer and Thorbecke, 1986a; Lipton, 1997: 1004). This function, known as the 'calorie cost function', in its simplest form reads $\ln VFC = a + bCal$, where Cal represents calories consumed and VFC an indicator of the value of food consumption (Thorbecke, 1998). The function is employed to determine estimates of the food poverty line corresponding to certain recommended daily allowances of calories (RDAs) (Greer and Thorbecke, 1986a: 73)[100]. The same equation can be employed in estimating total rather than food poverty lines by replacing the food expenditure variable in the equation with a total expenditure or income variable (Greer and Thorbecke, 1986a: 63; Ravallion and Bidani, 1994: 75-82).

The *food-share method* requires estimates of the cost of the food bundle that achieves the stipulated energy-intake. This estimate is then divided by the share of food in total expenditure of those households considered poor, e.g. the twenty per cent of households with the lowest

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(Watts, 1977: 185-200).

[100] This method can be employed to determine poverty lines for total populations or subgroups of those populations. This is done by estimating individual equations for the total population and each of the subgroups (Greer and Thorbecke, 1986a: 62-63). These subgroups can be distinguished on a regional, cultural or other basis. For examples of the application of this methodology, consult Greer and

level of consumption (Ravallion, 1994b: 33-34). The resulting estimate represents a poverty line which will enable households to spend the required amount on food whilst allowing expenditure on other goods and services to match that of poor households.

These are not the only techniques that have been employed in estimating food poverty lines. Less popular efforts include poverty lines based on (i) those food stuffs consumed by people in the third poorest decile of the distribution of national income (Ali, 1998), (ii) a reference diet found with the aid of linear programming using available price and consumption data (Greer and Thorbecke, 1986a: 71), (iii) a minimum cost diet based on a 70/30 split of consumption between maize and beans (Greer and Thorbecke, 1986a: 71), and (iv) the level of income at which the income elasticity of demand for food-staples is unity (Lipton, 1983, as quoted in Ravallion, 1994: 34).

- *Thirdly*, there are those techniques that employ available data on the distribution of resources to identify people as poor (Ravallion, 1992: 25-35). Identification takes place relative to current levels of income and/or consumption. The following are three examples of such indirect methods (Hagenaars and Van Praag, 1982: 140-148). The food-ratio (FR) method employs an Engel curve function to determine an adequate food expenditure-income ratio. People whose food expenditure-income ratio falls below this level are considered poor[101]. The percentile-of-income-

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Thorbecke's (1986a, 1986b) analyses of poverty in Kenya, and that of Kyereme and Thorbecke (1987) on Ghana.

[101] The ratio of total expenditure to food expenditure (inverse foodshare) (Anand and Harris, 1994: 226) or foodshare in the budget (Glewwe and Van der Gaag, 1988: 5-9) is by some considered the best

distribution (PID) method defines as the borderline a certain percentile of the income distribution. The average income of people falling within this percentile is then used as the poverty line. The fraction-of-median-income (FMI) method employs the relation between actual and median income to determine people's poverty status. Once a person's or a household's income amounts to less than a certain percentage of the median income, they are considered poor. The problem with these type of poverty lines is that poverty will always exist regardless of improvements in living standards (Woolard and Leibbrandt, 1999: 11-12).

- *Finally*, there is the practice of employing subjective survey questions in setting poverty lines (Ravallion, 1992: 25-35, 1994: 42; Ali, 1998). In these methods people evaluate their own economic status by answering questions as to what level of income or consumption they consider adequate or desirable (Danziger *et al.*, 1984). Answers to such questions are of course crucially dependent on respondents' personal circumstances and characteristics, reference or peer group effects, and previous levels of income and/or consumption (Colasanto *et al.*, 1984: 127-137; Pradhan and Ravallion, 1998: 6). Examples of such surveys include the Gallup poll[102] (Rainwater, 1974: 49-63), the Leyden poverty line (LPL) developed by Goedhart *et al.* (1977, as quoted in Hagenaars and Van Praag, 1982: 140-148), and the minimum income question (MIQ) and income evaluation

tool for measuring differences in the living standards of households differing in composition (Abel-Smith and Bagley, 1971: 91-99).

[102] The Gallup poll asks respondents, 'How much income a week do you think the average family of four needs for health and comfort in this community' and 'What is the smallest amount of money a family of four needs to get along in this community' (Rainwater, 1974: 49-63).

question (IEQ) employed in the Wisconsin Basic Needs Survey[103] (Colasanto *et al.*, 1984: 127-137)[104]. These methods require respondents to identify the specific monetary level of income or consumption they consider as adequate. Pradhan and Ravallion (1998: 1-11), however, measure the adequacy of income and consumption with the aid of a likert scale[105]. They employ a set of equations to convert these responses into poverty lines using data on actual levels of income and consumption. A popular practice here is to compare subjective minimum income with actual levels of income and set the subjective poverty line (SPL) at that level of income where subjective minimum income equals actual income (Ravallion, 1994b: 43; Pradhan and Ravallion, 1998: 4).

One can compare these methods in terms of their relative merits and demerits. The debate as to the relative merits of the food-energy-intake (FEI) and food-share methods has been especially pronounced. These methods have been extensively criticised for their lack of comparability given variances in nutritional requirements across individual characteristics such as age, gender and activity levels (Ravallion, 1994b: 31; Ravallion and Bidani, 1994: 75-82). Most of these methods, though, do

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[103] The MIQ and IEQ respectively ask respondents, 'Living where you do now and meeting the expenses you consider necessary, what would be the very smallest amount of income per month-after-taxes your household would need to make ends meet' and 'I am going to ask you to think about the amount of money per month-after-taxes that would make you feel terrible about your household's income; then we will work up to an amount that would make you feel delighted about your household's income' (Colasanto *et al.*, 1984: 127-137).

[104] For more examples of subjective techniques, consult Rainwater (1974: 49-63) and Sharif (1986: 568-573).

[105] They ask respondents, 'Concerning your family's food consumption over the past one month, which of the following is true? It was less than adequate for your family's needs (1), It was just adequate for your family's needs (2), It was more than adequate for your family's needs (3), or Not applicable (4). "Adequate" means no more nor less than what the respondent considers to be the minimum consumption needs of the family'. Similar questions are asked with regard to the adequacy of consumption on housing, clothing, health care and education, and income (Pradhan and Ravallion, 1998: Table 1).

allow one to control for this. So, for example, Lipton's (1997) variant of the FEI method controls for differences in height and weight in terms of adult equivalent calorie requirements. Greer and Thorbecke's (1986a: 60-65) calorie cost function allows poverty lines to be set for subgroups set apart on geographical, cultural, gender or other grounds (footnote 100, page 148). Proponents of the food-energy-intake (FEI) method also advocate:

(i) its directness (the use of nutritional information allows one to avoid using income as an intermediary in estimation),

(ii) its greater clarity and lesser arbitrariness in defining subsistence needs,

(iii) its flexibility in using prevalent consumption patterns and being able to account for changes in consumption patterns over time,

(iv) its recognition of the importance of malnutrition as an important element of poverty, especially in developing countries (Sen, 1981: 9-23), and

(v) its relative computational simplicity that requires only data on calorie consumption and food expenditure (Greer and Thorbecke, 1986a: 62-65).

Johnson (1996) employs other criteria in evaluating the poverty lines used in Australia. He argues that poverty lines should:

(i) represent the community's consensus view of adequacy,

(ii) be related to contemporary standards of adequacy,

(iii) be transparent with regard to the origins, calculation and updating of poverty lines, and

(iv) be unrelated to existing transfer programmes run by government (Johnson, 1996: 112-113).

It is obvious from the above overview of methods of poverty line estimation that there is no one method that meets all these criteria. Subjective methods, for example, will go further in meeting the need for community consensus. The nutritional standards used in estimating food poverty lines may represent a better standard of adequacy. Furthermore, poverty lines based on the food-ratio (FR), percentile-of-income-distribution (PID) and fraction-of-median-income (FMI) methods are relatively more transparent than most other methods in terms of the way in which they are calculated.

Poverty lines can furthermore be classified as either absolute or relative (Alcock, 1993: 58-95; Thorbecke, 1998). Estimates of absolute poverty revolve around a common poverty line required to meet subsistence needs (minimum capabilities) (Todaro, 1994: 42; Sloman, 1997: 281). An absolute poverty line does not change as the standard of living changes and is fixed across the entire domain of the poverty comparison. Poverty lines that are estimated with the aid of the cost-of-basic-needs (CBN) and food-energy-intake (FEI) methods are examples of such absolute poverty lines (Ravallion, 1994b: 30; Woolard and Leibbrandt, 1999: 10). Relative poverty lines are more flexible and allow societies to determine the standard of living they consider reasonable and acceptable (Sloman, 1997: 281). This type of poverty line increases as the standard of living of the particular community improves. Hence, poverty lines are allowed to differ across societies, regions and households depending on their particular needs, characteristics and circumstances. Examples of relative poverty lines are those set with reference to subjective survey questions or the

fraction-of-median-income (FMI) method (Ravallion, 1994b: 28-44; Johnson, 1996: 111; Woolard and Leibbrandt, 1999: 11-12).

Two other aspects of the methodology of poverty line estimation also require mention. The methods discussed above are normally employed to determine a poverty line for a certain reference household (page 145). Because of differences in prices and household size and composition, equivalence measures are required to translate these benchmarks into benchmarks for households that face different prices and that differ in size and composition (Johnson, 1996: 111). These differences are observed when collecting data on the income and consumption of households. Thus these measures were discussed in detail under the choice of resource base (pages 139 to 143).

Poverty lines also need to be updated where poverty is studied over time. In fact, many longitudinal analyses of poverty do not estimate poverty lines on a continuous basis but rather update the original estimate on a continuous basis. Indices of changes in average weekly earnings (AWE), median income, household disposable income per capita (HDIPC), the consumer price index (CPI), and the GDP deflator are employed to this end. The choice of method depends on the absolute or relative nature of the poverty line. Cost-based indices such as the CPI are more appropriate in the case of absolute poverty lines, since the CPI preserves the purchasing power of poverty lines. Income-based indices such as the HDIPC are more suitable when updating relative poverty lines since the HDIPC preserves the relativity between poverty lines (Johnson, 1996: 111-112).

Arbitrariness is practically unavoidable in setting poverty lines. Poverty lines, in fact, are inherently subjective and remain summary measures of a multifaceted and multidimensional concept (Kgarimetsa, 1992: 9; Alcock, 1993: 60-62; Johnson, 1996:

112). Hence the standard practice has become one of testing the robustness of poverty lines by simultaneously employing more than one such estimate in poverty analysis. Ravallion (1994b: 43) refers to this as the use of dual poverty lines. Results are compared across estimates based on different methodologies and/or alternative assumptions made using similar methods (Lipton and Ravallion, 1995: 2577; Lipton, 1997: 1003). Greer and Thorbecke (1986a: 71) compare estimates based on their calorie cost function to those based on a minimum cost diet based on the 70/30 maize/beans split and a linear programmed diet. Ravallion and Bidani (1994) compare estimates across the cost-of-basic-needs (CBN) and food-energy-intake (FEI) methods. Pradhan and Ravallion (1998: 11-20) compare subjective poverty lines with ones obtained with the aid of the FEI method. Such comparisons require aggregate measures of poverty and inequality against which the effect of different poverty lines definitions can be compared.

5.4.2 Aggregating the extent of poverty and inequality

Armed with the required survey data on income or consumption and the poverty line estimate, one can aggregate this information into descriptive measures of poverty and inequality (Grootaert, 1983: 3-10). The emphasis here is on measures that have been applied empirically in poverty studies. Measures of poverty and inequality confined only to theoretical analysis are not discussed here.

Table 5.1: Measures of poverty and inequality

Indicator	Description	Source
A. Measures of Inequality		
1. Size distribution	The percentage share of income earned by specific percentages of the particular reference group. The popular denominations are quintiles (fifths) and deciles (tenths), although some studies report quartile (fourths) and percentile (hundredths) distributions. A decile distribution, for example, reports the percentage share of income earned by each of the ordered ten per cent groups of the particular population[106].	Paukert (1973), Grosh and Nafziger (1986), and Todaro (1994).
2. Lorenz curve	A curve showing the cumulative proportion of income earned by any given cumulative percentage of the particular population (measured from the poorest upward).	Dalton (1920), Todaro (1994), and Sloman (1997).
3. Gini coefficient (G)	The average ratio between the proportion of total income actually earned by a specific household or individual and the proportion of income the household or individual would have earned had income been distributed equally. Graphically, the coefficient refers to the area between the Lorenz curve and the line of perfect equality (45 degree line) expressed as proportion of the area enclosed by the triangle defined by the axis. G = 0 represents total equality and G = 1 total inequality[107].	Paukert (1973)
4. Atkinson index	Also known as the equally distributed equivalent measure, it represents one minus the ratio of the equally distributed level of income that provides the same level of welfare, given a welfare function, to the mean of the actual distribution of income. Index = 1 - Y_{EDE}/mean income[108]. I = 0 denotes complete equality and I = 1 complete inequality. Its intuitive appeal is that a value of 0.3 implies that 70 per cent of national income needs to be redistributed to achieve an equal distribution of available income[109].	Atkinson (1970), Beckerman (1978) and Buhmann *et al.* (1988).

[106] Size distributions are on occasion reported with the upper income limit for each of the groups. Certain summary measures of inequality are sometimes derived from size distributions. These measures include (i) the ratio of the bottom 40 to the top 20 per cent of the population's share of income (Sloman, 1997: 284), and (ii) Bowley's quartile measure, i.e. (q3-q1)/(q3+q1), where q1 and q3 reflect the first and third quartiles (Dalton, 1920: 348-361).

[107] The Gini coefficient has often been subject to adaptations. Yitzaki (1983, as quoted in Sahn and Younger, 1998: 12) proposed estimating the relative progressivity of different types of public expenditure and taxes using Gini coefficients. Pandey and Nathwani (1997: 187-202) integrate income inequality and socioeconomic inequality by recalculating Gini coefficients for income adjusted with the aid of the Life-Quality-Index (LQI) devised by Lind *et al.* (1992) (Chapter 6, page 3, footnote 184). Theoretically their effort can be traced back to Sen's (1973, as quoted in Kakwani, 1981: 34) argument that welfare measures need to be adjusted for variations in life expectancy.

[108] Y_{EDE} can be adjusted for the degree of inequality aversion using parameter $\in$, where $\in = 0$ signifies constant relative inequality aversion (as income increases, concern over inequality remains constant) and $\in > 0$ points to increasing relative aversion (concern over inequality increases as income increases) (Buhmann *et al.*, 1988).

[109] Gini and Atkinson coefficients are popular measures for reporting on intra-household inequality. Woolley and Marshall (1994: 419-429) report Gini and Atkinson estimates for six different aspects of intra-household inequality. These six concepts are household income, equivalent household income, individual income, control over household resources, control over decision-making, and perceived inequality. For specific details of the 1998 Winnipeg Area Survey (WAS) questions employed in estimating each of these elements of intra-household inequality, consult Woolley and Marshall (1994: 422-429).

Indicator	Description	Source
5. Theil index	Inequality is a function of population size and mean income. $T_1 = 1/n \Sigma y_i/\mu (\log y_i/n)$, where y_i represents individual income, n the number of individuals, and μ mean income. $T_1 = 0$ denotes complete equality and $T_1 = 1$ complete inequality[110].	Berry *et al.* (1983), Buhmann *et al.* (1988) and Burkhauser *et al.* (1997).
6. Intra-household distribution	The percentage share of different household members in household income and/or expenditure. Examples include the adult/children and male/female shares of expenditure, either in total or according to certain types of expenditure, e.g. alcohol, tobacco, clothing, and food.	Thomas (1990) and Woolley and Marshall (1994).
7. Haddad-Kanbur index (HK)	The difference between the higher and lower income spouse's share of household income. $HK = (X_1-X_2)/X$, where X_1 represents the better-off spouse's income, X_2 the lower earning spouse's income, and X total household income. HK = 0 denotes an equal division of household income and HK = 1 complete inequality.	Woolley and Marshall (1994)
8. Gender income ratio index (GIRI)	The ratio of average female income to average male income. GIRI = average X_f / average X_m. GIRI = 1 denotes an equal division of income between females and males. The smaller (larger) the index value, the greater (less) the income bias toward male workers.	Fuchs (1986, as quoted in Woolley and Marshall, 1994).
B. Measures of Poverty		
1. Headcount index (H)	A measure of the prevalence or incidence of poverty. The percentage of the total population with income or consumption below the poverty line (z). H = q/n, where q represents the number of poor persons falling below the poverty line z and n the total population[111].	Atkinson (1987), Ravallion (1992/94a/94b), Lipton and Ravallion (1995).
2. Poverty gap index (PG)	A measure of the intensity or depth of poverty that allows for how far the poor fall below the poverty line. Calculated as each individual's shortfall below z summed over the total population. It considers the non-poor to have a zero poverty gap. $PG = 1/n \Sigma [(z-y_1)/z] = H(1-\mu/z)$[112].	Ravallion (1992/94a/94b), Ravallion and Bidani (1994), Lipton (1997), and Ali (1998).

[110] The Theil index can be decomposed (page 162). The decomposed index, known as Theil's population-weighted inequality index (Ram, 1982: 114), reads $T_2 = \Sigma v_g T_{1g} + \Sigma v_g \log(v_g/p_g)$, where v_g represents subgroup g's share of total income, p_g its population share, and T_1 Theil's index for subgroup g (Burkhauser *et al.*, 1997: 160).

[111] The headcount, poverty gap and squared poverty gap indices are special cases of the Foster-Greer-Thorbecke (FGT) class of poverty measures. $P_\alpha = 1/n \Sigma [z-y_i/z]^\alpha$, where z represents the poverty line and y_i the actual income or consumption level of each person or household. The three FGT measures each focus on a different conventional poverty measure. P_0, P_1 and P_2 respectively are derivatives of the headcount (H), poverty gap (PG) and squared poverty gap (SPG) indices (Greer and Thorbecke, 1986a). These poverty measures become more sensitive to the well-being of the poorest person as the value of α increases (Woolard and Leibbrandt, 1999: 28). These measures are additively decomposable and are used extensively in poverty profiling (page 161).

[112] PG can be interpreted as a measure of the potential saving to the poverty alleviation budget from targeting exactly the right amount of transfers to the poor. PG reflects the ratio between the cost of filling up each poverty gap to the poverty line (i.e. the sum of all poverty gaps) and transferring to everyone the value of the poverty line (i.e. z.n) (Ravallion, 1994b: 46). Two popular derivatives of PG are the income gap ratio (I = PG/H), which measures the average proportionate shortfall below the poverty line (Lipton and Ravallion, 1995: 2579), and PG multiplied by H, which gives an indication of both the prevalence and depth of poverty (Ravallion, 1992: 35-50). The two measures fail to comply with various of the axioms used to assess poverty indices (page 159). Hence Lipton and Ravallion (1995: 2579) consider PG to be a better measure of poverty than any of its derivatives.

Indicator	Description	Source
3. Squared poverty gap index (SPG)	A measure of the severity of poverty that allows for the extent of inequality amongst the poor. The SPG attaches more weight to those gains furthest from the poverty line (Ali, 1998). Calculated as the mean of the squared proportional poverty gaps over the entire population with the non-poor again counted as having a zero poverty gap. $SPG = 1/n\ \Sigma[(z-y_1)/z]^2 = PG^2/H + (H-PG)^2/H*CV_p^2$, where CV_p^2 is the squared coefficient of variation of income or consumption amongst the poor.	Ravallion (1994a/94b), Ravallion and Bidani (1994), Lipton and Ravallion (1995), and Lipton (1997).
4. Sen Poverty Index (P)	P represents the 'head-count ratio H multiplied by the income-gap ratio I and augmented by the Gini coefficient G of the distribution of income amongst the poor weighted by (1-I), i.e. the ratio of the mean income of the poor to the poverty-line income level' (Sen, 1976: 227). Thus, P (also sometimes denoted as S) = $H\ [I + (1-I)G_p]$[113].	Sen (1976), Ravallion (1994b), Shorrocks (1995), and Ali (1998).

Measures are categorised as either measures of poverty or of inequality (Table 5.1, page 156). Measures of *inequality* (section A, Table 5.1) quantify the degree of disparity among people but without reference to a desirable level of income or expenditure (i.e. a poverty line). These measures are estimated from data on individual or household levels of income or expenditure. The normal steps in the identification process are followed, except for poverty line estimation, which is not required. Measures of *poverty* (section B) focus on the extent to which people are poor relative to some determined standard. Poverty lines are used as a guideline for the adequacy of income or expenditure (Greer and Thorbecke, 1986a: 60; Thorbecke, 1998). Here the identification process described in the above pages runs its complete course.

This distinction between measures of poverty and measures of inequality is similar to that drawn by Davis (1945: 2-3). He distinguished between measures of the

[113] This formula has over time been adjusted so as to address some of the theoretical inadequacies of Sen's (1976) original index (Foster, 1984: 227-242). Kakwani's (1981: 21-32) poverty index represents a modification of Sen's index. He attempts to estimate the percentage of income that must be transferred from the non-poor to the poor so that the income of everyone below the poverty line (x^*) may be raised to x^*. According to Thon (1981: 207-208), Kakwani's poverty index reads $P = F(x^*)/\mu[x^*-\mu^*(1-G^*)]$, where x^* represents the poverty line, $F(x^*)$ the headcount index for poverty line x^*, q the number of people below the poverty line, n the total population, μ the mean income of the whole distribution, μ^* the mean income of the poor, and G^* the Gini coefficient reflecting the distribution of income amongst the poor.

level and the standard of well-being. The former relate to measures defined in view of actual levels of income or expenditure (inequality) and the latter to measures defined relative to some level of income or expenditure considered desirable (poverty). Poverty measures, however, remain measures of inequality insofar as they quantify the extent of inequality in relation to some benchmark.

Various theoretical axioms have been employed in evaluating these indices of poverty and inequality (Greer and Thorbecke, 1986a: 59). In the literature the discussion of these axioms is predominantly confined to the Atkinson, Sen and Foster-Greer-Thorbecke (FGT) indices. Monotonicity, transfer-sensitivity and equal additions are the most prominent of these axioms (Sen, 1976; Kyereme and Thorbecke, 1987). The *monotonicity axiom* requires that the poverty index will decrease when the resource base of the poor increases, i.e. when their incomes increase (Kakwani, 1980: 437-446). The *transfer axiom* requires that the poverty index will decrease when the non-poor transfer resources to the poor (Kakwani, 1980: 437-446; 1981: 21-32), assuming that such transfer is not so large as to simply reverse the initial positions of the rich and poor (Dalton, 1920). Indices are sensitive to a redistribution (transfer) of resources when complying with this axiom (Foster, 1984: 216-226)[114]. The *axiom of equal additions* tests the extent to which equal additions to the income of all individuals or households affect income inequality. Such additions should leave the inequality index unchanged (Kakwani, 1981: 23; Dalton, 1920: 355-357). The FGT group of poverty measures complies best with these axioms. Hence the headcount, poverty gap and poverty gap severity indices are afforded the greatest

[114] Pigou (1946: 758-767) argued that the transfer axiom also needs to be linked to changes in the 'national dividend' (total output) resulting from a redistribution of resources. Transfers may initially cause total output (GDP) to decline, while total output will increase only in the long term. According to Pigou (1946), this was the only true test of redistributive policies.

emphasis in studies of poverty, as is evident from the discussion of the methods used for poverty comparisons (pages 160 to 164).

5.4.3 Comparing the extent of poverty and inequality

Poverty analysis is concerned primarily with comparisons of poverty. Poverty lines, for example, are often expected to simultaneously comply with two seemingly irreconcilable but equally important requirements. Some common standard is required to allow for the direct comparability of poverty measures across different settings, e.g. between countries and between regions within countries (Sen, 1981: 9-23; Weigel, 1986: 1423-1428). Poverty lines also need to be domain specific, i.e. reflect local perceptions of what constitutes poverty in that particular subgroup (Ravallion and Bidani, 1994: 76). Poverty comparisons are crucial in determining the consistency of poverty lines. The subgroup to which a particular individual or household belongs (i.e. its specific characteristics) should not determine whether or not a specific standard of living (i.e. poverty line) constitutes poverty (Ravallion and Bidani, 1994: 76; Ravallion, 1994b: 44). Because of the plethora of poverty measures, it is also important to determine whether or not different poverty measures will yield different results when applied to different settings (Ravallion, 1994b: 50-51). Consequently, comparisons of the results of poverty analysis across different poverty lines and poverty measures are crucial to correctly inform policy. Hypothesis testing, poverty profiles and partial poverty orderings are used for this purpose.

Hypothesis testing allows one to determine whether poverty is significantly different in one situation than in another. It can be applied to additive poverty measures such as the FGT class of poverty measures. The standard deviation is

calculated for the sample distribution of the poverty measure. This is employed to determine the range within which the value of the poverty measure is likely to fall given a particular confidence interval - normally ninety-five per cent. Where the poverty measures of different subgroups fall within this confidence interval, poverty does not differ significantly in the two settings. In these comparisons, the poverty line is treated as fixed. This type of comparison, therefore, is not suitable for comparisons across a range of poverty lines (Ravallion, 1994b: 57-59).

A *poverty profile*, or what is also referred to as a decomposition of poverty, reports estimates of poverty and inequality for any number of subgroups of the particular population as well as for the total population[115]. These subgroups are mutually exclusive and exhaustive. Profiling requires measures that are additively decomposable. The Theil index of inequality is additively decomposable (footnote 110, page 157), as is the FGT class of poverty measures (footnote 111, page 157). Additive decomposability means that overall inequality can be portioned into inequality between subgroups and within subgroups. The subgroups used in decomposition are usually distinguished according to those characteristics complicating comparisons of poverty and inequality. These characteristics include, amongst others, household size and composition, characteristics of the household head, land holding size, cropping patterns, race, region, residence, occupation, level of education, and sector of employment (Greer and Thorbecke, 1986b; Ravallion, 1994b: 61-64; Lipton and Ravallion, 1995: 2580; Mwabu *et al.*, 1998).

Decomposition for profiling purposes can be performed across space or time. Decomposition across space requires measures of the type $P_\alpha = n_A P_{\alpha A} + n_B P_{\alpha B}$, where A and B represent two subgroups and n_A and n_B the population shares of the two

[115] For examples of poverty profiles, consult Greer and Thorbecke (1986b) and Mwabu *et al.* (1998).

groups that the poverty estimate for each group is weighted by (Lipton and Ravallion, 1995: 2580-2581; Thorbecke, 1998). Decomposition across time requires measures of the type $P_2-P_1 = \Sigma(P_{i2}-P_{i1})s_{i1} + \Sigma(s_{i2}-s_{i1})P_{i1} + \Sigma(P_{i2}-P_{i1})(s_{i2}-s_{i1})$, where, for subgroup i, P represents the poverty measure and s the population shares for each of the two periods. Such decomposition allows one to distinguish between changes in poverty resulting from changes within subgroups, population shifts between subgroups, and interactions between different subgroups (Ravallion, 1994b: 65-66; Ali, 1998)[116].

Poverty profiles can be presented in one of two formats (Ravallion, 1994b: 61-64). On the one hand, one can report the incidence of poverty amongst subgroups defined in terms of characteristics such as race, region of residence or gender (type A profile) (Woolard and Leibbrandt, 1999: 32-41). On the other hand, one can report the incidence of characteristics such as employment status, source of income and access to services amongst subgroups with different poverty status, e.g. those who are respectively poor and non-poor (type B profile) (Woolard and Leibbrandt, 1999: 41-47). The particular choice as to the method of presentation depends on the purpose of the analysis. Where, for example, the objective of a transfer programme is to have the greatest impact on the overall poverty gap, a type A profile presents a better guide than one of type B (Ravallion, 1994b: 63).

Decompositions such as these allow a detailed profile of the characteristics and circumstances of the poor to be constructed. According to Ravallion and Bidani (1994: 75), such profiles are normally the first step in formulating antipoverty policies. Woolard and Leibbrandt (1999: 47), for example, through decompositions determined that the poor in South Africa are generally African, live in rural areas,

[116] Decomposition can also be employed to distinguish between the growth and distribution effects responsible for changes in poverty. Datt and Ravallion (1992, as quoted in Ali, 1998) developed a method for doing so. The growth and distribution components respectively refer to changes in poverty

have low levels of education, lack access to wage employment, are found in female-headed households, and lack access to basic services and transport.

Partial poverty orderings allow one to determine the extent to which different choices with regard to poverty lines and other measurement assumptions affect poverty comparisons (Ravallion, 1994b: 1-3; Woolard and Leibbrandt, 1999: 12). This is a crucial test for the robustness of poverty comparisons. Poverty value curves are employed for this purpose. To obtain these curves, estimates of the headcount, poverty gap and squared poverty gap indices for different subgroups are plotted for a range of poverty lines (normally ranging from zero to maximum consumption). The subgroups can refer to poverty estimates for different time periods or estimates for different subgroups of the population (pages 161 to 162). The values of the poverty measure are plotted on the vertical axis and the cumulative values of the poverty line are plotted on the horizontal axis. Ravallion (1994b: 67) describes the poverty value curves for the class of FGT poverty measures as the poverty incidence curve, poverty deficit curve and poverty severity curve. A comparison is robust and consistent if the poverty value curve for one subgroup dominates and/or matches that of another subgroup across the entire range of poverty line estimates. In the case of South Africa, for example, the headcount poverty index for Africans exceeds the headcount index for Whites across the entire range of poverty lines. Hence Africans are consistently ranked poorer than Whites (Woolard and Leibbrandt, 1999: 37). These conditions are respectively referred to as first, second and third-order dominance in the case of the poverty incidence, deficit and severity curves. Two poverty value curves may cross. So, for example, Africans may be ranked poorer than Coloureds at a certain range of poverty lines, whereas Coloureds are ranked poorer than Africans at

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that would have occurred had the distribution of income and the mean income remain unchanged

another range of poverty lines. Such comparison is inconsistent and inconclusive. The only way to draw conclusions from such comparison is to narrow the range of critical poverty lines so that the above condition of dominance is met (Ravallion, 1994b: 66-76; Woolard and Leibbrandt, 1999: 29-30).

In terms of the four elements of method and technique identified in Chapter 2 (pages 24 to 27), the measurement of poverty and inequality described in the above pages can be judged as follows. *Firstly*, these indicators are evidently of a quantitative rather than of a qualitative nature since each reports on the extent of poverty and inequality in numerical terms (Thorbecke, 1998).

Secondly, there is the issue of objectivity and subjectivity. Except for measures of the intra-household distribution of consumption, the indicators of inequality are relatively objective. These measures simply report on the relation between observed levels of income and/or expenditure. In terms of intra-household inequality, though, there are various sources of subjectivity. A relatively small number of commodities can unambiguously be assigned to men, women or children. These commodities represent a small fraction of total household expenditure. Differences in preferences, age and occupation, moreover, are important determinants of variations in intra-household expenditure (Woolley and Marshall, 1994: 416-417).

Poverty measures have over time become increasingly contentious, especially with regard to the estimation of poverty lines (Ravallion, 1996: 1328-1334). Subjectivity is inherent to the subjective methods of poverty line estimation (page 150). Other methods also entail subjectivity. The cost-of-basic-needs (CBN) group of methods requires arbitrary choices regarding the level of need aimed at and those

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(Ravallion, 1994b: 64-65).

goods and services included in commodity bundles (Townsend, 1962: 215-218; Franklin, 1967: 286-294; Rein, 1971: 46-63). The food-energy-intake (FEI) method, furthermore, requires a subjective choice in selecting the activity level and body weights relative to which 'official' energy requirement estimates are set (Lipton and Ravallion, 1995: 2576)[117]. Thus, as Rein (1971: 46-63) points out, poverty line estimates are at best arbitrary and relative, since they are so dependent on assumptions regarding values, preferences and circumstances.

Sen (1981: 9-23), however, defended poverty research as objective. He argued that poverty, although subjectively defined within a particular context, can be interpreted objectively. The process of identification is inherently subjective but the process of aggregation remains an objective effort at measurement. As Bowley (1925: 14, as quoted in Atkinson, 1987: 751) put it, poverty lines are 'arbitrary, but intelligible'. Weigel (1986: 1423-1428) described it as an objective response to subjective needs.

Yet, poverty line estimation is not the only subjective aspect of poverty measurement. The resource base may be interpreted as weak insofar as its representativeness, reliability and accuracy can be estimated with the aid of statistical parameters (Lipton and Ravallion, 1995: 2579). Thus, unrepresentative surveys and poor survey design can introduce arbitrariness in measurement (Ravallion *et al.*, 1991: 346-349; Ravallion, 1992: 8-17; Greer and Thorbecke, 1986a: 59). The objectivity of indicators can also be evaluated in terms of the degree to which they meet the various axiomatic requirements put forward by the likes of Sen (1976) and Kakwani (1980/81).

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[117] Greer and Thorbecke (1986a: 61) defend the food-energy-intake (FEI) method as objective insofar as calorie requirements represent the typical needs of large groups of people sampled during the estimation of RDAs.

In the *third* instance, these indicators are cardinal rather than ordinal measures. Although many are presented in terms of an index value, the index value is ultimately cardinal since it is derived from numeric differences in levels of consumption and/or income. Differences between measures are meaningfully interpretable in terms of the level of poverty or inequality either increasing or decreasing.

Finally, these indicators are uni- rather than multidimensional by nature insofar as they quantify the extent of disparity in resource distribution without incorporating other dimensions of economic development (Atkinson and Bourguignon, 1982)[118]. Another interpretation of dimensionality relates to the extent to which poverty indices quantify the different dimensions of poverty, i.e. incidence, depth and severity (Lipton and Ravallion, 1995: 2579). The headcount (H), poverty gap (PG) and squared poverty gap (SPG) indices respectively measure each of these dimensions and are complementary insofar as each report on a different dimension of the poverty problem (Table 5.1, page 156). In this narrow sense, these measures may be considered multidimensional indicators of poverty, each of which affords one a different view of poverty.

5.5 COMPARATIVE APPLICATION OF MEASURES OF POVERTY AND INEQUALITY

As with other indicators of economic development, measures of poverty and inequality are especially complex to apply in comparative analysis (Sharif, 1986: 563).

[118] Atkinson and Bourguignon (1982) adjusted the distribution of income for differences in purchasing power and life expectancy and Pandey and Nathwani (1997) the Gini coefficient for life expectancy (footnote 107, page 156) in an attempt to develop multidimensional indicators of inequality. These

5.5.1 Interspatial and intertemporal comparisons

The intricacies involved in comparing measures of poverty and inequality across time and space are best discussed by way of certain of the elements of method and technique discussed in the previous pages. These include choices as to resource base and unit of analysis, poverty line estimation, and the selection of a specific indicator (Berry, 1985; Lipton and Ravallion, 1995).

Firstly, poverty lines are not directly comparable across poverty studies. There are two reasons for this. Poverty lines, on the one hand, are estimated with the aid of different methods, each of which identifies different people as poor (Anand and Harris, 1994: 226). Danziger *et al.* (1984), for example, report considerable differences in poverty line estimates obtained with subjective as opposed to cost-of-basic-needs (CBN) methods[119].

On the other hand, even when a single standardised method is used, inherent differences in the units of analysis across which poverty lines are compared also introduce complexities. Some variants of the cost-of-basic-needs (CBN) method, for example, base the poverty line on what it presumes to constitute a palatable but inexpensive diet. Such diet may, however, be too monotonous to be palatable or properly assimilable (Franklin, 1967: 286-294). Nutrient needs and food consumption patterns, in fact, vary substantially across both time and space (Greer and Thorbecke, 1986a: 61; Pitt *et al.*, 1990). The food-energy-intake (FEI) method, however, has addressed this shortcoming by allowing for the composition of the observed diets of the poor and of their nonfood consumption when estimating the poverty line

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indicators represent variants of the type of composite indices of development discussed in Chapter 7 (pages 218 to 257).

(Ravallion and Bidani, 1994: 75-82; Thorbecke, 1998). Foodshare ratios, which are employed in some estimation techniques, also differ substantially across households due to differences in price, demographic composition, tastes, and income elasticity of demand (Ravallion, 1992: 17-25). Other cost-of-basic-needs (CBN) methods have applied similar simplifying assumptions to a broader bundle of consumption needs. Thus, they fail to allow for differences in consumption and/or income not related to resource inequality (Lipton and Ravallion, 1995: 2582-2583). These sources of variance include interspatial and intertemporal differences in physiological features (gender, age, height and weight), dietary preferences, climate, activity levels, culture, relative price levels, the availability of goods and services, location, household size and composition, marital status, the ability to adapt to economic distress, access to public services provision, and the level of affluence (Franklin, 1967: 284-294; Abel-Smith and Bagley, 1971: 86; Sen, 1981: 9-23; Gilder, 1982: 75-77; Sharif, 1986; 563-567; Greer and Thorbecke, 1986a: 62-65; Atkinson, 1987: 750-754; Ravallion *et al.*, 1991: 345; Ravallion, 1992: 8-17; Anand and Harris, 1994: 226-230; Lipton and Ravallion, 1995: 2574-2576)[120].

Inherently there is nothing wrong with poverty line estimates differing across nations, households or persons. In fact, poverty lines should differ since they are applied in heterogeneous settings (Ravallion, 1992: 25-35). Townsend (1962: 218-220) insisted that poverty lines be applied with specific reference to the structure, organisation, and physical environment of the particular universe they apply to. This need not limit the value of poverty lines in comparative analysis, because the ultimate emphasis is not on the precise location of the poverty line but rather the comparison it

[119] Other analyses reporting differences in poverty estimates obtained with the aid of different poverty line definitions include those of Greer and Thorbecke (1986a: 70-73), Buhmann *et al.* (1988), and Leibbrandt and Woolard (1999).

implies across time and space (Buhmann *et al.*, 1988: 115-142; Hagenaars, 1991: 135-146; Lipton and Ravallion, 1995: 2576-2577).

Yet, bias may be introduced where country-specific poverty lines are adjusted for comparative purposes using official exchange rates or PPPs (Ravallion *et al.*, 1991: 345; Lipton, 1997: 1003). Although discussed in great detail in Chapter 3 (footnote 40, page 65), the index number problem warrants reiteration. It refers to the bias introduced in comparisons, because the use of different prices implies a different outcome in terms of the estimated distance between indifference curves (or in this case nations, households or persons) (Beckerman, 1968: 202-232; Ram, 1982: 227). This problem becomes more pronounced as differences increase in the composition and relative prices of consumption bundles on which poverty line estimates are based (Lipton and Ravallion, 1995: 2582-2583). As noted elsewhere (page 168), these differences are inherent in any comparison of poverty lines. Furthermore, PPPs are biased due the fact that they are derived from national consumption patterns rather than from consumption patterns amongst the poor (Lipton, 1997: 1004). In the few cases where countries do report group-specific cost-of-living indices, they normally do so only for middle income and low income urban groups (Berry, 1985: 343). Given the ignorance about low income households living in rural areas, even PPPs derived with the aid of these indices may be biased. Difficulties also arise where estimates for comparative purposes need to be adjusted to a single base year, especially due to disparities in the procedures and practices employed in national accounting (Berry *et al.*, 1983: 331-336; Yotopoulos, 1989: 358-365).

Secondly, there is the bias introduced by choice of resource base. Consumption need not be a good indicator of well-being when measuring poverty

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[120] Interspatial differences refer to differences in these parameters at the unit of analysis, i.e. between

over time. Consumption is considered a better long-term indicator of income because it reveals information about past and future income. Yet, consumption can vary considerably over the life-cycle because of changes in consumption needs and constraints on opportunities for consumption smoothing (Ravallion, 1994b: 15).

Measures based on differently defined resource bases are also not directly comparable (Yotopoulos, 1989: 358-365). As noted elsewhere, income and consumption levels differ as a result of saving/dissaving and due to differences in measurement error (Srinivasan, 1994a: 13-14). Thus, people not identified as poor on the basis of income may be so on the basis of consumption and vice versa (Townsend, 1971: 100-112). Woolley and Marshall (1994: 420) show how poverty estimates vary across different conceptualisations of household income, while Grosh and Nafziger (1986: 350) show how Lorenz curves estimated with data sets from different surveys differ. Radner (1997: 71) illustrates this bias by comparing 'equivalent income' estimates based on conventional income and income including non-cash income with consumption-based equivalence scales[121].

Furthermore, given differences in the availability of and measurement error in data on income and consumption, data on income and consumption are uneven in quality (Townsend, 1971: 2-12; Ravallion *et al.*, 1991: 354-359; Srinivasan, 1994a:

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nations, households and individuals.

[121] There have been some efforts at standardising data collection in poverty analyses. The Living Standards Measurement Study (LSMS) launched by the World Bank in 1980 was aimed at promoting the dialogue between the producers and consumers of poverty data and to guide the data collection process towards issues of importance in policy-making. These included deciding on which data needs to be collected, which concepts are to be used in analysis, and how this data can be used to interpret trends in poverty and assess the relative success of policies designed to alleviate poverty (Grootaert, 1983: 1-2). The Luxembourg Income Study (LIS) represents a standardisation effort confined to developed countries. Established in 1983, its goal was to gather in one central location, i.e. the Centre for Population, Poverty and Policy Studies (CEPS) in Walferdange, Luxembourg, data sets containing measures of income and economic well-being. LIS allows researchers a choice in terms of income definition, poverty measure, the accounting unit, and the type of equivalence scales employed in estimation (Buhmann *et al.*, 1988: 116). The LIS data bank currently covers twenty-six developed countries, the majority of which are situated in Western Europe. Survey data are available for these countries for select years between 1979 and 1997 (Luxembourg Income Study, 2000).

21-22; Lipton and Ravallion, 1995: 2582-2583). Measurement error may result from either deliberate or inadvertent underreporting or from poor survey design (page 143) (Berry, 1985: 343). Many African countries, moreover, fail to release survey data to research institutions once surveys have been completed. Berry (1985: 342-351) points specifically to the failure of LDCs in meeting the minimum data requirements for reliable measurement and comparison. He concludes that one always needs to assess the coverage, quality of reporting, and comparability of data employed in poverty comparisons. Ravallion *et al.* (1991: 346-349), although recognising that the extent of measurement error differs internationally, consider these errors random and uncorrelated and thus incapable of introducing bias in poverty estimates.

Thirdly, it needs to be pointed out that the same poverty measure, if applied at different levels of application, often yield different results. Berry (1985: 343-345) illustrates how poverty estimates differ when applied at the household as opposed to the personal level. This is because all the household members within a particular household are not necessarily identified as poor when the application shifts to the personal level. Thus, care needs to be taken in making sure that poverty measures are compared across the same level of application.

Finally, the selection of any single poverty measure involves a degree of arbitrariness, because of the kind of comparative inconsistencies described in the previous paragraphs and the relative strengths and weaknesses of different indicators (Foster, 1984: 242-244). The fact that some measures have constantly been updated, while others, once introduced, have never been consistently applied in poverty research has acted to further cloud this issue (Ravallion, 1992: 8-17). The practice at one stage was to select those indicators that best complied with the myriad of theoretical axioms put forward by Sen (1976) and Kakwani (1980/81). So, for

example, Sen's poverty index (P) was developed in order to satisfy those axioms that the conventional headcount (H) and poverty gap (PG) indices failed to address individually (Sen, 1976: 227). Kakwani's poverty indices, furthermore, were the result of efforts at developing indices that complied with an even larger set of axioms (footnote 113, page 158).

According to Foster (1984: 242-244), scientific selection requires a partial ordering of outcomes to determine which indicator consistently ranks households or individuals higher or lower than other indicators (page 163). The importance of this issue has been highlighted in recent research pointing to the relative inconsistency in estimates of poverty and inequality reported with the aid of different indicators. Anand and Harris (1994: 230), for example, report the extent to which the ranking of the poorest thirty per cent of individuals differs across five different indicators. The percentage of the poorest thirty per cent of people that were ranked similarly on alternative indicators ranges from 85.3 (highest) to 38.3 (lowest). Ravallion (1994a: 359-363) found a relatively high degree of consistency between the poverty rankings obtained with the aid of the headcount (H), poverty gap (PG), squared poverty gap (SPG) and Atkinson indices[122].

These disparities, coupled with the issues highlighted in the foregoing pages, strengthen the case for using a range of poverty lines and poverty indicators rather than a single poverty estimate based on a single poverty line (Ravallion, 1994a: 359-363; Ravallion, 1996: 1328-1334). This has caused the focus in poverty studies to shift to poverty profiles and partial poverty orderings (pages 160 to 164) (Ravallion, 1992: 50-66).

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[122] Atkinson indices were found to produce consistent poverty rankings only when assuming low inequality aversion (Ravallion, 1994a: 359-363). For details concerning other analyses reporting on the relative consistency of rankings obtained with different indicators, consult Lipton and Ravallion (1995: 2575).

5.5.2 Absolute versus relative measures of poverty and inequality

According to Sen (1981), relative measures are more important than absolute ones. Relative measures, however, only supplement and cannot supplant the notion of absolute poverty (Sen, 1981: 22). Poverty remains an absolute notion in terms of being defined in the space of certain basic capabilities. Yet, it finds true meaning only when applied in the relative space of commodities, characteristics and resources (Paukert, 1973: 100; Sen, 1981: 4-6; 1983b: 160-163). Thus, the poverty measures discussed here (Table 5.1, page 156) can all be interpreted as relative, although applied with reference to some absolute base. So, for example, poverty estimates reported in terms of 'equivalent income' represent a measure of both relative and absolute poverty (Ringen, 1996: 424). It is relative in that it enables a comparison between individuals belonging to households of different size and composition. Its absoluteness resides in the fact that it represents that minimum level of consumption to which households and individual household members ultimately require access.

5.6 FOCUS OF MEASURES OF POVERTY AND INEQUALITY

The measures of inequality listed in Table 5.1 (page 156) focus on those means required to achieve a certain standard of living. These means are expressed in terms of income or consumption. The poverty measures focus indirectly on ends. These indicators are poverty line-based and thus require a relation to be drawn between means (resources) and ends (e.g. nutritional requirements). In terms of their final interpretation, though, these poverty measures, given their focus on the adequacy of income and/or consumption to meet certain ends, remain means-based.

5.7 CLARITY AND SIMPLICITY OF MEASURES OF POVERTY AND INEQUALITY

Clarity and simplicity can be related to two aspects of measurement, namely estimation and interpretation. In terms of estimation, most of these measures are relatively complex, especially with regard to poverty line estimation. The discussion on method and technique (pages 134 to 164) bears testimony to this. As is evident from the discussion on pages 167 to 173, this also further compounds comparative application.

In terms of interpretation, those indicators expressed in index numbers relative to zero (equality) and one (inequality) are especially advantageous, i.e. the Gini coefficient and Atkinson, Theil and Haddad-Kanbur (HK) indices (Sloman, 1997: 284). Measures expressed in ratios are also relatively simple to interpret, e.g. the size distribution of income and headcount (H) and poverty gap (PG) indices (Sen, 1981: 9-23; Woolley and Marshall, 1994: 418-419; Lipton, 1997: 1003). Other measures, however, lack simplicity and clarity in interpretation. The interpretation, for example, of the Gender Income Ratio (GIRI) index is problematic. The index allows inequality benefiting females to cancel out with inequality benefiting males. Assume, for example, that a male partner of one couple has the same income as the female partner of another couple. Assume also that the female partner of the former couple has the same income as the male partner of the latter couple. In this case the GIRI will take on a value of 1, which represents complete equality (Woolley and Marshall, 1994: 418-419). Ravallion (1992: 35-50) finds the squared poverty gap index (SPG) also relatively difficult to interpret since it simultaneously measures more than one aspect of poverty, i.e. the depth and severity of poverty.

5.8 AVAILABILITY OF MEASURES OF POVERTY AND INEQUALITY

The availability of data on poverty and inequality has improved markedly in recent decades. Early data was primarily confined to size distributions for the US, England and Germany since these countries were the only ones with a well-developed base of income and expenditure data (Kuznets, 1955: 3-6). Most countries, however, had by the late 1960s started making efforts at compiling data on poverty and inequality at the national level (Franklin, 1967: 284-286). Of the early compilations of statistics on poverty and inequality, Paukert (1973: 124) considers Adelman and Morris' (1971) *Anatomy of Patterns of Income Distribution in Developing Nations* as the most detailed. Their effort covers forty-four countries and reports full details on both primary and secondary sources of data. A number of academic articles and statistical compendiums have drawn the net even wider. Bruno *et al.* (1998: 121-123) analyse Gini coefficient estimates for a sample of forty-five developed and developing countries. The Word Development Report reports the most recently available national estimates of the size distribution of income, Gini coefficient, and headcount (H) index for more than fifty developing nations (World Bank, 1997: Tables 1 and 5)[123]. Data on the twenty developed countries covered in the particular tables are confined to national estimates of the size distribution of income (World Bank, 1997: Table 5). The Human Development Report reports national estimates of the income share of the poorest forty per cent of households and the ratio between the share of the richest and poorest twenty per cent of households for close to seventy

[123] H represents the percentage of people living on less than US$ (PPP) 1 a day (World Bank, 1997: 214-215). Percentage shares in income (or consumption) are reported for the bottom and top deciles, and the first, second, third and fourth quintiles (World Bank, 1997: 222-223). These estimates are dated between 1981 and 1995.

developed and developing countries[124]. The report also lists estimates of urban and rural headcount indices for some forty developing nations (UNDP, 1996: Table 17)[125]. World Development Indicators reports headcount poverty indices based on national and/or international poverty lines for close on ninety developing countries (World Bank, 1999: Table 2.7)[126]. This bears testimony to Greer and Thorbecke's (1986a: 66) and Ravallion's (1996: 1328-1334) claims that the headcount index remains the most prominent indicator of poverty. As far as inequality measures are concerned, the size distribution and Gini coefficient are the most prominent.

Yet, there still remain substantial disparities in the frequency with which estimates of poverty and inequality are reported. The following example is indicative of this situation. For the four decades straddling the 1960s and 1990s, the USA (45), UK (31) and India (29) reported the most Gini estimates (number of observations in brackets). Mexico, Portugal, Trinidad and Tobago, and Venezuela each reported only four estimates over the same period. Most disconcerting, though, is the fact that the majority of developing countries in Africa failed to report four or more estimates of the Gini index between 1960 and 1997 (Bruno *et al.*, 1998: 122-123). The relative infrequency of poverty surveys is also confirmed by those estimates of poverty measures reported by the World Bank and UNDP (footnotes 123, 124 and 126, pages 175 to 177). This supports Kgarimetsa's (1992: 12) claim that the most important constraint to poverty alleviation is the 'lack of reliable statistical data and constant updates to provide information on the number of poor people, where they are located or live and why they are poor'.

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[124] These estimates are dated between 1981 and 1993 (UNDP, 1996: 198).

[125] Estimates are determined with the aid of a country-specific 'absolute' poverty line representing the 'income or expenditure level below which a minimum, nutritionally adequate diet plus essential nonfood requirements are not affordable' (UNDP, 1996: 222-223).

5.9 FLEXIBILITY OF MEASURES OF POVERTY AND INEQUALITY

These measures of poverty and inequality are relatively flexible. While different indicators have accommodated new developments in technique and method, the collection of measures listed in Table 5.1 (page 156) is also indicative of a high degree of complementarity. Different indicators report on different dimensions of poverty and inequality, e.g. the incidence, depth and severity of poverty. Poverty lines, furthermore, can be adjusted so as to allow for changes in the conception of poverty, e.g. moving away from subsistence bundles towards including a wider and changing spectrum of needs (Townsend, 1971: 12-13). Inflexibility, however, is inherent in measurement insofar as the choice of resource base remains confined to income, consumption or wealth, i.e. the monetary domain of economic development.

5.10 CONCLUDING REMARKS ON MEASURES OF POVERTY AND INEQUALITY

These indicators of poverty and inequality, although extremely complex and intricate when applied in comparative analyses, afford one an indispensable view on economic development. Yet, poverty measures only really come into their own when employed in combination with socio-economic indicators of development. These indicators afford one a glimpse of the social impact of policies aimed at higher economic growth and poverty alleviation. Thus, the discussion now turns to socio-economic indicators and composite indices of development.

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[126] These estimates are dated between 1984 and 1996 (World Bank, 1999: 66-68).

Chapter 6

Social Indicators of Economic Development

6.1 SCOPE OF THIS CHAPTER

Social indicators today figure prominently in studies of economic development, given the shortcomings of income-based measures of economic development described in Chapter 3. These indicators are discussed here in terms of the different dimensions of measurement identified in Chapter 2. This discussion is preceded by a brief overview of the context within which social indicators gained prominence in development studies. Composite indices of development, often derived from social indicators, are discussed in Chapter 7.

6.2 BACKGROUND TO THE SOCIAL INDICATOR MOVEMENT

As a result of the shortcomings of income-based measures of economic development (Chapter 3, page 56), the search for alternative indicators has figured prominently in the literature on indicator development (Drewnowski, 1972: 80-83; 1974: 1-2; Perthel, 1981 1-3; Kao and Liu, 1984: 400; Todaro, 1989: 108-113)[127]. This movement, popularly known as the Social Indicators Movement, was motivated by the 'need to monitor changes ... in a wide range of quality of life issues' (Andrews, 1989: 401, as quoted in Kallmann, 1997: 8). On the one hand, it has focused on a

[127] The developments in research on alternative development indicators discussed here are to be distinguished from efforts at expanding accounting frameworks to include the social and environmental aspects of economic development. Examples include social accounting matrices (SAMs) and other

wide range of social indicators which individually quantified a variety of microlevel elements of economic development. This followed the increasing attention being paid to the social aspects of economic development (Perthel, 1981; Griffen and Knight, 1989: 15). During the 1970s this concern was embodied in the basic needs development approach. Basic needs development is concerned with providing people with opportunities for a full life by fulfilling their most basic needs via the provision of certain public goods and services (Stewart, 1985: 2-5; Squire, 1993: 381; Streeten, 1995: 25-26). It represents an approach rather than strategy insofar as it prioritises certain objectives but without prescribing exact means required to meet these ends (Stewart, 1985: 2). The 1980s saw the focus temporarily shift away from the social side of economic development in this period of economic stagnation (Koskiaho, 1985: 193; Jolly, 1989: 259). The 1990s, though, witnessed a revival in social indicator research in the wake of the increasing concern with human development (Ul Haq, 1995: 24). The UN's fourth Development Decade (1991-2000) lists as its main goals improvements in infant and maternal mortality, nutrition, literacy and primary education, access to sanitation and safe water, and gender equalisation (Jolly, 1989: 259-260). Heralded as an entire new perspective on development by some of its proponents, human development has seen the focus shift to the enlargement of people's choices and the identification of those outputs to which they ascribe a long-term value. It is all about 'creat(ing) an enabling environment for people to enjoy long, healthy and creative lives' (Ul Haq, 1995: 11-14). According to Streeten (1995b), human development is but an extension of the basic needs development approach. The conclusive statement from the Budapest Roundtable confirms this. Human development is defined as entailing 'a major stress on poverty alleviation and

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satellite accounts appended to the national accounts. These developments are related in Chapter 3 (pages 47 to 55).

the attainment of basic human needs' (Haq and Kirdar, 1988: 3). Thus, it simply redefines basic needs to cover a wider spectrum of need and it focuses on all human beings rather than only the poor (Streeten, 1995b: 25-26).

This discussion has been informed by three independent but overlapping bodies of research. *Firstly*, there are those analyses that employ empirical techniques in determining the interdependence between a wide range of economic, social and political variables. Felipe and Resende (1996), for example, perform multivariate analyses on a set of thirty-nine socioeconomic variables, while Diener and Diener (1995) analyse the correlation between income and thirty-two economic, social and political indicators[128]. *Secondly*, there are those studies that focus solely on the definition of an acceptable conceptual framework within which development should be defined and/or composite indices developed. Perez (1989), for example, identifies a conceptual framework for an Index of Social Welfare (ISW) but never gets as far as applying it in measurement. The UN's Commission on Sustainable Development, furthermore, presents a general framework for the development of indicators of sustainable development (CSD, 1996). *Finally*, there are those efforts that have attempted both the conceptualisation and application of social indicators. The numerous statistical publications generated by the UN, World Bank and other development agencies remain central in this regard.

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[128] Similar efforts but which employ different empirical techniques include those of Berry and Ginsberg (1961), Adelman and Morris (1965 and 1967), Ahluwalia (1976), Rao (1976), Hicks and Streeten (1979), Wilson and Woods (1982), and Chowdury and Islam (1993). These analyses are often

6.3 CONTENT OF SOCIAL INDICATORS

The discussion on content is here confined to explaining what are understood to be social indicators of economic development. The social indicators related in these pages are those that relate to Sen's idea of capabilities and functionings (Chapter 5, page 132). The focus is on what people are actually capable of doing, rather than the implied capabilities afforded them via income and/or consumption (Drèze and Sen, 1989: 42-45; Griffen and Knight, 1989: 9). In terms of the aim of the World Bank's living standard (LS) studies, it involves the measurement of the degree to which people's physical, social and mental needs are actually met (Sharif, 1986: 567). The concern, therefore, is with ends rather than means (Kallmann, 1997: 8). One can measure the presence (e.g. school enrolment) or absence (e.g. illiteracy) of a particular capability (Sugden, 1993: 1951-1954). Capabilities also range from rather elementary to extremely complex, e.g. being well-nourished and avoiding premature mortality versus having self-respect and participating in community life (Sen, 1992: 4-5). According to Ul Haq (1995: 4-6), the use of a comprehensive set of social indicators is one of the central elements of development planning. For the purpose of this thesis, therefore, social indicators are defined in the widest possible sense. Included here are all those indicators attempting to quantify the characteristics of both people and the environment in which they live (Drewnowski, 1966: 4-15). Social indicators include any 'statistic of direct normative interest which facilitates concise, comprehensive and balanced judgements about the condition of major aspects of a society' (Kallmann, 1997: 4).

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employed in selecting the variables and components included in composite indices (Chapter 7, page 221).

6.4 TECHNIQUE AND METHOD OF SOCIAL INDICATOR DEVELOPMENT

Social indicators are derived from data collected via a variety of surveys. These include surveys performed by international and regional agencies with specific data collection agendas as well as surveys performed by national data collection and administration agencies (Rao *et al.*, 1978: 83-84, 181-222). A survey on data collection activities conducted by the UN Statistics Division in 1995 reported a total of 312 collection activities conducted by international organisations (ECOSOC, 1999). Most significant of the sources of international social indicator data series are the World Bank's World Development Report and UNDP's Human Development Report. Since the indicators reported in these statistical compendiums are in most cases only a collection of indicators estimated at the national level, the predominant focus is on those social indicators reported in the above-mentioned and in other international publications.

Such indicators are essentially of three types (Drewnowski, 1966: 16-22). While some social phenomena are directly quantified, others either give one a choice of methodology or cannot be directly quantified and are assessed by using subjective techniques. So, for example, death rates can be calculated only by counting the number of deaths. Malnutrition can be assessed in terms of either daily calorie intake or body weight. Political freedom, furthermore, is usually assessed via observer ratings.

It is important to note that Table 6.1 (page 184) does not represent a definitive list of social indicators. Other social indicators do exist. These, however, are either reported only at the national level or for a small and insignificant sample of countries.

These indicators, furthermore, are listed here only in the particular format in which they are reported. Many of these indicators are not reported in that most common manner of expressing development indicators, i.e. per 1000 population. Other indicators, moreover, are not expressed in terms of annual rates of change. Yet, nothing suggests that these adjustments cannot be made so as to report these statistics in such format. This further highlights the necessity of emphasising that this list is not a definitive one and that alternative indicators can be derived by simply combining those listed here.

A typology of social domains is useful in presenting a summary of social indicators. The classification of development issues put forward by the UN's Commission on Sustainable Development (CSD) was used as a point of reference. Excluded from this framework, though, are those classes of measures covered in the preceding chapters, i.e. income and economic growth (Chapter 3), employment and labour utilisation (Chapter 4), and poverty and inequality (Chapter 5). The remaining classes of measures include indicators of demographic dynamics (A), education and training (B), health and nutrition (C), human settlement (D), the environment (G), and institutional framework (H) (CSD, 1996). Political and social stability (E) and culture, social fabric and family values (F) were added to the above six classes of indicators. The last four domains (E to H) were included insofar as social indicators are here interpreted as covering all the parameters within which societies and their citizens function (page 181).

Some indicators can be employed as proxies of domains of social development other than the domain they are directly related to. So, for example, life expectancy is often employed as proxy of, inter alia, the quality and availability of health care, population density as proxy of environmental impact, and vehicle ownership as proxy

of air and noise pollution in urban areas. To avoid the debate regarding the assumed association between these indicators, indicators were classified only in those categories to which they directly relate. A distinction is also drawn between stock, flow and ratio variables. 'Stock' variables refer to indicators measured at one particular point in time, 'flow' variables to indicators measured with reference to a particular time frame, and 'ratio' variables to indicators combining more than one stock and/or flow variable in measurement (Mohr *et al.*, 1988: 3).

Table 6.1: Classification and summary of 143 selected social indicators

Indicator	Description and Notes
A. Demographic Dynamics	
1. Population; in total (millions) and by age, gender and urban/rural residence (STOCK)	Population estimates are normally based on the de facto definition of population, i.e. all residents regardless of legal status or citizenship. Estimates are derived from national census data or sample surveys. Pre- and postcensus estimates are based on interpolations or projections (Estes, 1984: 173; World Bank, 1997: 250).
2. Average annual rate of population growth (percentage) (FLOW)	
3. Population doubling period (RATIO)	Years it will take for the current population to double in size at current population growth rates.
4. Population dependency ratio (RATIO)	Number of people aged under 15 and over 64 as percentage of the working-age population (UNDP, 1996: 220).
5. Youthfulness (RATIO)	Percentage of the population aged 14 years and younger.
6. Population density (RATIO)	Total number of inhabitants divided by the total surface area. Surface area includes land area and inland waters (World Bank, 1997: 250).
7. Crude birth rate (RATIO)	Annual number of births per 1000 population (UNDP, 1996: 219).
8. Total fertility rate (RATIO)	The average number of children born alive to a woman during her lifetime, if she were to bear children at each age in accordance with prevailing age-specific fertility rates (UNDP, 1996: 220).
9. Contraceptive prevalence rate (percentage) (RATIO)	The percentage of couples (either the wife, husband or both partners) practising any form of modern or traditional contraception (UNDP, 1996: 219).

Indicator	Description and Notes
10. Crude death rate (RATIO)	Annual number of deaths per 1000 population (UNDP, 1996: 219).
11. Average life expectancy at birth (years) (RATIO)[129]	The number of years a newborn infant would live if patterns of mortality prevailing at the time of birth were to prevail throughout the child's life (UNDP, 1996: 222).
12. Cause of death (FLOW)	The general typology of causes of death include natural (disease) and external causes, as well as accidents, poisoning and violence (Central Statistical Service, 1994: 3.27).
13. Number of people annually emigrating to and immigrating from a particular country (FLOW)	
14. Permanent immigrants; in total and by country of origin (STOCK)	Permanent immigrants are foreigners granted the right to permanently reside in the particular country (UNDESIPA, 1996: 213).
15. Foreign residents: in total and by country of nationality (STOCK)	
16. Number of refugees; in total and by country of asylum (STOCK)	Refugees are persons who, owing a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, are outside their country of nationality and are unable or, owing to such fear, unwilling to avail themselves of the protection of that country (UNDESIPA, 1996: 213).
17. Number of asylum-seekers (STOCK)	Asylum-seekers are foreigners filing a claim for asylum because of a well-founded fear of persecution (UNDESIPA, 1996: 213).
B. Education, Training and Knowledge	
1. Public expenditure on education; in total, by level of education and by purpose of expenditure (FLOW)	Includes all expenditure on the provision, management, inspection and support of all types of educational institutions and at all levels of education, as well as on general administration and subsidiary services (UNDP, 1996: 220).
2. Public expenditure on education; per capita or as percentage of GDP(GNP) and/or total government expenditure (RATIO)	
3. Pupil:teacher ratio (RATIO)	Number of enrolled pupils relative to number of trained educators (Estes, 1984: 169).

[129] Life expectancy is often adjusted in order to present composite measures reflecting the general quality of life. Silber's (1983, as quoted in Kallmann, 1997: 17) Equivalent Length of Life (ELL) sees life expectancy adjusted with the aid of Atkinson inequality indices, while the Happy-Life Expectancy Index (HLE) sees average life expectancy multiplied by an adjusted happiness index of the Cantril-type (section F, indicator 1) (Veenhoven, 1996b: 28-41). The Index of Potential Life-Time (PLT) reflects the 'length of life one has yet to live'. It can be applied at the individual, household, regional, national or global level. National Potential Life-Time = P.L.T, where P represents the total population, L life expectancy, and T the difference between life expectancy and average age of the population (Desai, 1989: 191-196). The Life Product (LPI) and Life Quality (LQI) Indices combine life expectancy with income per capita. $LPI = b^{w}.L$, where L represents life expectancy, b real GDP per person, and w the proportion of average life spent in economic activity. The estimate for w is based on the expected hours a person with average life expectancy will spend at work. In the case of North America, for example, w = 0.14 when assuming people work 50 out of 80 years, 48 out of 52 weeks, and 42 out of 168 hours available for work. Final index estimates are based on an assumed average w of 1/6 (Lind, 1993: 267-277). LQI differs from LPI in that the index allows for the relative importance of leisure and work in quality-of-life. $LQI = b^{w}.L^{(1-w)}$ (Lind *et al.*, 1992, as quoted in Pandey and Nathwani, 1997: 192).

Indicator	Description and Notes
4. Enrolment at primary (first), secondary (second) and tertiary (third) levels of education; either in rates (RATIO) or disaggregated by type of institution (STOCK)	Gross enrolment rates represent the number of pupils enrolled as percentage of the population aged 6-11 years (primary), aged 12-17 years (secondary), and aged 20-24 years (tertiary) (World Bank, 1997: 255). Gross rates include pupils regardless of whether they belong to the particular age group or not. Gross rates, therefore, can exceed 100. Net enrolment rates, though, only take into account those pupils falling into the specific age group (UNDP, 1996: 220).
5. School life expectancy; in total and by gender (RATIO)	Number of years of formal schooling children can expect to receive, assuming that the probability of them being enrolled in school in future is equal to current enrolment rates, including years spent repeating one or more grades (UNESCO, 1998).
6. Percentage of cohorts reaching grade four (RATIO)	The proportion of children succeeding in completing grade four in the four years since starting their primary school education (World Bank, 1997: 255). Grade four is employed as reference because pupils at this stage are supposed to have acquired basic literacy and numeracy skills.
7. Illiteracy rate (RATIO)	The percentage of the population aged 15 years and older who cannot with understanding read and write a short simple statement on their everyday life. Estimates are often based on self-reported data or derived from figures on school attendance up to grade four level (refer indicator 6 above) (World Bank, 1997: 251).
8. Percentage of students enrolled in particular faculties (RATIO)	
9. Students (tertiary) per 100 000 population (RATIO)	
10. Number of teachers, students and graduates; in total and by type of institution and field of study (STOCK)	
11. Number of foreign students enrolled; in total and by country of origin (STOCK)	
12. Daily newspapers; number of publications (STOCK) and total circulation (FLOW)	
13. Total production and consumption of newsprint (FLOW)	
14. Periodicals; number of publications (STOCK) and total circulation (FLOW)	
15. Book production; titles and copies in total and by classification (FLOW)	
16. Total production and consumption of printing and writing paper other than for newspapers (FLOW)	
17. Imports and exports of reading matter, i.e. books, pamphlets, newspapers and periodicals (FLOW)	
18. Number of libraries; in total and by classification (STOCK)	
19. Number of library users; in total and by class of library (STOCK/FLOW)	UNESCO (1997) also reports the annual additions to and total size of the collections of libraries.

Indicator	Description and Notes
20. Number of scientists, engineers and technicians engaged in research; in total and by sector and category of personnel (STOCK)	
21. Scientists and technicians per 100 000 population (RATIO)	Scientists refer to scientists and engineers with tertiary scientific and technological training in any field of science and who are engaged in professional work in R&D activities. Technicians refer to persons engaged in scientific R&D activities who have received vocational or technical training for at least three years after the first stage of secondary education (UNDP, 1996: 224).
22. Patents granted per 1000 of the labour force (RATIO)	
C. Health, Food and Nutrition	
1. Public expenditure on health, per capita or as percentage of GDP(GNP) and/or total government expenditure (RATIO)	Includes current and capital expenditure of all government offices, departments, establishments and other bodies involved in health care, including medical insurance schemes and family planning (UNDP, 1996: 221).
2. Percentage of health bills paid by public insurance (RATIO)	
3. Public expenditure on social security and welfare; per capita or as percentage of GDP(GNP) and/or total government expenditure (RATIO)[130]	
4. Physician:population ratio (RATIO)	Physicians include graduates from all medical fields of study regardless of whether they are involved in the practice, teaching, administration or research of medicine (UNDP, 1996: 220).
5. Nurse:population ratio (RATIO)	Nurses include all persons who have completed a programme of basic nursing education and are qualified and registered or authorised by the country to provide responsible and competent service for the promotion of health, prevention of illness, care of the sick and rehabilitation (UNDP, 1996: 222).
6. Hospital beds; per 1000 population or occupancy rate (RATIO)	
7. Percentage of population with access to health care (RATIO)	Refers to people who can reach appropriate local health services on foot or by local means of transport in no more than one hour (UNDP, 1996: 221). Treatment is confined to that of common diseases and injuries, including essential drugs on the national list (World Bank, 1997: 254).
8. Infant mortality rate per 1000 live births (RATIO)	Number of infants annually dying before reaching age one (UNDP, 1996: 221).
9. Percentage of one-year-olds fully immunised against tuberculosis, measles, polio and DPT (RATIO)	Immunisation is interpreted relative to the immunisation schedules put forward in the Universal Child Immunisation Programme (UNDP, 1996: 221).
10. Percentage of children dying before age five (RATIO)	Average number of children annually dying before reaching age five over the last five years (UNDP, 1996: 224).

[130] Expenditure on social security and welfare is listed here insofar as it can be assumed that these transfer payments are spent primarily on health care and food.

Indicator	Description and Notes
11. Oral rehydration use rate (RATIO)	Percentage of all cases of diarrhoea in children under age five treated with oral rehydration salts or an appropriate household solution (UNDP, 1996: 222).
12. Percentage of pregnant women aged 15-49 with anaemia (RATIO)	
13. Maternal mortality rate per 100 000 live births (RATIO)	Number of women annually dying from pregnancy-related causes (UNDP, 1996: 222).
14. Percentage of births attended by trained health personnel (RATIO)	Trained personnel include physicians, nurses, midwives, primary health care workers, and traditional birth attendants (UNDP, 1996: 219).
15. Percentage of low-birth-weight infants (RATIO)	Low-birth-weight infants are infants weighing less than 2 500 grams at birth (UNDP, 1996: 222).
16. Percentage of mothers breastfeeding at six months (RATIO)	
17. Percentage of adults smoking (RATIO)	
18. Alcohol consumption per capita (RATIO)	Derived from sales data for beer, wine and spirits. The sales of each commodity is converted to absolute alcohol based on its alcohol content and then divided by the population (UNDP, 1996: 219).
19. Likelihood of dying after age 65 of cancer or heart disease (RATIO)	
20. Potential years of life lost (PYLL) (RATIO)	The sum of years that persons dying from a particular cause or disease would have lived had they experienced normal life expectancy. So, for example, a person dying from cancer at age 23 represents 47 years of life lost where the average life expectancy is 70 years (Nova Scotia Vital Statistics, 1997; Australian Bureau of Statistics, 1998).
21. Disease incidence, e.g. reported cases of AIDS and malaria per 100 000 people (RATIO)	
22. Percentage of total population suffering from disabilities (RATIO)	
23. Food production per capita index (RATIO)	The average annual quantity of food produced per capita in relation to that produced in the indexed year. Food is defined as comprising nuts, pulses, fruit, cereals, vegetables, sugar cane, sugar beets, starchy roots, edible oils, livestock and livestock products (UNDP, 1996: 221).
24. Food consumption as percentage of total household consumption (RATIO)	Derived from data presented in the UN's System of National Accounts (SNA), the International Comparison Programme's (ICP) Phase IV (UNDP, 1996: 220), or general household surveys[131].
25. Food imports as percentage of total merchandise imports (RATIO)	

[131] So, for example, Engel-ratios can be derived from household survey data. These ratios reflect the proportion of total income or expenditure that households at different levels of income spend on food (Estrin and Laidler, 1995: 20-21).

Indicator	Description and Notes
26. Metric tons of cereal imported and received as food aid (FLOW)	Cereals include all foodstuffs listed as such in the Standard International Trade Classification (SITC), e.g. wheat, rice and maize. Food aid represents cereal received by donor countries and international donor organisations (UNDP, 1996: 219-220).
27. Daily calorie supply: in total calories (FLOW) or as percentage of daily requirements (RATIO)	The calorie equivalent of the net food supplies in a country, divided by the population, per day (UNDP, 1996: 220). Daily calorie requirements are set by the World Health Organisation (WHO).
28. Percentage of children under age five suffering from malnutrition (RATIO)	Children who in weight are two standard deviations below the median birth-weight-for-age of the reference population (UNDP, 1996: 224).
D. Human Settlement, Infrastructure and Communication	
1. Urbanisation level (RATIO)	Percentage of total population living in urban areas. Urban population refers to that proportion of the midyear population residing in areas defined as urban in each country (World Bank, 1997: 256).
2. Rate of urbanisation (percentage growth) (FLOW)	Rate at which urban population increases from one year to the next.
3. Population living in cities with more than 100 000 (or one million) inhabitants: in total (STOCK) and as percentage of the total and/or urban population (RATIO)	
4. Average number of rooms per dwelling (RATIO)	
5. Average number of persons per room of dwellings (RATIO)	
6. Percentage of housing units with piped water (RATIO)	
7. Percentage of housing units with electricity (RATIO)	
8. Percentage of people with access to sanitation (RATIO)	People with reasonable access to sanitary means of excreta and waste disposal, including outdoor latrines and composting (UNDP, 1996: 223).
9. Percentage of people with access to safe water (RATIO)	People with reasonable access to a supply of safe water, including treated surface water and untreated but uncontaminated water such as that from springs, sanitary wells and protected boreholes (UNDP, 1996: 223). 'Reasonable' access in urban and rural areas respectively refers to a public fountain or water spigot being within 200 metres of the household as opposed to not having to spend excessive time each day in fetching water (World Bank, 1993: 15).
10. Railways and (paved) roads: total length (STOCK), length per capita and density (RATIO)	
11. Paved roads as percentage of total roads (RATIO)	
12. Number of motor vehicles: in total (STOCK) or per 1000 population and/or road length (RATIO)	A further distinction is often drawn between passenger as opposed to commercial vehicles.
13. Injuries and deaths from road accidents: per 100 000 population or one million kilometres travelled (RATIO)	

Indicator	Description and Notes
14. Telephones; total number, length of lines (STOCK) and lines per capita (or per 1000 population) (RATIO)	
15. International telephone calls in minutes per capita (RATIO)	
16. Mobile cellular telephone subscribers per 100 population (RATIO)[132]	
17. Number of radio receivers; in total (STOCK) and per 1000 population (RATIO)	
18. Number of television receivers; in total (STOCK) and per 1000 population (RATIO)	
19. Post offices per 100 000 population (RATIO)	
20. Fax machines per 100 population (RATIO)[132]	
E. Political and Social Stability	
1. Police force; total members (STOCK) or population per police officer (RATIO)	
2. Public expenditure on policing; per capita or as percentage of GDP (GNP) and/or total government expenditure (RATIO)	
3. Number of crimes reported; in total and by type of crime and/or geographic area (FLOW)	The general criminal classification distinguishes between theft, assault, robbery, drug crimes, fraud, embezzlement, homicide, rape, bribery, burglary and other types of crime (UN, 1994a: 10-11).
4. Incidence of crime; in total (e.g. total reports of crime per 100 000 population) and/or by type of crime (e.g. reported homicides per 100 000 population) (RATIO)	
5. Number of suspects arrested, prosecuted and convicted (FLOW)	The efficiency of the judicial system is often measured by determining what percentage of arrested suspects are actually prosecuted and convicted.
6. Length and nature of sentences handed down (FLOW)	
7. Annual number of prison admissions (FLOW)	
8. Prison population per 100 000 population (RATIO)	
9. Prison staff relative to prison population (RATIO)	
10. Military forces; number of permanent, reservist and/or paramilitary members (STOCK)	
11. Soldier:civilian ratio (RATIO)	
12. Public expenditure on defence; per capita or as percentage of GDP (GNP) and/or total government expenditure (RATIO)	Includes all expenditure, whether by defence or other state departments, on the maintenance of military forces, including the purchase of military supplies and equipment, construction, recruitment, training and military aid programmes (UNDP, 1996: 220).

[132] Unlike most other social indicators, these two statistics are reported per 100 rather than per 1000 or 100 000 population. The indicators are reported in this specific format in the UNDP's annual Human Development Report. No particular reason is offered why it is not expressed in the same format as other social indicators.

Indicator	Description and Notes
13. Defence expenditure as percentage of combined expenditure on education and health (RATIO)	
14. Number of political strikes (FLOW)[133]	Political strikes are work stoppages by industrial or service workers or a stoppage of normal academic life by students to protest against a regime and its leaders' policies or actions (Taylor and Jodice, 1983: 21).
15. Number of political demonstrations in support of or in protest against the ruling regime (FLOW)[133]	Demonstrations are organised, nonviolent gatherings of people for the purpose of protesting against or lending support to government, its leaders and/or policies (Taylor and Jodice, 1983: 19-21).
16. Number of riots (FLOW)[133]	Riots are large, unorganised and violent demonstrations. Property destruction is an essential component of the observed behaviour (Taylor and Jodice, 1983: 29).
17. Number of armed attacks (FLOW)[133]	Armed attacks are acts of violent political conflict carried out by (or on behalf of) an organised group with the object of weakening or destroying the power exercised by another organised group, e.g. political parties, ethnic minorities and the state itself. They are characterised by bloodshed, physical struggle and the destruction of property (Taylor and Jodice, 1983: 29).
18. Number of political assassinations (FLOW)[133]	Political assassinations represent politically motivated murders of national leaders, high ranking government officials, or politicians (Taylor and Jodice, 1983: 43).
19. Number of political executions (FLOW)[133]	Political executions are events in which a person or persons are put to death under orders of the national authority, thus excluding people killed in political assassinations, armed attacks and riots (Taylor and Jodice, 1983: 63).

[133] The World Handbook of Political and Social Indicators annually reports in excess of 136 national data series on indicators 14 to 21 in section E and indicators 5 to 7 in section H. Trained observers are employed to code observations in each country as acts of political protest, state coercive behaviour, governmental change and national elections. These events exclude criminal and economic activities of a similar nature, e.g. deaths resulting from criminal actions and labour union strikes (Taylor and Jodice, 1983: 1-15). A number of composite indices of political instability have been derived from these variables reported in the World Handbook of Political and Social Indicators. The following are but four examples of these efforts. Hibbs (1973) developed two indices, each based on three variables. His index of collective protest includes the number of political riots, anti-government demonstrations and political strikes, while his index of internal revolution includes the number of political assassinations, armed political attacks and deaths from political violence (Hibbs, 1973: 7-17). Venieris and Gupta's (1986) Index of Sociopolitical Instability (SPI) are based on observations regarding protest demonstrations, deaths from domestic political violence, and regime type. Gupta's (1990) Index of Political Instability (PIQ) includes ten variables. In addition to the six variables employed by Hibbs (1973), he includes the number of political executions, attempted and successful coups, and a dummy variable representing the political legitimacy of government. Alesina and Perotti's (1996) Index of Sociopolitical Instability includes five variables, i.e. the number of assassinations, deaths from domestic political violence, successful coups, unsuccessful coup attempts, and nature of the political system. Venieris and Gupta (1986) and Gupta (1990) employ discriminant analysis, while Hibbs (1973) and Alesina and Perotti (1996) both use principal component analysis in estimating their indices.

Indicator	Description and Notes
20. Number of deaths resulting from domestic political violence (FLOW)[133]	Includes national casualties incurred during riots, armed attacks, political assassinations, and foreign interventions. It excludes deaths resulting from political executions and homicides, and deaths in enemy prisons, international wars, and border incidents (Taylor and Jodice, 1983: 43).
21. Number of impositions and relaxations of government sanctions (FLOW)[133]	Government sanctions are actions taken by authorities to neutralise, suppress, or eliminate a perceived threat to the security of the government, the regime, or the state itself (Taylor and Jodice, 1983: 62). So, for example, the South African government during the 1970s and 1980s on numerous occasions declared a state of emergency as a result of perceived threats to national security.
F. Culture, Social Fabric and Family Values	
1. Happiness Indices	Indices representing people's satisfaction with life in general or with specific life domains, e.g. work and family life. Scores are expressed using ordinal response scales, e.g rating happiness on a scale of zero ('worst possible life') to ten ('best possible life'), and are based on respondents' answers to particular survey questions, e.g. 'Where on the ladder would you place your current life?' (Easterlin, 1974: 90-99; Beckie and Hayduk, 1997: 21-39)[134].
2. Maximum percentage of the total population sharing a specific language and/or religion ('homogeneity index') (RATIO)	
3. Individualism-collectivism-scales (STOCK)	Countries were ranked on a scale of 1 (most collectivist) to 10 (most individualistic) by Triandis, a leading expert in the field (Schyns, 1998: 13).

[134] Happiness indices, also known as indices of subjective well-being, come in a variety of forms. Probably best known is Cantril's Self-Anchoring Striving Scale (SASS), which is described in the note to indicator 1. The Gallup poll happiness item asks respondents to rate themselves as very happy (1), fairly happy (2) or not very happy (3) (Easterlin, 1974: 90-99). It represents one of the earliest attempts at indexing happiness and was included in the worldwide Gallup International surveys of 1960 and 1975 (Veenhoven, 1996b: 53). Other examples of subjective well-being scales include the Diener *et al.* (1985) Satisfaction with Life Scale (SWLS), the Collective Life Satisfaction Scale (CLSS), both with five items scaled 1-7, the single item 1-7 scaled Satisfaction with Life Scale (SL), and the Mood Adjusted or Affect Balance Scales which combines the frequency of positive and negative emotions during the month preceding the interview (Diener *et al.*, 1995: 16-17). For more examples of happiness indices, see Beckie and Hayduk (1997: 21-39). Respondents can be asked to evaluate their well-being relative to their perception of the level of happiness enjoyed by others (social comparison), relative to their own experiences (life-time comparison), relative to those notions of life folklore is based on, or relative to certain objective standards of quality of life (Veenhoven, 1995: 34-36). These surveys, although inherently similar in terms of methodological construct, often draw a semantic distinction between 'happiness' and 'satisfaction'. Campbell *et al.* (1976: 5-18), for example, prefers 'satisfaction' to 'happiness' since it is easier to define than the perceived discrepancy between aspiration and achievement, is more relevant to public policy, and can be related to various life domains. Happiness indices aggregated across different life domains represent a kind of composite index of happiness. Cantril (1965, as quoted in Easterlin, 1974), for example, measures subjective well-being across nine different life domains, while Diener *et al.* (1993) employ twelve. These domains include transportation, housing, recreation, employment, health, finances, marriage partner, education, friends, family, religion, self-esteem, social values, status quo, political hopes and the international situation (Cantril, 1965, as quoted in Easterlin, 1974: 90-99; Diener *et al.*, 1993: 212-214).

Indicator	Description and Notes
4. Museums; in total and by subject of collection, attendance, receipts, personnel and current budget (STOCK)	
5. Annual movie and theatre attendance (FLOW)	
6. Suicides per 100 000 population (RATIO)	
7. Marriages; annual number (FLOW) and rate (RATIO)	Marriage rates represent the average annual number of marriages per 1000 marriageable males and females enumerated. Estimates only include legally performed and registered marriages (UN, 1997: 573).
8. Divorces; annual number (FLOW) and rate (RATIO)	Divorce rates represent the average annual number of divorces per 1000 population or per 1000 married couples. Divorces only include final divorce decrees granted under civil law and exclude annulments and legal separations (UN, 1997: 573).
9. Number of legally induced abortions (FLOW)	
G. Environmental Resources and Pressures	
1. Average annual rainfall (mm) and temperature (°C) ('climatic conditions') (FLOW)	
2. Water stress index; in cubic metres of internal renewable water per capita (RATIO)[135]	Estimates are interpreted relative to a standard of 1000 cubic metres per capita. Below this benchmark countries are considered likely to experience water scarcity on a scale sufficient to impede development and harm human health (WRI, 1996: 21).
3. Annual freshwater withdrawals; in total (FLOW) and cubic metres per capita and as percentage of total water resources (RATIO)	These include withdrawals from nonrenewable aquifers and desalting plants but not losses from evaporation (UNDP, 1996: 224).
4. Rates of depletion of renewable and nonrenewable resources such as minerals, forests, wetlands and prime agricultural land (RATIO)[136]	World Reserves Life Indices (WRLIs) are often employed in reporting on the depletion of nonrenewable resources. Index values reflect the time it will take for nonrenewable resources to run out, given existing reserves and the annual rate of consumption. Indices are calculated by dividing the reserves of the particular resource by the annual consumption thereof (Thiessen, 1997: 149-160). In the case of renewable resources, water used, for example, is expressed as percentage of the natural supply of water by rain, snow and cross-border rivers (UNDP, 1996: 224).

[135] Internal renewable water resources refer to the 'average annual flow of rivers and groundwater generated from endogenous precipitation', including river flows from other countries (WRI, 1996: 307, 312).

[136] Renewable resources refer to resources that can be replaced or replenished, either by natural processes or human action. Air, water and forests are examples of renewable resources and minerals and fossil fuels are examples of nonrenewable resources (World Bank, 1993: 17).

Indicator	Description and Notes
5. Deforestation in thousand square kilometres (or hectares) and average annual percentage change (FLOW)	Deforestation refers to the permanent clearing of forests and woodlands for shifting cultivation, permanent agriculture and settlements, excluding selective logging (UNDP, 1996: 220). Change in forest area represents the annual increase or decrease in forests and woodlands as percentage of that area at the start of the period (World Bank, 1993: 4).
6. Average annual extent of reforestation (hectares) (FLOW)	Reforestation refers to the establishment of plantations for industrial and non-industrial use. It generally excludes activities aimed at the regeneration of old tree crops (UNDP, 1996: 223).
7. Carbon dioxide (CO_2) emissions; in million metric tons (FLOW) and metric tons per capita (RATIO)	This includes only human-originated CO_2 emissions from energy use. It also includes oil held in international marine bunkers and peat but excludes the use of biomass fuels (World Bank, 1993: 8; UNDP, 1996: 219).
8. Methane emissions (metric tons); in total and by source (FLOW)	This includes only emissions caused or produced by human activity, e.g. coal mining, oil and gas production, and wet rice agriculture (WRI, 1996: 328-329).
9. Greenhouse index in metric tons of carbon per capita (RATIO)	Includes net emissions of the three main greenhouse gases, i.e. CO_2, methane and chlorofluorocarbons (CFCs). Each gas is weighted according to its heat-trapping quality and expressed in CO_2 equivalents (UNDP, 1996: 221)[137].
10. Suspended particular matter (SPM); average micrograms per cubic metre of air and average annual growth rate (percentage) (RATIO)	SPM represents smoke, soot, dust, and liquid droplets from fuel combustion that are in the air (World Bank, 1993: 6,14).
11. Percentage of paper and other materials recycled (RATIO)	Recycling rates are estimated by dividing the quantity of material recycled by the estimated consumption of the particular type of material (UNDP, 1996: 224).
12. Municipal waste in kilogrammes per capita (RATIO)	Includes all waste collected by municipalities or by their order, regardless of source (UNDP, 1996: 222).
13. Number of total, endemic and endangered mammal, bird, higher plant, reptile, amphibian, and freshwater and coastal fish species ('biodiversity') (STOCK)	Total, endemic and endangered species respectively include species introduced to countries or which are endemic to more than one country, ones known to be found only within the particular country, and species 'in danger of extinction and whose survival is unlikely if causal factors continue operating' (WRI, 1996: 270)[138].

[137] CO_2 equivalents are also called Global Warming Potentials (GWPs) in environmental terminology. GWPs reflect the 'CO_2 concentration that would have had about the same effect on the radiating properties of the atmosphere as a particular concentration of another greenhouse gas' (De Haan and Keuning, 1996: 139).

[138] Other classifications employed in categorising species include vulnerable, rare, indeterminate, out of danger and insufficiently known (WRI, 1996: 270).

Indicator	Description and Notes
14. Protected areas; in total number, size, by type (STOCK) and as percentage of total land area (RATIO)	Nationally protected areas refer to areas of at least 1000 hectares that are categorised as (i) scientific and strict nature reserves, (ii) national parks of national or international significance not materially affected by human activity, (iii) natural monuments and landscapes with some unique aspects, (iv) managed nature reserves and wildlife sanctuaries, or (v) protected landscapes or seascapes (which may include cultural landscapes). Sites protected under local or provincial law are excluded because the indicator refers only to nationally protected areas. Areas where consumptive uses of wildlife are allowed are also excluded (World Bank, 1997: 257).
15. Number and size (hectares) of world heritage sites (STOCK)	World heritage sites represent areas of 'outstanding universal value', be it of natural or mixed natural and cultural value[139]. Natural sites include examples of a major stage of Earth's evolutionary history, a significant ongoing geological process, a unique or superlative natural phenomenon, formation or feature, or a habitat for a threatened species (WRI, 1996: 270).
16. Number of major natural disaster impacts (FLOW)	Major disasters are natural events which cause damage of at least $1 million, or the death and/or injury of at least 100 people (Estes, 1984: 174).
17. Loss of life from natural disasters per million population (RATIO)	
18. Number of major environmental treaties signed (STOCK)	Response of countries to twelve global environmental conventions promulgated between 1963 and 1989. Contracting countries score 1 and others zero (Dietz and Kalof, 1992: 355)[140]
H. Political and Civil Institutions	
1. Ratings on political rights, civil liberties and political freedom (RATIO)[141]	Ratings on political rights and civil liberties range from 1 (most free) to 7 (least free). Freedom ratings are derived from the average of these two ratings. Nations are rated as not free (5.5-7), partly free (3-5.5) or free (1-2.5) (Gastil, 1981; McColm, 1993).

[139] Although the annual World Resources publication of the World Resources Institute lists only sites of mixed natural and cultural value, the number and size of cultural heritage sites may be included as a cultural indicator in section E of this table.

[140] Contracting countries refer to nations who have ratified treaties, i.e. who have signed the treaty and taken further political action to implement it. The twelve treaties include those on nuclear tests (1963), wetlands (1971), biological and toxic weapons (1972), world cultural and natural heritage (1972), ocean dumping (1972), endangered species (1973), ship pollution (1978), migratory species (1979), law of the sea (1982), ozone layer (1985), CFC control (1987), and hazardous waste (1989) (Dietz and Kalof, 1992: 355).

[141] Freedom House has since 1981 annually reported these ratings. Ratings are based on specific checklists of issues according to which points are allocated (Gastil, 1981; McColm, 1993). Ul Haq's (1995) Political Freedom Index (PFI) represents yet another example of a composite index of political development. It draws the net wider than other such indices (footnote 133, page 191) insofar as it includes political variables from a much wider range of sources, e.g. Amnesty International, Freedom House and the Human Rights Watch. The PFI consists of four component indices, i.e. political participation, rule of law, freedom of expression and non-discrimination. Each domain is weighted equally in the composite index. Countries are ranked relative to zero (most free) and 100 (not free) and index values are reported for 104 nations (Ul Haq, 1995: 67).

Indicator	Description and Notes
2. Status of selected international human rights instruments (STOCK)	Reports to what extent individual countries are party to international conventions regarding human rights issues such as the elimination of racial discrimination, the prevention and punishment of crimes of genocide, the rights of the child, the elimination of discrimination against women, and the status of refugees (UNDP, 1996: 214-216).
3. Number of years since independence and/or most recent constitution ('age of nation') (FLOW)	
4. Number of years since specific legislation was introduced (FLOW)	
5. Incidence and frequency of national elections (FLOW)	Includes elections to national legislatures, elections of national chief executives, and national referenda (Taylor and Jodice, 1983: 80).
6. Number of executive adjustments (FLOW)	Executive adjustments refer to changes in the composition of governmental leadership, e.g. cabinet coalition shifts and cabinet reshufflings (Taylor and Jodice, 1983: 88).
7. Number of unsuccessful and successful regular and irregular transfers of executives (FLOW)	Executives refer to individuals in leadership positions, such as presidents, prime ministers, monarchs, and party chiefs in single-party states, as well as collegial executive bodies, such as cabinets. Regular transfers refer to transfers of executive power not accompanied by violence or by physical coercion and conforming to conventional procedures. Irregular transfers are accompanied by violence or threats of violence and are accomplished outside conventional procedures. Successful transfers refer to cases where executive power is actually transferred through either regular or irregular means, while unsuccessful transfers refer to abortive attempts at either regular or irregular transfers of power (Taylor and Jodice, 1983: 85-100).
8. Women as percentage of people in government; in total and at ministerial and subministerial levels (RATIO)	Generally reported by the UN's Division for the Advancement of Women, estimates include elected heads of state and central bank governors (UNDP, 1996: 157).

Other sources: Bennett (1951), Harbison and Myers (1964: 23-34), Ahluwalia (1976), Hicks and Streeten (1979), Wilson and Woods (1982: 15-37), Estes (1984: 169-179), Ginsberg, Osborn and Blank (1986: 60-65), Barro (1991: 432), Green Indicators (1991: 48), Kurian (1991), Slottje (1991), Tholba and El-Kholy (1992: 646), Glanz and Smit (1995: 55-59), Alesina and Perotti (1996: 1207), International Institute for Security Studies (1996: 264-269), World Economic Forum (1996), Mainardi (1997: 22), and UNESCO (1997/98).

This myriad of social indicators has led some writers to criticise social indicators for failing to reflect some aggregate of development (Stewart, 1985: 54-

66). This, however, was never their intention. The idea, rather, was to develop specific indicators which could complement income-based measures of development (Diener and Suh, 1997: 192-200).

Another criticism Stewart (1985: 54-66) levels at social indicators is that they are often highly correlated. There are, however, good reasons for continuing with a variety of different but highly correlated indicators. Social needs are often met via different modes or manifested in different ways as a result of differences in, amongst other things, consumer preferences, purchasing power and location (Wish, 1986: 93-97). Transportation and health care are good examples. The former is very much dependent on purchasing power and geographical limitations, while the latter is manifested in various ways in urban as opposed to rural areas (Perthel, 1981: 44-46). In this sense, it is imperative that one employ a variety of social indicators in assessing levels of development in diverse settings.

Yet another reason for employing a variety of social indicators is that measures of capability need to be distinguished from measures of efforts at providing the means for satisfying these needs. Examples of measures of the latter type include indicators of the extent of public expenditure and service delivery, and commitment of governments to certain policy issues (e.g. ratification of international treaties). In some instances, though, this distinction is not that clear. Daily calorie intake, for example, is often considered an indicator of capability. Upon closer inspection it becomes evident that the indicator is calculated by determining the calorie equivalent of net food supplies rather than by determining the calories consumed, i.e. actual levels of food consumption (indicator C27, page 189). Thus, it remains an indicator of provision of means rather than of actual capability (Anand and Ravallion, 1993: 136-138). This type of measure needs to be interpreted in conjunction with capability

measures in order to establish whether the provision of food supplies actually curbs malnutrition.

The interpretive value of social indicators expressed in population ratios is often questioned. Examples of such indicators include the number of newspapers and television and radio receivers per 1000 of the population (Table 6.1, page 184). Dividing the total available number of certain goods and services by thousands of total population affords analysts the opportunity to meaningfully compare the availability of these goods and services across space and time. It is for this reason that indicators reported in this format are so popular in composite indexing (McGranahan, 1995: 39). However, for the resulting indicators to reflect differences in the availability of particular goods and services accurately, the denominator should include only those persons with a real need for the particular good or service. So, for example, statistics on radio receivers and telephones per 1000 of the population ignore the fact that small children cannot and do not read newspapers or use telephones (McGranahan *et al.*, 1972: 20). As a result, the actual availability of radio receivers and newspapers will be underestimated in developing countries where a substantial number of the population are children. Another option for standardisation which introduces similar bias in indicators is that of expressing indicators in some geographic unit, e.g. road lengths per square kilometre. These indicators conceal disparities in suburban, city-centre and rural indicator levels. Hence, care needs to be taken in evaluating the actual comparability of social indicators reported as ratios.

Since most of these social indicators are gathered with the aid of surveys or censuses, the general criticisms levelled at survey data are again equally relevant. The comparability and reliability of estimates are dependent on the quality of statistical systems, and the nature of concepts and methodologies employed in

estimation (UNDP, 1996; World Bank, 1997). The accuracy of estimates is also dependent on the nature of the original data and the processing of survey data (Morgenstern, 1950: 3-8). Inconsistencies in data collection and processing techniques are equally important sources of conceptual and methodological bias.

Error during data collection may result from reporting and representation bias. Causes of such bias include misunderstanding, mistrust and/or deliberate intent on the part of respondents, interviewers or observers, coupled with the fact that certain observations can be made only at specific points in time. The misunderstanding which results in reporting and representation bias often emanates from poor and inadequate training of interviewers and observers. Other sources of measurement error include the imprecise and changing conceptualisations of measurement constructs, and poor survey design, which has become especially problematic as the number of questions included in questionnaires has increased (Morgenstern, 1950: 8-41; Diener and Suh, 1997: 192-200). Certain social indicators are especially dependent on statistics collated by specific government departments, e.g. teacher-pupil ratios, the number of hospital beds, and size of military forces (Srinivasan, 1994a: 3-5; World Bank, 1997: 254-257). Given disparities with regard to the quality of statistical and administrative systems, the quality of these indicators is often compromised.

Data processing sees error introduced as a result of (i) human and/or machine error during data processing, e.g. misreading and misprints of data, (ii) in the case of indicators derived from other variables, the mathematical complication of results, (iii) numerical effects resulting from the rounding of variables, and (iv) the further amplification of data collection error during successive rounds of data processing (Morgenstern, 1950: 8-41). Other sources of procedural bias include the use of

outdated estimation techniques and survey designs in estimating indicator values (UNDP, 1996: 130-132). Certain social indicators, furthermore, are based on an extrapolation of data from one or more survey estimates (Hilhorst, 1985: 10-11). The concepts and methodologies employed in these survey estimates may differ, thereby introducing bias in such estimates.

Thus, observed differences in indicators may be attributable to conceptual and methodological inconsistencies rather than to actual disparities in the particular phenomena (Stewart, 1985: 54-66). Beckerman and Bacon (1966: 521-529) and Wilson and Woods (1982: 14) draw similar conclusions, especially with regard to the quality of social indicator databases of LDCs. These disparities are evident when perusing the magnitude of footnotes and technical notes employed in the World Development and Human Development Reports when reporting on social indicators (UNDP, 1996; World Bank, 1997). Both reports stress the considerable effort made at standardisation. So, for example, data are selected from those sources perceived to be the most authoritative. Both reports, however, conclude that full comparability cannot be ensured and that care needs to be taken in interpreting indicators (UNDP, 1996: 130; World Bank, 1997: 249). Social indicators, in fact, always need to be checked for comparability in terms of the concepts, formulae and techniques employed in estimation (Srinivasan, 1994a: 23; McGranahan, 1995: 54-55; Veenhoven, 1996b: 16)[142]. The purpose of both these reports is described as reporting the major trends in indicators and differences between countries with regard to a variety of social and economic aspects of development rather than the precise quantitative assessment of these phenomena (UNDP, 1996: 130; World Bank, 1997:

[142] A reconciliation of data can also contribute to data comparability. If and where possible, estimates from different sources can be adjusted after cross-checking for differences in concepts, coverage and periodicity. Reconciliation, though, is of limited value insofar as even reconciled data may remain

249). Srinivasan (1994a: 3-5), however, is not satisfied with this general statement and calls for a complete disclosure of the underlying deficiencies of indicators. Consequently, we turn to criticisms levelled at particular classes of social indicators. Most of these are but examples of the types of criticism related above.

Firstly, in terms of demographic indicators, the reliability of population data is especially important. Various social indicators are either derived from demographic data (e.g. life expectancy) or expressed in population ratios (e.g. radio receivers per 1000 population) (Srinivasan, 1994a: 16-21). According to Srinivasan (1994a), the published data on population size, growth, fertility and mortality are seriously deficient. He cited Chamie's (1994) report on the quality of population census data for developing countries. Of a total of 180 LDCs, seven nations had performed no population census whilst twenty-two nations' last population census pre-dated 1975 when Chamie wrote in 1994. Post-1980 data for the estimation of life expectancy were not available for eighty-seven out of 117 LDCs. Thus, the United Nations Population Division (1994) emphasises the need for continued improvements in the collection and standardisation of demographic data. Improvements are to be achieved through the training of specialists adept at collecting, processing and analysing population data, through increased cooperation and through the sharing of technical expertise (UNDESIPA, 1994: 11)[143].

Critique of a more conceptual nature is often levelled at life expectancy. Differences in life expectancy need to be interpreted in the context of differences in

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suspect. Close agreement cannot guarantee the absence of bias just as divergence is no proof of bias (Srinivasan, 1994a: 23).

[143] The UN regularly performs surveys aimed at inquiring from countries how they see the role of international cooperation in population research. The sixth UN Population Inquiry was performed in 1988. Of the seventy-nine developing countries that responded, the majority reported that technical cooperation makes a significant contribution to progress in population research. Computer equipment and training were identified as the needs with the highest priority. The need for consultants and resident experts remained important but declined in importance in comparison with previous surveys of this nature (Baldwin, 1991: 89).

genetics and lifestyle (Lind, 1992: 94). Aggregate life expectancy also hides substantial gender differences (Lind, 1992: 94). Suppose, for example, that two countries both have an aggregate life expectancy of seventy years. It could be that the range of male-female life expectancy differs considerably between the two nations, e.g. seventy-two to sixty-eight years for country A and seventy-nine to sixty-four years for country B. Thus, life expectancy can be reported in gender-specific ranges rather than single estimates. This perhaps allows for a more meaningful comparison of life expectancy. Hence Stewart's (1985: 54-66) call for life expectancy to be expressed in a range of years rather than a single figure, is not unreasonable. Life expectancy, furthermore, does not really tell one much about the quality of that life. Yet, it is often employed as general proxy for a relatively healthy, educated and safe life. So, for example, a long life characterised by disease may be less desirable than a shorter life without prolonged suffering (Stewart, 1985: 54-66). Life expectancy estimates also exclude stillborn children. This may imply lower quality-of-life for individuals experiencing such trauma (Lind, 1992: 94). Fertility rates have been subjected to similar criticism. So, for example, fertility rates reflect different underlying patterns of sexual behaviour (Entwisle and Mason, 1985: 616-618). Yet, similar fertility rates cannot be said to reflect similar patterns of sexual behaviour. Nor can different fertility rates be said to necessarily reflect different pattens of sexual behaviour. In the same sense, fertility rates cannot necessarily be considered indicators of the extent to which different societies put a different value on household size (Entwisle and Mason, 1985: 616-618).

In the *second* instance, there are indicators of education, training and intellectual property. These measures are fraught with conceptual difficulty. Literacy and enrolment rates are the most and often criticised of these indicators. According to

Srinivasan (1994a: 16-21), the definitions of literacy employed by the World Bank, UNESCO and UNDP all differ to some extent. His argument seems unfounded insofar as the World Development and Human Development Reports use a similar definition of literacy. This standard definition, however, is biased in that it does not allow for cultural and linguistic diversity, e.g. Chinese signs versus alphabet languages (Hopkins, 1991; Lind, 1992: 92-93). Lind (1992), moreover, goes so far as to claim that literacy is a culturally biased indicator since it only rose to prominence with the advent of telecommunications. The fact that literacy measures only linguistic and not numerical literacy is also of importance (Stewart, 1985: 54-66). Numerical literacy is equally if perhaps not more important than linguistic literacy in enhancing the long-term growth potential of an economy.

Enrolment rates are compromised by the fact that some countries employ age goalposts that differ from those described in the general guidelines (Table 6.1, page 184) (World Bank, 1997: 254-257). Gross enrolment rates also include students who enter school later than normal, who repeat grades, and who remain 'bunched' in the final grades (World Bank, 1997: 254-257). Thus, gross enrolment rates are not a true reflection of the carry-through rate of educational systems. Enrolment rates alone also cannot reflect differences in the quantity and quality of schools (Srinivasan, 1994a: 16-21). Thus, one requires a variety of indicators to quantify the numerous aspects of education, training and intellectual property.

Thirdly, in terms of indicators of health, food and nutrition, malnutrition has been the main focus of criticism. The basic criterion for a lack of nutrition is that food energy intake falls short of the required food energy intake. As noted in Chapter 5 (page 151), nutritional requirements need to be set relative to age, sex, body size and composition, as well as levels of physical activity (McKenzie, 1971: 64-85;

Srinivasan, 1994a: 16-21). Estimates of calorie intake, furthermore, are hampered by doubts as to the nutritional content of different food types. Nutritional content differs substantially across different samples of the same produce (McKenzie, 1971: 64-85). Required calorie intake is assumed to ensure people long-term good health and to maintain economically necessary and socially desirable physical activity. According to Srinivasan (1994a: 16-21), though, this is rather ambitious, given the fact that the publicised relation between childhood nutrition and intellectual capacity is not actually employed in developing measures of required calorie intake. Malnutrition is also dependent on factors such as household size, birth conditions, income inadequacy and the willingness of people to change their behaviour (McKenzie, 1971: 64-85).

Many health indicators are also often criticised. Estimates of maternal mortality differ in terms of the definition of death during childbirth. While some estimates include only complications during pregnancy, others also include abortions and causes of death not directly related to childbirth (World Bank, 1997: 254-257). Measures of contraceptive prevalence are problematic due to the fact that countries employ different age goalposts in estimates, e.g. expressed as percentage of married women aged fifteen to forty-four or forty-nine (World Bank, 1997: 254-257). Srinivasan (1994a: 16-21) argues that the definition of physician and nurse is ambiguous and that it not always clear how practitioners of traditional medicine are dealt with. Since the medical registration systems of LDCs are often poorly developed, estimates of the incidence of disease and causes of death are not always equally reliable (Srinivasan, 1994a: 16-21). Deaths during childbirth, for example, are believed to be highly underreported in rural areas and, in the process, compromise estimates of maternal mortality (World Bank, 1997: 254-257).

In the *fourth* instance, there are those indicators describing the physical environment in which people live. On the one hand, indicators of urbanisation fail to distinguish the wide disparities with regard to the quality of urban settlement. Informal squatter settlements and urban slums differ considerably from upper-class suburban settlements (Entwisle and Mason, 1985: 616-618). The quality-of-life in urban and rural areas is also dependent on the extent to which the particular system of political participation allows residents some input in the management and development thereof (Entwisle and Mason, 1985: 616-618). Estimates of access to safe water, on the other hand, currently do not allow for the extent to which people may themselves convert dirty into clean water (Stewart, 1985: 2-5). Although the concept of safe water has been changed a number of times (World Bank, 1997: 254-257), the adjustments have not yet addressed this shortcoming highlighted by Stewart (1985: 2-5).

Fifthly, indicators of political and social stability have not escaped criticism. Crime indicators are particularly problematic. Criminal statistics are dependent on legal definitions employed in categorising crimes (UN, 1994a: 43-44). Since countries differ with regard to their legal systems, the classification of crimes is not internationally standardised. Glanz and Smit (1995: 5-69) emphasise the complexities related to the interpretation of crime statistics. Reported crime alone is an inadequate measure of the actual situation. Victimisation rates, though more complex in terms of measurement since they require surveys rather than just police reports, represent a better alternative for quantifying the actual incidence of criminality (Glanz and Smit, 1995: 5-69). Many crimes, in fact, go unreported. People's willingness to report crimes is dependent on their perception of the seriousness of the particular crime, the type of crime involved, the extent to which crimes are covered by insurance, and the

ease with which crimes can be reported. Equally important are perceptions regarding police fairness, impartiality and competence, and the legitimacy and efficiency of the criminal justice system. Police officials, furthermore, may underreport hard-to-solve crimes. Thus, reported crime needs to be assessed in the context of arrests and prosecutions. The degree to which suspects are arrested and successfully convicted depends on the extent of investigative cooperation between the police and public, the efficiency of police practices, type of crime, strength of evidence, likelihood of conviction, age of the offender, seriousness of the offense, and procedural efficiency of the criminal justice system. Statistics on sentencing are also misleading insofar as they take account only of prison sentences handed down by courts and exclude other forms of punishment, e.g. corporal punishment and community service. Statistics of prison populations, furthermore, often include those awaiting trial, thus misrepresenting reality (Glanz and Smit, 1995: 5-69)[144].

Indicators of national security are also open to underreporting. In the case of measures of military capacity, countries may, for strategic reasons, prefer not to fully disclose details.

Sixthly, there are indicators of culture, social fabric and family values. Although the lack of this type of development measure is often highlighted, its measurement remains problematic. Examples of cultural constructs include the position of women in social and economic life, the exposure to the Judo-Christian ethic, the importance of extended family, and a high regard for hygiene (Gopalakrishnan, 1988). These constructs, though, remain country-specific rather

[144] According to the UN (1994a), however, the possibilities of improving the quality of crime data by adjusting the questionnaires employed in their international crime surveys, have been exhausted. Thus, their focus has shifted to the expansion of these suveys so as to report on more aspects of the criminal justice system. The UN's Fourth Crime Survey, for example, has seen the indicators on criminal justice expenditure and prison capacity (measured in terms of the number of prison beds available) supplemented with data on inflation rates and estimates of living space per prisoner (UN, 1994a: 43).

than universally applicable. Estimates of such constructs may point to differences in culture but may equally well simply reveal differences in those underlying factors explaining these disparities. So, for example, politics rather than a particular underlying value system may be the underlying cause of gender inequality. Given the conceptual and methodological elusiveness of cultural constructs, these indicators remain crude, surrogate indicators (Hulme and Turner, 1990: 15-23).

As far as social fabric goes, happiness indices, despite being considered conceptually sound measures of the general well-being of nations, have numerous methodological shortcomings. Estimates are not directly comparable given the variety of questions and survey designs employed in estimating happiness (footnote 134, page 192). Where happiness indices distinguish between different domains of subjective well-being, these domains may be culture-specific ones which limit their value in a comparative analysis of happiness (Veenhoven, 1996a: 3-18; Diener and Suh, 1997: 200-206). Estimates of happiness, furthermore, are said to be (i) highly dependent on the emotional states of respondents, implying instability in measurement, (ii) invalid insofar as respondents cannot be expected to objectively assess their own well-being, and (iii) arbitrary insofar as interviewers may elicit stereotyped rather than honest responses from respondents (Easterlin, 1974: 90-99; Pill and Stott, 1987: 125-128; Elster and Roemer, 1991: 5-10). Language also plays a crucial role in the manner in which respondents interpret these questions, as do the different response styles of respondents and the extent to which particular responses may be more socially desirable than others (Veenhoven, 1996a: 3-18; Veenhoven, 1996b: 12-28; Diener and Suh, 1997: 200-206). Diener *et al.* (1995), for example, report that respondents in Pacific Rim countries score consistently lower on happiness indices, even when controlling for difference in income. Thus, the nature of

responses to questions regarding subjective well-being varies across individuals and regions, especially in the context of the relative importance of hedonic values (Ziegler and Britton, 1981: 303-304; Diener *et al.*, 1995: 7-16; Diener and Suh, 1997: 200-206). Pill and Stott (1987: 125-128), furthermore, found that high scores are often associated with higher levels of education and religious commitment. Diener and Suh (1997: 200-206), however, conclude that happiness indices remain comparable insofar as they represent estimates of a common dimension of quality-of-life shared by all people.

Standardisation with regard to happiness indices has improved insofar as more countries are employing the happiness item employed in the World Value Survey (Veenhoven, 1996a: 14)[145]. Studies have also been found to perform well in terms of tests for concurrent, face and congruent validity[146]. The multitrait-multimethod (MTMM) designs now employed in analyses allow researchers to identify and correct the undesirable effects of method, sequencing and technique (Veenhoven, 1996a: 6-8)[147]. Thus, happiness indices have improved considerably with regard to comparability (Veenhoven, 1996a: 3-18; Diener and Suh, 1997: 200-206).

Finally, there are the criticisms leveled at environmental indicators. Environmental pressures can be measured either directly (e.g. estimating the physically available quantities, relative quality and rate of depletion of particular resources) or indirectly (e.g. employing population burden estimates as a proxy of

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[145] The World Value Survey asks respondents, 'Taking all things together, would you say you are ... very happy, quite happy, not very happy, or not at all happy' (Schyns, 1998: 11).

[146] Tests for *concurrent validity* determine whether responses to happiness surveys actually correlate with factors it is supposed to be associated with, e.g. income. Tests for *face validity* focus on the specific nature of the questions and response-scales employed in happiness surveys. The question here is whether the measurement construct actually measures subjective well-being. Tests of *congruent validity* compare the response to different types of survey questions attempting to measure subjective well-being (Veenhoven, 1996a: 4-6).

[147] MTMM designs allow analysts to contrast the results obtained with the aid of different types of data collection techniques and measurement constructs (i.e. questions and response-scales) so as to ensure high levels of validity and reliability (Veenhoven, 1996a: 8).

environmental pressure). Both these options have their drawbacks. Direct measurement is problematic insofar as reports on the stock of resources need to take cognisance of the great variety of uses resources can be put to, be it in consumption, production or both. Optimal utilisation rates, furthermore, which are considered of greater concern than decreasing stocks of resources, are based on these estimates of available stocks and usage rates. The construction of proxy indicators is problematic due to the mainly non-linear and diffuse nature of the relationship between causes and effects of environmental degradation (Dasgupta *et al.*, 1994: 28-33).

Given that environmental concerns have only fairly recently risen to prominence, environmental indicators also tend to suffer from poor coverage (Economist, 1991: 48). As always, coverage seems to be especially problematic in developing countries. This often is the result of a lack of funds to perform the necessary research to publish series of environmental data regularly (Tholba and El-Kholy, 1992: 647). These countries, though, are often those in possession of a substantial proportion of world resources. Developing countries such as Brazil, Indonesia and Zaïre, for example, have some of the largest forestry resources, yet their forestry data are not as reliable and accurate as that of more developed countries (Mainardi, 1997: 8-11). In cases where data coverage is relatively good, the comparability of indicators suffers as a result of the lack of conceptual standardisation across the existing wide range of environmental publications (Tholba and El-Kholy, 1992: 647). Deforestation, for example, is differently defined in different settings (Mainardi, 1997: 8-11). As a result, reports on environmental indicators require numerous qualifications and voluminous notes (Economist, 1991: 48).

Given these shortcomings, both of social indicators in *general* and of *specific* social indicators, the question is how one selects measures for analytical and

comparative purposes from this collection of statistics[148]. The OECD's Social Indicators Development Programme of the 1970s suggested a number of guidelines. Firstly, in terms of validity, indicators need to be direct and valid statistical measures which monitor the levels and changes in the levels of fundamental social concerns. Secondly, indicators are required to be available in both aggregate and disaggregate form. Disaggregation may be applied across personal (e.g. age, gender, race, or ethnic group), well-being (e.g. level of education or income) or contextual (e.g. mortality by cause of death) characteristics. Disaggregation, though, should never be a criterion employed at the cost of validity. Thirdly, in terms of comparability, different and changing indicator values should reflect actual changes (i.e. improvement or deterioration) in the underlying measurement construct. Fourthly, indicators need to be understandable in terms of their meaning and formulation. In the fifth place, indicators of quality are required. Data quality is assessed relative to the cost, availability and statistical error of indicators. Finally, the association between selected indicators needs to be minimal and measurable so as to allow a meaningful analysis of differences and changes in the indicators (OECD, 1976: 25-34).

In the light of the criticisms of social indicators discussed above (pages 196 to 210), one can reflect as follows on the four aspects of technique and method identified in Chapter 2 (page 24). The social indicators listed in Table 6.1 (page 184) are all *quantitative* (measuring the social facets of development in numerical terms). Some measures, though, are also *qualitative*, e.g. happiness indices, individualism-collectivism-scales and political ratings. Although expressed in numerical terms, these indicators reflect the position of people and/or nations relative to some

[148] In terms of the selection of variables for composite indexing, the same difficulty applies. Thus, the

qualitative ideal of happiness and political freedom. According to Hilhorst (1985: 6-10), other social aspects of economic development also remain qualitative despite being quantified. This drive towards quantification has resulted from the rise of positivist science and the demand on social sciences to become involved in policy-making.

Some of these social indicators are estimated by employing *subjective* measurement techniques, e.g. happiness indices, individualism-collectivism-scales and political freedom ratings. Most of the others, furthermore, remain inherently subjective despite their perceived *objectivity*. Major sources of subjectivity include the lack of conceptual clarity and standardisation, as well as the various elements of subjectivity introduced during survey research (pages 198 to 201) (Glewwe and Van der Gaag, 1988: 5-9; Diener and Suh, 1997: 192-200). Given the multiplicity of social indicators, subjectivity is also introduced when certain social indicators are preferred above others for reporting purposes (Glewwe and Van der Gaag, 1988: 5-9). In essence, subjectivity results from theoretical dilemmas as to the character of social phenomena, the impossibility of precise social measurement, and the tendency for indicators to become value-laden vindicators of policy actions (Kallmann, 1997: 12). Thus, Elster and Roemer (1991: 5-10) describe social indicators as objective proxies of subjective well-being.

The only *ordinal* social indicators listed in Table 6.1 (page 184) are happiness indices, individualism-collectivism-scales and political freedom ratings. These indicators merely rank entities relative to each other in terms of perceptions regarding subjective well-being and political freedom. The other social indicators are *cardinal* measures insofar as disparities between nations, households and/or individuals are

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guidelines put forward here can be equally well applied during composite indexing (Chapter 7, page 223).

expressed in numerical terms and, more importantly, are able to be meaningfully interpreted, e.g. the population of country A exceeding that of country B by three million.

Social indicators, furthermore, are *unidimensional*. Composite indices (discussed in Chapter 7), in fact, were developed to overcome the unidimensionality and resulting multiplicity of development indicators (UN, 1994b: 9; Ul Haq, 1995: 50-54). The latter is evident from the magnitude of social indicators related in Table 6.1 (page 184).

6.5 SOCIAL INDICATORS IN COMPARATIVE APPLICATION

The comparative application of social indicators remains problematic. To a large extent, this results from the various shortcomings of social indicators related in these pages (pages 196 to 210). The comparison of cross-section data is hampered by something like the increasingly smaller differences between nations with regard to some of these indicators (Ram, 1982a: 116). Similar to the 'plateau curve effect' highlighted by Gaertner, countries are often grouped so close at the upper limits of achievement on certain indicators that meaningful comparison is rendered impossible (Sen, 1993: 62-66). Life expectancy is a good example of such an indicator. At high levels of life expectancy, such as in the 70s, the rate of progress is much slower as a result of the cost-intensity and relative inability of medical care focused on degenerative diseases such as cancer and cardiovascular illnesses to impact significantly on life expectancy (McGranahan, 1995: 40). Malnutrition, furthermore, is more difficult to observe in developed countries than in LDCs since these countries all score in excess of 100 on indicators of the degree to which daily calorie

requirements are met (McKenzie, 1971: 64-85). According to Sen (1993: 62-66), measurement in such cases needs to be based on alternative indicators that do allow meaningful comparisons, even if this means employing indicators in their relative infancy and/or of relative complexity.

Other complexities introduced during comparative analysis apply to comparisons across both time space and time. Social indicators are compared at the intergroup, intertemporal and international level (OECD, 1976: 157-164). Comparison bias, in fact, is the rule rather than the exception. Comparison bias results from differences in (i) definitions of concepts, (ii) methodologies employed in data collection, (iii) the frequency of data collection, (iv) the quality of personnel and equipment employed in data collection, and (v) the priority nations assign to the measurement of particular social constructs (Kurian, 1991: xi-xii; Diener *et al.*, 1995: 7-16; Diener and Suh, 1997: 200-206).

Finally, there is the issue of absolute as opposed to relative measures. 'Stock' social indicators represent absolute measures. Estimates relate the magnitude of social constructs independently of anything else (e.g. number of people living in cities). 'Flow' and 'ratio' indicators, though, are relative measures. Whereas the former express social phenomena relative to a certain time frame (e.g. annual average population growth), the latter express variables relative to other stock and/or flow variables (e.g. motor vehicles per 1000 of the population). According to Wilson and Woods (1982: 11-12), absolute indicators are not useful in assessing the social conditions in nations. Thus, flow and ratio variables are normally preferred above stock indicators in comparative analyses.

6.6 FOCUS, CLARITY AND SIMPLICITY OF SOCIAL INDICATORS

Social indicators, as argued on page 181, represent measures of capabilities and functioning. Thus, they are measures of ends rather than means. Some ends, though, are means to other ends. Literacy, for example, is an end in itself but also represents a means to increased earnings. A distinction can also be drawn between different types of ends-based social indicators. Veenhoven (1996b: 5-12) distinguishes between indicators of the 'quality of nations' (the 'good society') as opposed to ones of the 'quality of life in nations' (the 'good life'). The latter type of indicator focuses on the extent to which people's needs are met or they are equipped with certain capacities. Examples of such indicators include life expectancy and literacy rates. The former type of indicator is concerned with judgements as to the quality of society, i.e. the social fabric, productivity, and ideals of entire nation states. Examples of such indicators include ratings of political stability and measures of criminality. These two conceptions of measurement are interdependent insofar as the quality of nations is dependent on the quality of life that individual members of that particular nation enjoy. The nature of this relationship is not always that apparent. So, for example, political stability can be achieved under authoritarian rule, yet without the accompanying quality of personal life enjoyed in stable democracies.

Social indicators, where clearly conceptualised, are relatively simple to interpret. In terms of method and technique, though, these indicators are not simple, as is evident from the critique of social indicators (pages 196 to 210). This introduces a number of complexities in the comparative analyses of social indicators of development (pages 212 to 213).

6.7 AVAILABILITY OF SOCIAL INDICATORS

As far as cross-national availability goes, many of these social indicators, especially those reported in the World Development and Human Development Reports, are today available for large samples of both developing and developed countries. A 1995 UN survey on data collection activities reported as many as 117 global collection activities (ECOSOC, 1999). Yet, disparities in interspatial availability remain. Disparities in the quality and accessibility of reporting frameworks represent a major reason for these gaps in statistical information. Non-response to surveys is central in this regard. With as many as 117 questionnaires being sent to each country by international collection agencies alone, the resulting reporting burden on especially developing countries explains why interspatial gaps in data remain problematic. These gaps are most significant in the case of Africa. Out of a total of fifty-four African nations, for example, only six nations had by 1999 reported estimates of life expectancy for 1990 or later. The African performance is even worse in respect of other social indicators. Only four, five, and two respectively of these fifty-four African nations had by 1999 reported estimates of infant, child and maternal mortality rates for 1990 or later (ECOSOC, 1999). Another reason for interspatial inconsistencies in data availability is the difference in the priorities that nations put on reporting. Some nations, such as Guinea and Cambodia, have gone as far as prohibiting the collection and publication of data on the premise that it is criminal and/or undesirable for political reasons (Kurian, 1991: xi-xii).

Intertemporal availability is compromised in that estimates for some social indicators are available only for up to three years outside the year estimates are reported for (World Bank, 1997: 249). Some surveys are conducted only every

twenty or thirty years, and others are never completed due to a lack of funds and/or change of government (Kurian, 1991: xi-xii). In the case of literacy rates, for example, Behrman and Rozenweig (1994, as quoted in Srinivasan, 1994a: 16-21) found that out of a total of 145 countries, nineteen had last reported estimates of adult literacy for 1970 and forty-one had only reported estimates of adult literacy for the 1970s. This infrequent updating of data and measurement methodologies causes dramatic shifts and breaks in social indicator data series (UNDP, 1996: 130-132). National data collection agencies also constantly revise indicator estimates as underlying data are updated. This often results in disparities between social indicator estimates reported in different editions of the World Development and Human Development Reports (UNDP, 1996: 130; World Bank, 1997: 249). In general, though, social indicator data series have improved considerably in terms of both cross-sectional and intertemporal availability[149]. But estimates of those social indicators for which the underlying social issues only rose to prominence during the last two decades, remain limited. Most notable of these are statistics on crime, gender equality, AIDS and the environment (Stahmer, 1993: 511-540; UNDP, 1996: 130).

6.8 FLEXIBILITY OF SOCIAL INDICATORS

Given the wide choice of social indicators (Table 6.1, page 184), social indicators may, in terms of content, be considered flexible. Drewnowski (1972: 80), though, was less optimistic. He argued that measurement efforts have 'witnessed

[149] Happiness indices, for example, have since the 1970s improved considerably in terms of both cross-national and intertemporal availability. While happiness surveys had by 1974 been conducted in only nineteen countries (Easterlin, 1974: 89), the current World Database of Happiness reports results on some 761 happiness surveys run in as many as sixty-seven nations by 1995 (Veenhoven, 1997). Happiness time-series of ten years and longer are available for fifteen countries (Veenhoven, 1997).

meagre results amidst the creation of an incoherent maize of variables'. In terms of method and technique, social indicators are relatively inflexible insofar as statistics are collected within a framework of established concepts and methodologies. Concepts and methods can sometimes be adjusted at the national level but only to the detriment of relative comparability. This, in fact, is one of the main reasons why the comparability of social indicators remains problematic (page 212).

6.9 CONCLUDING REMARKS ON SOCIAL INDICATORS

On the strength of the systematic positive association between income and social indicators, many have claimed that social indicators represent no real contribution to the literature on indicator research. Bulmer (1989) and Innes (1989) (both as quoted in Kallmann, 1997: 11-12) point out that social indicators have not met the expectations held in the 1950s and 1960s, especially with regard to their institutionalisation in public policy. Social indicators, however, do represent useful supplements to income-based development indicators (Ram, 1982a: 116). Diener and Suh (1997) argue that social indicators are methodologically and conceptually complementary despite their strengths and weaknesses. Each indicator contains information not reflected in others. Thus, social indicators are indispensable in assessing the quality of life (Ginsberg *et al.*, 1986; Diener and Suh, 1997). Evident, furthermore, from the discussions in Chapters 3 to 6 is the great proliferation of development indicators, which resulted in a need to combine a variety of individual development indicators in index form so as to present aggregate measures of this heterogenuous concept of economic development.

The time-series for the US and Japan are the most expansive, covering respectively forty-five and thirty-five years (Veenhoven, 1996a: 3-18).

Chapter 7

Composite Indices of Economic Development

7.1 SCOPE OF THIS CHAPTER

Composite indices of economic development, apart perhaps from the UNDP's Human Development Index (HDI), remain the least prominent of the classes of indicators of economic development discussed in Chapters 3 to 7. One needs, however, to appreciate the reasons why composite indices, unlike individual indicators of economic development, came to be used as indicators which could reflect the heterogeneous nature of economic development. These reasons are briefly related in the next passage, after which composite indices are discussed in respect of the dimensions of measurement identified in Chapter 2.

7.2 BACKGROUND TO COMPOSITE INDEXING

The search for alternative indicators of development has also witnessed the development of a variety of composite indices. These indices represent macrolevel valuations of economic development insofar as they integrate various social, political and economic elements of economic development in measurement (Todaro, 1989: 108-113). These efforts are founded on the belief that 'no single yardstick exists to measure development just as no single set of objectives can describe adequately the diversity of development conditions in the world' (Wilson and Woods, 1982: 11). Sainz (1989: 156-160), furthermore, argues that the increasing social and economic

heterogeneity of nations necessitates combining both synthetic *and* specialised indicators in measurement. The motivation behind efforts at composite indexing differs. While some analysts intended their indices to evaluate the social situation independently, others saw them as indicators to contrast with economic indicators, or indicators which combined the economic and social aspects of economic development in measurement (Sainz, 1989: 156).

7.3 CONTENT OF COMPOSITE INDICES

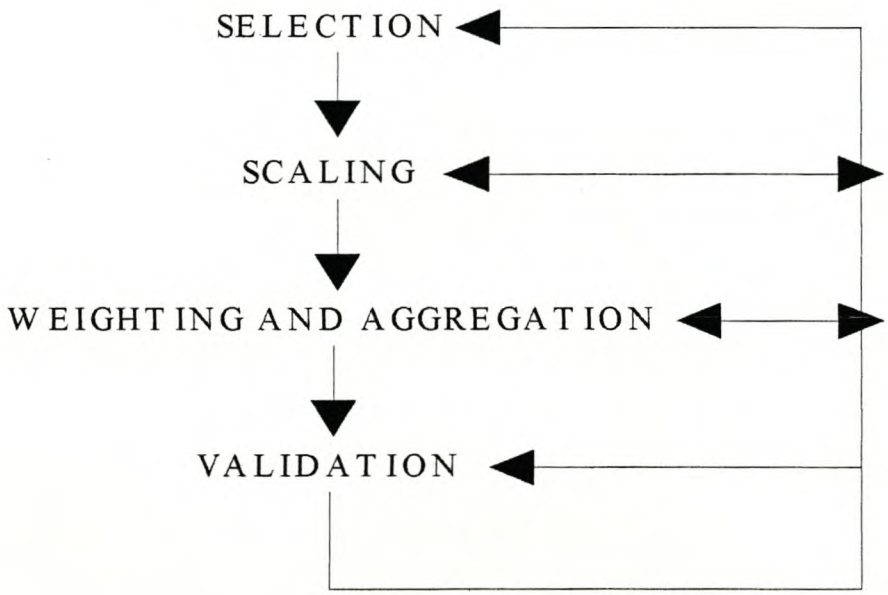
The discussion on content is here confined to explaining what are understood to be composite indices of economic development. Arguments as to which specific elements of development are to be included in composite indices are presented elsewhere (pages 220 to 226). Composite indices represent measures arrived at via some empirical aggregation of a number of economic, social and political variables (Babbie, 1995: 161-175). In Sainz's (1989: 156) words, composite indices are those measurement efforts which require a 'synthesis of numerous factors into one given factor'. As with other indicators of economic development, these indices propose to 'facilitate international comparisons or the study of a single country's development over time' (Thiessen, 1997: 13).

7.4 TECHNIQUE AND METHOD OF COMPOSITE INDEXING

Composite indexing entails the aggregation of any number of economic, social and political indicators, including those listed in Table 6.1 (Chapter 6, page 184). Composite indexing involves four steps, i.e. selection; scaling; weighting and

aggregation; and validation (McGranahan *et al.*, 1972). It is important to note that the steps of composite indexing do not necessarily follow in this sequence. It is a concurrent effort during which selection can be altered, weights adjusted and variables rescaled in order to arrive at final index estimates.

Figure 7.1: A general methodology of composite indexing



7.4.1 Selection of variables and components

Choices regarding two issues are required (Ginsberg *et al.*, 1986; McGranahan *et al.*, 1972: 8-10; Drewnowski, 1974: 19-33). In the first instance, the number and nature of the component indices which will make up part of the composite index need to be determined. Secondly, the specific variables employed in estimating each of the component indices need to be selected. Such selection is generally based on theory, empirical analysis, pragmatism or intuitive appeal, or some combination thereof (Adelman and Morris, 1972: 117-119; Diener and Suh, 1997: 192-200). Political and

policy considerations also figure in selection insofar as composite indices are in some cases developed with a view to informing particular audiences regarding certain issues (Stewart, 1985: 1-2).

Both bivariate and multivariate statistical techniques are employed where selection is based on empirical analysis (Babbie, 1995: 161-175). Whereas bivariate analysis measures the strength of the association between all pairs of variables, multivariate analysis assesses the overall power of any collection of variables to measure any other variable. Bivariate analyses traditionally employ correlation matrices in selection. The most strongly correlated variables are selected from a larger sample of applicable variables. The rationale behind this is that development is a highly interdependent process and that characteristics will tend to be grouped together in successful economies (McGranahan *et al.*, 1972: 14-18). Most notable of the multivariate techniques employed in composite indexing are discriminant, principal component and cluster analyses (Felipe and Resende, 1996). During *discriminant analysis* a large number of variables is identified and then reduced to a few which best explain variations in the particular measurement construct. Dellaportas (1983: 153-166), for example, starts out with sixty-two variables and cuts these down to seven. *Principal component analysis* is equally useful in reducing the dimensionality of data, as is *factor analysis*, which is a close variant of principal component analysis (Kallmann, 1997: 18). Principal component analysis establishes the relation between certain principal components and the studied phenomenon. Each principal component is made up of variables from a larger selection of variables (Everitt and Dun, 1991). As output, this technique determines that combination of the original variables capturing the largest proportion of variance in the original set of variables (Ram, 1982b: 229). Both these techniques require a proxy for development.

Per capita income and life expectancy are the two variables most often employed as dependent variables in discriminant and principal component analyses. Cluster analyses employ scattergrams and other advanced clustering techniques to determine the broad categories in which observations can be classified or grouped (Everitt and Dun, 1991)[150]. The objective is to obtain a collection of clusters for which components of the same cluster are highly correlated and components belonging to different clusters are not highly correlated (Mazumdar, 1995, as quoted in Kallmann, 1997: 18). Multivariate techniques put great emphasis on visual and graphical tools. Scatterplots, boxplots, and histograms are, for example, often employed in determining underlying patterns in data (Everitt and Dun, 1991).

Another central consideration during selection is the purpose of measurement. Where the goal is the international comparison of well-being, the components will have to be of universal significance and cross-cultural applicability (Elster and Roemer, 1991: 5-15). Cross-national empirical analyses of the association between development phenomena are useful in identifying these shared components. Household surveys can also be employed to determine the specific developmental issues to which people attach high priority (Rao *et al.*, 1978: 117). National and group-specific analyses can also be dealt with in composite indexing. One can select different components and variables to devise composite indices for countries, regions or groups. The UNDP, for example, reports human poverty indices for developed as opposed to developing countries (Table 7.1, page 240). Arguments in favour of the latter approach to selection are often based on the fact that industrialised countries have reached the upper end of the so-called plateau curve of basic needs achievement,

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[150] For instance, agglomerative hierarchial clustering techniques start out by measuring the distance between each observation, which is considered a separate cluster. It then, in each subsequent step, fuses the two closest clusters. Various measures of cluster dissimilarity are employed to determine

thus compromising the discriminant ability of the resulting indices (Diener, 1995: 107-125).

Equally dependent on purpose of measurement is the distinction between variables focused on ends as opposed to means. Adelman and Morris (1972: 117-119) claim that variables included in composite indices should focus on either the one or the other. McGranahan *et al.* (1972: 12), however, argue that only intended ends should be included in composite indices. Thus, unintended negative outcomes such as crime and pollution should be excluded. But some indices, such as the UNDP's Human Development Index (HDI), were specifically designed to include both means *and* ends. Some variables, furthermore, represent measures of both ends and means (Morris, 1979: 20-40). Literacy, for example, is both an end (being able to read and write) and a means (increasing one's future earnings potential).

Other important selection criteria include validity, reliability, comparability, simplicity, and availability (Morris, 1979: 20-40; Estes, 1984: 30-31; Kurian, 1991: xi). In terms of validity, it is crucial that variables measure the component they are supposed to measure. Differences in indicators must reflect differences in the particular measurement construct (Morgan, 1968: 37-39; Babbie, 1995: 161-175). Some variables relate to needs which can be met in a variety of ways. The need for transportation, for example, can be satisfied via a variety of modes of transport, depending on geographic constraints and personal preferences. Where modes of satisfaction differ depending on circumstances, tastes and culture, variables need either to be adjusted so as to allow for these differences, or to be excluded, given their resulting lack of validity (McGranahan, 1995: 54-55). Other variables are problematic in that they are both positively and negatively associated with certain

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after each step whether or not to continue to the next level of fusion. These include dendograms and cophenetic correlation coefficients (Everitt and Dun, 1991: 97-126).

aspects of development (Drewnowski, 1972: 85-86; Rose, 1995: 114; Streeten, 1995b: 28; Veenhoven, 1996b: 2-5). Divorce, and suicide among the terminally ill, are cases in point. While both signify an expansion of choice, they are also considered indicative of a deterioration of the social fabric and of family life. Urbanisation, furthermore, may cause both improved access to health services and increased criminal activity. A good but difficult test for validity is that improvements in the selected variables must imply a gain for all members of society (Morris, 1979: 20-40; Estes, 1984: 30-31; Streeten, 1995a: xii-xiv; World Economic Forum, 1996: 30).

When it comes to comparability, meaningful comparisons of indices require a standardisation of the concepts and methodologies employed in data collection (Morris, 1979: 20-40; Estes, 1984: 30-31). As will become evident in these pages, some variables have come a long way towards complete standardisation. Others, though, remain suspect. According to Ginsberg *et al.* (1986: 101-120), the sample of countries to which composite indices are applied also needs to be relatively comparable in terms of the nature of political and economic systems, the level of development, population size, and geographic proximity. Different systems of economic organisation often imply different assumptions as to the prescribed patterns of development, this in turn implying a need for differential selection (Morris, 1979: 20-40). Thus, some analyses include only countries with populations in excess of one million and exclude countries with centrally-planned economies and authoritarian regimes. The UNDP, for example, excludes industrial countries from their estimation of the Human Poverty Index (HPI) because the particular indicators cannot adequately quantify deprivation in advanced economies (UNDP, 1997b). In general, though, most efforts at composite indexing have been relatively indiscriminate in terms of country coverage.

Selection requires a balance between simplification and complication (McGranahan *et al.*, 1972: 8-10; Drewnowski, 1974: 19-33). On the one hand, the greatest threat to simplicity is the tendency to keep on adding variables and components to indices as the scope of development issues expands (Thais, 1989: 174). According to Weigel (1986: 1423-1428), indices concerned with preferences rather than needs are particularly susceptible to this tendency. The resulting indices are anything but simple and manageable (an important criterion for a good index) (Ul Haq, 1995; 46-48). This may also divert attention from crucial components of development (Porwit, as quoted in Rao *et al.*, 1978: 31-32). Oversimplification, on the other hand, runs the danger of omitting significant components of the development problem. Unfortunately there are no hard and fast rules for identifying indices which are simple yet substantive and informative.

In terms of data availability, a 'constant awareness of the sources and interpretation of data' is required (McGranahan *et al.*, 1972: 3). Data availability needs to be assessed with regard to both the timeliness and the width of the database. Timeliness requires that analyses employ the most recently available and similarly dated estimates of data. According to Estes (1984: 30-31), this condition may be waived where analyses are provisional, the particular variable is of the utmost importance, or acceptable proxies are not available. With regard to the width of the database, data samples need to be large enough to ensure statistically significant results. Where more than one variable represents a proxy of the particular component and variables are equally qualitative, one should select the variable(s) with the widest base (McGranahan *et al.*, 1972: 14-18).

Closely related to data availability, is the handling of missing data. There are various options for dealing with missing data. The choice is dependent on the effect

of that particular option on the credibility, representativeness and statistical significance of the results (Babbie, 1995: 161-175). When the sample with complete data is still representative and large enough to yield statistically significant results, missing observations are normally excluded. During survey research, questions respondents do not or cannot answer are normally coded as such. This allows one to monitor the effect of missing data on the representativeness and statistical significance of the results closely. Where representativeness and statistical significance are in jeopardy, estimates of missing observations can be derived from existing data using regression techniques. Alternative options include the use of group averages and mean, median or random values (Ginsberg *et al.*, 1986: 17-47; Babbie, 1995: 161-175)[151].

Despite claims that value-judgements and cultural issues should be avoided as far as possible in selection (Morris, 1979: 20-40), composite indexing remains an inherently value-laden and subjective exercise (Drewnowski, 1972: 85-86; Rose, 1995: 114). Even when empirical techniques are employed in data reduction, analysts are required to make choices regarding the variables included in the original sample of variables. These choices are further compounded by the fact that (i) some constructs of economic, social and political development are more difficult to measure than others, (ii) opinions regarding the relative desirability of components and variables differ, (iii) development is an interdependent and multidimensional process within which many grey areas remain, and (iv) underdevelopment differs in terms of its regional characteristics (Felipe and Resende, 1996: 184). Thus, there exists no general framework for selection (Wish, 1986: 93-97).

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[151] Shen and Lai (1998: 225-230) propose and apply an 'optimal scaling' method which restores the

7.4.2 Scaling of variables

Scaling entails the 'ordering (of) things in some meaningful way', e.g. labelling a thermometer as Fahrenheit did. The aim is to point out the relation among certain objects, how far apart they are and in what direction they lie relative to each other. It is not a prerequisite for scaling that variables be cardinal in nature (Dunn-Rankin, 1983: 1-8). Ordinally scaled variables, like political ratings and subjective well-being, can either be rescaled or employed in their original form. Nor are variables required to be expressed in similar units (Morgan, 1968: 35-37). These are two of the main advantages of composite indexing.

Scaling involves a combination of placing and grouping, naming and categorising, ordering, and quantifying (Dunn-Rankin, 1983: 9-27). One can generally distinguish between four types of scales. *Nominal scales* simply classify objects into specific categories. *Ordinal scales* preserve the serial order of properties during classification. *Ordered metric scales* also preserve the rank order of the distance between all points. *Ordered cardinal scales* allow scales to be meaningfully combined in addition to preserving serial and rank order (Adelman and Morris, 1972: 111-112). The scales employed in composite indexing are generally of the ordinal type.

Scaling for composite indexing purposes can be performed in one of four ways. *Firstly*, there is the option of not scaling variables. This is an especially viable option where variables are already scaled, e.g. reported in percentage terms or some ordinal response scale. In the case of the Human Development Index (HDI), for example, the adult literacy variable need not be rescaled since it is already reported in

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continuity of ordinal response scales. Missing responses ('Don't know' or 'No Answer') are coded and then estimates are provided for these missing responses.

terms of a percentage. Some of the early efforts at composite indexing, however, employ unscaled variables in their original, unadjusted form. This is not desirable. Unscaled variables cannot during aggregation be meaningfully added or subtracted, although multiplication and division are feasible (Morgan, 1968: 35-37).

In the *second* instance, the use of standard scores (z and t values) is also popular in composite indexing. Raw scores are first adjusted for directionality by multiplying each with either +1 or -1. Standardisation then involves transforming raw scores on each indicator into standard scores, e.g. z = actual score - mean/standard deviation. Normalised t values are ideal for indexing purposes as they have a mean of zero and standard deviation of one (World Economic Forum, 1996: 36-39). Standard scores can be further adjusted if calculations yield awkward values. Options include the multiplication of all scores by 10 to obtain more visually manageable scores, adding the proportionate share of each component in the composite index to each component score, rounding each score to eliminate decimals, and adding 100 to each score to obtain better indexed scores (Estes, 1984: 169-179). In some cases, standard scores are expressed relative to that achieved by an individual country, e.g. USA = 100. The selected country may be the one which obtained the highest standard score, a world leader in respect of economic development, or the country employed as case study in the particular analysis. The standard score of this country is valued at 100 and the scores of other nations are divided by this standard score and multiplied by 100 to obtain index values. Standard score scaling is not without its shortcomings. Development data are not always centrally distributed around a mean and the inclusion of outliers substantially influences results (McGranahan *et al.*, 1972: 68-136).

Thirdly, there is the option of transforming variables into ordinal response scales. This may be done either during the survey itself or at a later stage using available data. In the case of Johnston and Sheehy's (1995) Index of Economic Freedom (IEF), for example, experts grade items on a scale of 1 (free) to 5 (least free). Although most ratings are semantically defined, a number of scales are linked to specific ranges of indicator values. Examples include the use of government consumption as percentage of GDP, top tax rates, and average tariff rates to index the degree of government intervention and protectionism (Johnston and Sheehy, 1995: ix-21). Gwartney *et al.* (1996) employs similar scaling techniques in constructing their Economic Freedom Indices (EFIs). They employ statistics on money supply, inflation, government transfers and subsidies, and interest rate differentials in scaling variables (Gwartney *et al.*, 1996: 1-46).

Finally, there is the conventional linear scaling transformation (LST) method. Variables are scaled from 0 to 100 with the aid of this technique. This requires points of reference relative to which indicators can be scaled (Drewnowski, 1972: 83-85). A minimum and a maximum value are usually identified for each of the variables (Weigel, 1986: 1429-1432). The HDI, for example, scales life expectancy relative to a minimum of twenty-five and maximum of eighty-five years (UNDP, 1996: 106)[152]. Index values are determined by subtracting the minimum value of the particular variable from its actual value and dividing it by the difference between the selected maximum and minimum values (Thiessen, 1997: 142). Some analysts, though, employ only maximum values in scaling. Index values are then calculated by dividing the actual value of the particular variable by its maximum value. This may be advantageous where the minimum and maximum values are so wide apart that they

distort index scores. This distortion involves the degree to which scales act as implicit weights in addition to the explicit weights often introduced during the aggregation of index values (page 233). The wider the minimum and maximum values are apart, the higher the implicit weighting and vice versa. This is because it becomes more difficult to achieve the same relative increase in that particular variable. An increasing magnitude of variance in the variable is explained by one percentage point in the particular index (Morris, 1979: 41-56).

The reference points employed in scaling can be selected relative to the observed minimum and maximum values of the particular variable, be it for a specific year or over an extended period of time. Since observed minimum and maximum values may be based on inaccurate data and/or the countries these values are observed for may be excluded from the particular sample of nations, McGranahan *et al.* (1972) opt for correspondence charts in determining these reference points. Each of the variables included in the index is plotted relative to some independent variable such as per capita income in a multidimensional scatter diagram. Reference points are then derived from the curves best fitting these data sets. The reference points are that level of each of the variables generally associated with a certain level of income, e.g. the level of life expectancy normally associated with an income of $200 per capita. As a result, the minimum scores are set equally low on all the variables. The problem, though, is that scores may now exceed the boundaries of 0 and 100 since some observations lie outside the fitted curve (McGranahan *et al.*, 1972: 68-136). So, for example, countries with per capita incomes in excess of that used in selecting the reference points may have life expectancies lower than that generally associated with the selected minimum of income. Alternatively, reference points can be determined

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[152] Research during the late 1980s and the 1990s has indicated that this maximum of eighty-five years

relative to expert expectations of observed minimum and maximum values (Drewnowski, 1974: 19-33; Morris, 1979: 41-56). So, for example, the goalposts employed in estimating the HDI's life expectancy component were set with reference to the highest and lowest observed and expected values during the previous and next thirty years (Ul Haq, 1995: 48-50). In the case of variables where there exists no readily identifiable maximum value (e.g. number of motor vehicles), variables have to be adjusted so as to allow scaling. Variables, for example, can be expressed in population ratios (e.g. motor vehicles per 1000 population) or in terms of terms of percentages of the total population with access to the particular end or means (e.g. percentage of population with access to safe water) (Weigel, 1986: 1429-1432).

The fact that reference points may differ across societies has often been highlighted (Diener and Suh, 1997: 192-200). Thus, index scores for nations at different levels of development may be calculated using different sets of reference points. Rao (1991: 1453-1459), for example, argues for differential scaling to be employed in scaling GDP per capita in the HDI. Countries at different levels of development do not have the same chances of achieving the average of world income formerly employed in scaling (footnote 170, page 242). This, however, precludes the comparison of index scores across nations at different levels of development. Where the variance in variables correlates with the magnitude of the particular variable, scaling is equally difficult. Climatic indicators are characterised by higher levels of variance at some levels. Average rainfall, for example, varies more at lower levels (eighty per cent variance at 250mm per annum) than at higher levels (only thirty per cent variance at 650mm per annum) (Curry, 1985: 324-325).

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identified by Fries (1980) may be substantially below the actual possible maximum life expectancy (Fogel, 1994: 266-268).

The most important criterion in selecting reference points for scaling is that a balance be found between the width of the range and the spread of index scores (Kurian, 1991: xi; Babbie, 1995: 161-175). Index scores should not be so closely approximated as to prevent nations from being meaningfully distinguished from one another. Nor should the index scores be so widely spread as to keep relatively similar nations from achieving similar scores. So, for example, Streeten (1994: 235-236; 1995a: xii-xiv) argues that index scores based on literacy rates and life expectancy are better balanced than those based on per capita income.

According to Drewnowski (1972: 83-85), scaling requires variables similar in direction. This, however, is not the case. Variables can be adjusted for direction by subtracting the scaled index value from 100. Drewnowski (1972: 83-85), furthermore, argues that scaled values need to take account of inequality. This is to be achieved by multiplying each of the index values with the particular variable's distribution coefficient or its inverse (Drewnowski, 1974: 19-33). It is, however, not always possible to derive such coefficients for all variables because distributional data are not always readily available. An alternative option is to multiply the composite index value by the Gini coefficient or other general indicator of distribution (Baster, 1985: 36-38). Adjustments for structural differences such as population and country size can also be affected at either the component or the index level (McGranahan *et al.*, 1972: 13-20)[153].

7.4.3 Weighting and aggregation of component indices

One also needs to decide on the weighting system and method employed in aggregating component scores into one composite index. In addition to the implicit weights introduced during scaling (page 230), explicit weights may be introduced during aggregation. The aim with explicit weighting is that weights should reflect the relative importance of each of the variables and/or components (Drewnowski, 1974: 19-33). The first option, though, is not to employ explicit weights. Here component and index scores are simply averages of the corresponding variable and component scores. Slottje (1991: 686-688) calls this an 'attributes-based' weighting system. Thus, no weighting is introduced other than that implicitly introduced during the scaling of variables.

Where explicit weights are employed, the conventional practice has been one of selecting weights following consultation with experts. Weights may also be based on the analyst's perceptions of the attitude of policy makers (Drewnowski, 1974: 19-33). Harbison and Myers (1964: 23-24) employed such an ad hoc weighting system in their Human Resource Development Index (HRDI). Tertiary education, in their opinion, was much more important than secondary education in explaining differences in the quality of human capital. Thus, they multiplied the tertiary enrolment rate by five before adding it to the secondary enrolment rate to obtain the composite index value (which counts out of a maximum of 600). Two further examples of ad hoc weighting systems are those employed by Gwartney *et al.* (1996) in estimating their Economic Freedom Indices. Both are expert-based weighting systems. In the case of Survey Index 1 (Is1), experts were asked to assign a total of

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[153] According to McGranahan *et al.* (1972: 25-26), composite indices need to be adjusted for country

100 points between the seventeen components. Each component was then weighted with the average percentage point it scored in this expert survey. In Survey Index 2 (Is2), experts familiar with specific countries were asked to rate these countries on a scale of 0-100 in terms of their perception of the general degree of economic freedom. Next, the extent of correlation between these subjective ratings and each of the components included in the index was determined. These correlation coefficients were then employed in weighting each of the seventeen component indices (Gwartney *et al.*, 1996: 37-41). Alternatively, weights can be based on explicit agreements between policymakers as to the desirability of different development goals, derived from policy statements of governments and development agencies, or derived from collective utility functions based on individual preference functions of the particular population (Drewnowski, 1974: 19-33). These are all relatively subjective methods of weighting. Each is based on subjective perceptions regarding the relative desirability of certain developmental goals. Indices employing such weighting systems are often singled out for their arbitrariness in weighting (Diener and Suh, 1997: 192-200).

Multivariate techniques present an empirical and relatively more objective option for weight selection. In the case of principal component analysis, components are weighted with the proportion of variance in the original set of variables explained by the first principal component of that particular component. This technique has the advantage of determining that set of weights which explains the largest variation in the original variables (Ram, 1982b: 230-232; Slottje, 1991: 686-688). Component scores based on a variety of variables can be weighted by their coefficients of correlation or regression with some selected variable not included in the index. Slottje (1991: 686-688) calls this hedonic weighting. The drawback, though, is that

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size, population size and density, culture and climate at the index level.

multivariate techniques allow one no control over the selection and weighting of components (Ginsberg *et al.*, 1986). Thus, although methodologically sound, these techniques introduce conceptual rigidity in composite indexing[154].

Since different weighting systems imply different results and given the subjectivity inherent in many of these weighting systems, no weighting system is above criticism (Morris, 1979: 41-56; Gwartney *et al.*, 1996). It is for this reason that Babbie (1995: 161-175) argues that equal weighting should be the norm and the burden of proof should fall on differential weighting. According to Wish (1986: 93-97), many of the early composite indices lack an adequate justification for the particular weighting system adopted. Analysts today tend to experiment with a variety of weighting techniques and compare results across these techniques before selecting either one or a combination of techniques in deriving index estimates (Ginsberg *et al.*, 1986: 101-120; McGranahan, 1995: 45-50). This represents a move towards recognising Wish's (1986: 93-97) call for a balance to be struck between the objective assignment of weights and the role of subjective choice. Slottje (1991: 686-688), for example, employs six different multivariate weighting techniques in calculating his indices. He argues that such practice controls for the substantial effect of different weighting systems on the eventual results. Morris (1979: 41-56), however, after experimenting with different weighting systems, found that the different indices remained fairly well correlated.

As in the case of selection, it often makes sense that different types of societies employ different weighting systems. Nations do not advance equally or uniformly on the path to economic development (Townsend, 1971: 2-12).

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[154] In a departure from conventional multivariate weighting techniques, countries may be treated as variables (or components), and variables (or components) as observations. Matrices can then be transposed to determine the orthogonal factors to be used as weights. Factor loadings here display the

Differential weighting may be desirable where countries have already achieved a high success rate in respect of certain variables or where particular variables are culturally less prominent in particular societies (Veenhoven, 1996b: 2-5). Yet, differential weighting prohibits meaningful comparisons of index values. Thus, analysts almost invariably employ a uniform weighting system in compiling index values for large samples of countries.

After weights have been assigned to each component index and the component scores weighted accordingly, these scores are aggregated into a composite score. The aggregation of indices tends to be of either an additive or a functional nature. Whereas the former entails the mere addition of component scores to arrive at index values, the latter is based on the estimated functional relationship between certain variables (Adelman and Morris, 1972: 111-112). Beckerman and Bacon (1966) employed the latter type of technique in estimating their Index of Real Consumption. Seven independent economic variables were combined in five different types of equations in order to explain differences in private consumption per capita (the dependent variable). The equation explaining the largest proportion of variance in private consumption was then employed to arrive at an Index of Real Consumption by substituting the actual values of the seven variables into the equation for each country (footnote 161, page 240) (Beckerman and Bacon, 1966: 524). Stoikov (1967) was very critical of these functional indices. He argued that the determinants employed in selecting the best equation, i.e. multiple regression coefficients and standard errors, are wholely dependent on the number of observations and particular variables selected. Thus, functional indices are empirically biased[155].

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extent to which each country is associated with each variable (or component) (Ginsberg *et al.*, 1986: 49-65). Thus, countries rather than components are weighted.

[155] Stoikov (1967) claims that such bias could be avoided by running estimations on smaller samples of countries in order to better estimate functions for relatively similar countries. According to Beckerman

What is very important, though, is that the composite index should remain relatively simple in terms of its construction and interpretation (Morris, 1979: 20-40). According to Ginsberg *et al.* (1986: 101-120), the choice of method employed in weighting and aggregation is ultimately dependent on the nature and scope of the particular study. So, for example, studies aimed at exploring theoretical aspects of composite indexing usually employ rather complex techniques. Studies aimed at presenting a simple and informative view of general well-being or at informing officials regarding particular issues tend to opt for relatively simpler methods in order to allow indices to be easily comprehensible and readily calculable.

7.4.4 Validation of composite indices

Composite indices also need to be validated. Only through continued validation and adjustment resulting from constructive debate can indices be improved. During validation adjustments are effected in selection, scaling, weighting and aggregation in order to improve the quality of the final estimates (Ul Haq, 1995: 54-57). Validation is normally performed by using either item analysis or external validation (Adelman and Morris, 1972: 125-128; Babbie, 1995: 161-175).

Adelman and Morris (1972: 125-128) describe item analysis as an evaluation of the discriminant ability and correlation of component and index scores. Lind (1992) claims that the HDI lacks discriminant validity, because it is too sensitive to small variations in variables. Consider, for example, Denmark, whose GDP per capita considerably exceeds that of Australia. Although the two countries achieved relatively similar scores on the other two components, Denmark finds itself ranked

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and Bacon (1967), this needs to be traded-off against the equally important need for better coverage and predictive value of functions, depending, of course, on the purpose for which such functions were

below Australia (Lind, 1992: 96-97). This supports McGranahan's (1995) argument regarding the undesirability of combining arithmetic (life expectancy and literacy) and geometric (GDP per capita) variables in composite indexing employing conventional scaling. This is because the relative rankings of countries at similar levels of development will not correspond (McGranahan, 1995: 55-56). Countries will achieve relatively higher ratings on life expectancy and literacy than on per capita income. This compromises the meaningful comparison of index values. Improvements may be effected by either reselection or rescaling. Correlation analysis is equally useful during validation. Where the correlation between components and index scores or variable and component scores is especially weak, the specific components or variables may be excluded from the index. Profiling can also be employed in validating composite indices. It entails the plotting of component scores for different countries (or the same country over time). It enables one to identify those components of the composite index which require particular attention and to detect shared patterns of economic development (McGranahan, 1995: 43-45).

External validation entails an analysis of the relationship between component and index scores and items (validators) not included in the index, e.g. correlating index values with per capita income. External validation is used to distinguish between 'bad' as opposed to 'good' indices. An index is considered 'good' if both the index and the component scores correlate well with the validator. External validation can also be used in distinguishing between 'good' as opposed to 'bad' validators. A good validator is one that correlates well with both the index and component scores (Babbie, 1995: 161-175). Hopkins (1991), for example, identifies economic growth with development success and concludes that the HDI lacks validity since countries

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estimated in the first place.

such as Sri Lanka boast high HDIs but lack high growth rates. This follows from his argument that improved levels of education are meant to instil entrepreneurship and other desired skills required for improved economic growth (Hopkins, 1991). Yet, insofar as the HDI measures the extent to which the citizens of countries are able to enjoy relatively 'long, educated, comfortable and peaceful lives' (Rao, 1991: 1451), it may be considered a valid measurement construct. According to McGranahan *et al.* (1972: 3) and Srinivasan (1994b: 240-242), external validation is hampered by the fact that there is no objective and universal validator against which composite indices can be validated.

Ultimately, good composite indices need to be sufficiently sensitive to differences in the particular measurement constructs, reliable in terms of repeated measures yielding stable results, and accurate in being free from systematic error resulting from the omission of influences whose effects are presumed to be incorporated in the index (Adelman and Morris, 1972: 125-128).

7.5 CHRONOLOGICAL OVERVIEW OF COMPOSITE INDICES

The variety of composite indices presented in academic articles and statistical publications is summarised in Table 7.1 (page 240), indicating in each case the particular methods employed in selection, scaling, weighting and aggregation. The number of variables and component indices included in each of the composite indices is also noted, as is the number of countries for which index values were reported.

Table 7.1: Chronological summary of 21 composite indices of economic development

Description	Number of Variables (Components) [156]	Selection Method [157]	Scaling Method [158]	Weighting Method [159]	Aggregate Format [160]	Country Coverage
1. Combined Consumption Level Index (Bennett, 1951)	19 (6)	ad hoc	0-100 indexed scores	equal average	additive	31
2. Human Resources Development Index (HRDI) (Harbison and Myers, 1964)	2	ad hoc	none	ad hoc	additive	75
3. Real Index of Consumption (Beckerman and Bacon, 1966)[161]	7	ad hoc	none	correlation coefficients	functional	80

[156] Where only variables are listed, it means that either each of the component indices of the composite index is represented by a single indicator or that the composite index is not made up of individual component indices. In some cases, though, certain of the component indices of the composite index include more than one indicator (e.g. the education component of the composite index including three variables). Here the number of component indices are noted in parentheses. Due to lack of space, details as to the specific variables included in each of these indices are not related here. Yet, the variables included in the Physical Quality of Life (PQLI), Human Development (HDI), Gender Empower (GEM), and Human Poverty (HPI) Indices are briefly noted, because these reflect the most prominent and/or recently available of these indices.

[157] *Ad hoc* selection is based on theory, expert opinions and/or intuitive appeal. Where bivariate and multivariate techniques were employed in selection, the original number of variables included in the particular analysis is noted in parenthesis.

[158] *None* means that the variables were employed in their original form in calculating index values and were not rescaled using any of the techniques normally employed in rescaling variables (pages 227 to 232).

[159] *Equal average* weighting refers to the use of no explicit weighting system in aggregation. *Ad hoc* weighting is based on expert opinions and/or intuitive appeal.

[160] During *additive aggregation* composite scores are calculated by adding up each of the component scores. In the case of *functional aggregation*, composite scores are calculated by combining the component scores in some functional equation.

[161] The final scores on the Real Index of Consumption (RIC) are standardised relative to the score of the United Kingdom (UK = 100). Index scores are derived from the equation $\log y = b_0 + b_1 \log x_1 + \ldots + b_n \log x_n$, where x_i represents the score on each of the consumption variables and y real private consumption at the national level. The values for real private consumption were adjusted for international price differences using the ratio between average geometric US and national price weights (Beckerman and Bacon, 1966: 519-529).

Description	Number of Variables (Components)	Selection Method	Scaling Method	Weighting Method	Aggregate Format	Country Coverage
4. UNRISD General Index of Development (GID) (McGranahan *et al.*, 1972)[162]	18 (2)	correlation matrix (73)	0-100 indexed scores	correlation coefficients	additive	58
5. Indices of Well-Being (Campbell *et al.*, 1976)	8/9	ad hoc	1-7 metric scales	equal average	additive	1 (USA)
6. Quality of Life Index (Liu, 1977)	125 (5)	ad hoc	standard scores	equal average	functional	1 (USA)[163]
7. Physical Quality of Life Index (PQLI) (Morris, 1979)[164]	3	ad hoc	0-100 indexed scores	equal average	additive	150
8. Composite Basic Needs Indices (Ram, 1982b)	5	ad hoc	none and 0-100 indexed scores	principle component analysis	additive	82
9. Index of Social Progress (ISP) (Estes, 1984)[165]	44 (11)	ad hoc	standard scores	equal average	additive	107
10. World Standard Distance Scales (Ginsberg, *et al.*, 1986)[166]	42/22 (5)	ad hoc	standard deviation multiples	equal average	additive	143
11. Human Suffering Index (HSI) (Camp and Speidel, as related in Hess, 1989)	10	ad hoc	0-10 metric scales	equal average	additive	60 plus
12. Quality of Life Rankings (Slottje, 1991)	20	ad hoc	none	mixed	functional	126

[162] Two earlier composite indices developed by the United Nations Research Institute on Social Development (UNRISD) include the Level of Living (LoL) and Social Development (SDI) Indices. These two indices respectively included twenty and sixteen variables and were combined into six and two component indices each (UNRISD, as quoted in Todaro, 1989: 108 and Felipe and Resende, 1996: 187).

[163] Liu (1977: 230) calculated index values for sixty-five US metropolitan areas with populations in excess of 500 000 people each.

[164] The PQLI employed infant mortality rates, literacy rates and life expectancy at birth (Felipe and Resende, 1996: 187-190).

[165] In the field study preceeding its wider application this index was called the Index of Social Vulnerability (NSV) (Estes, 1984: 2-19). A variant of ISP, the Index of Net Social Progress (ISNP), is based on the exclusion of the geographic component index (Estes, 1984: 169-179).

[166] These scales consist of a Composite (RICHDEX) and Growth Potential (GROTPOT) Index which respectively employ forty-four and twenty-two variables. Index scores were rescaled relative to the average world standard by dividing country scores by the scores the country with the highest score on the first component (economic development) achieved on each of the component indices (Ginsberg *et al.*, 1986).

Description	Number of Variables (Components)	Selection Method	Scaling Method	Weighting Method	Aggregate Format	Country Coverage
13. Combined Quality of Life Indices (CQLI) (Diener, 1995)[167]	14 (7)	ad hoc	standard scores	equal average	additive	77
14. Index of Economic Freedom (Johnston and Sheehy, 1995)	10	ad hoc	1-5 metric scales	equal average	additive	100 plus
15. Economic Freedom Indices (EFIs) (Gwartney *et al.*, 1996)[168]	17 (4)	ad hoc	0-10 metric scales	equal impact and ad hoc	additive	103
16. Human Development Index (HDI) (UNDP, 1996)[169]	4 (3)	ad hoc	0-100 indexed scores[170]	equal average and ad hoc[171]	additive	174
17. Capability Poverty Measure (CPM) (UNDP, 1996)	3	ad hoc	none	equal average	additive	101

[167] CQLI consists of a Basic Value (BQLI) and Advanced Value (AQLI) Quality of Life Index. Each employs seven variables selected in an attempt to discriminate between developing and industrialised countries in terms of the same general domains of development. The combined index is the sum of the scores achieved on each of the two indices (Diener, 1995: 107-125).

[168] The first version of this index appeared in the early 1990s. Estimates are reported for three differently weighted indices. The equal impact index (Ie) weights each component with the inverse of its standard deviation. This means that highly variable components are weighted lower. Each component thus exerts an equal impact on the composite index. The two other indices are estimated with the aid of expert-based weighting systems (page 233) (Gwartney *et al.*, 1996: 37-41).

[169] The first refined version of the HDI was published in 1992, although the groundwork was laid in the late 1980s (Todaro, 1994: 63; Ul Haq, 1995: 46-48). Life expectancy at birth, adult literacy rates, mean years of schooling (which in 1990 replaced combined primary, secondary and tertiary enrolment rates), and real GDP per capita (PPP$) are used in estimating the HDI (Felipe and Resende, 1996: 187-190; UNDP, 1996: 106).

[170] With the exception of GDP per capita, the HDI employs conventional scaling. Up to 1998 it employed Atkinson's formula in transforming each country's per capita GDP relative to the threshold level of the world average income (UNDP, 1996: 106). This practice heavily penalised countries with incomes in excess of this threshold by discounting these excesses at an increasing rate. It, for example, reduced the $34 000 (PPP$) between the threshold and maximum observed income to a mere $321 (PPP$). Since 1999 a new formula is being used in rescaling the income component of the HDI. The conventional LST technique is used but with the difference that each value is transformed into logs. $W(y) = \log y - \log y_{min} / \log y_{max} - \log y_{min}$ (UNDP, 1999: 159). For a more detailed discussion of the rationale behind this change, see Anand and Sen (1999).

[171] The component index for educational attainment weights adult literacy at two thirds and the combined enrolment ratio at one third (UNDP, 1996: 106).

Description	Number of Variables (Components)	Selection Method	Scaling Method	Weighting Method	Aggregate Format	Country Coverage
18. Gender-related Development Index (GDI) (UNDP, 1996)	4 (3)	ad hoc	adjusted 0-100 indexed scores[172]	equal average	additive	163
19. Gender Empowerment Measure (GEM) (UNDP, 1996)[173]	4 (3)	ad hoc	adjusted 0-100 indexed scores[174]	equal average	additive	100
20. Global Competitiveness Indices (World Economic Forum, 1996)[175]	155 (8)	data coverage (300+)	standard scores	ad hoc and correlation coefficients	additive	49
21. Human Poverty Index (HPI-1) for developing countries (UNDP, 1999)[176]	5 (3)	ad hoc	none	equal average	functional	92

[172] The achievement on each of the three HDI component indices is adjusted for the observed disparity between men and women. The formula employed for this purpose expresses a moderate aversion to inequality, setting the weighting parameter ϵ, equal to 2. This is the harmonic mean of the male and female index values. As in the case of the HDI, the formula employed in calculating the income component index is fairly complex. It employs the Atkinson index adjusted for inequality aversion only after adjusting GDP per capita for disparity in the gender share in income and population. Disparity is quantified using data on male/female wage ratios and the male/female share in the economically active population. Where wage ratio estimates were not available, the weighted mean for all countries reporting wage ratios was used (i.e. 75 per cent) (UNDP, 1996: 107-108; 1997a: 123-124).

[173] The variables used in the GEM include women's percentage share in parliamentary presentation, administrative and managerial as opposed to technical and professional jobs, and income adjusted for gender inequality (footnote 173 above) (UNDP, 1996: 108).

[174] GEM component indices are calculated using population-weighted $(1-\epsilon)$ averaging to derive an 'equally distributed equivalent percentage' (EDEP) for both sexes. The EDEP for parliamentary presentation, for example, is calculated as [percentage male population share/percentage male parliamentary presentation] + [percentage female population share/percentage female parliamentary presentation]/2. As in the case of the Gender-related Development Index, the inequality aversion parameter (ϵ) takes on a value of 2 (UNDP, 1996: 108; 1997a: 124).

[175] Some weights are assigned in ad hoc fashion, given assumptions regarding the relative reliability of data obtained from quantitative databases as opposed to business surveys. Two variants of the Competitiveness Index (CI) are estimated. The Growth Index (GI) combines the CI with per capita income and thus pushes poorer countries higher up in the rankings. The Market Growth Index (MGI) combines the GI with the size of the economy in terms of each country's contribution to overall world economic growth and thus pushes larger countries up the rankings (World Economic Forum, 1996: 5-13; 36-39).

[176] The HPI for developing countries employs the percentage of population not expected to survive to age forty, adult illiteracy rates, the percentage of population with access to safe water and health services, and the percentage of underweight children under age five). Final index values are estimated using $HPI\text{-}1 = [(P_1^3 + P_2^3 + P_3^3)/3]^{1/3}$, where P_1, P_2 and P_3 represents each of the component indices (UNDP, 1997a: 124-125).

Description	Number of Variables (Components)	Selection Method	Scaling Method	Weighting Method	Aggregate Format	Country Coverage
22. Human Poverty Index (HPI-2) for developed countries (UNDP, 1999)[177]	4	ad hoc	none	equal average	functional	17

Only composite indices for which details on each of these elements were available, were included in Table 7.1. As a result, the Level of Living (LoL) and State of Welfare (SWI) Indices developed by Drewnowski (1974), Narrol's (1984, as quoted in Veenhoven, 1996b: 2) Quality of Life Index, Williamson's (1987, as quoted in Kallmann, 1997: 16) Physical Standard of Living Index (PSLI), and Kacapyr's (1996, as quoted in Veenhoven, 1996b: 2) Index of Well-Being had to be excluded. The five indices developed by the International Fund for Agricultural Development (IFAD) were also excluded (UN, 1994b)[178]. Measures which represent adjustments of individual social indicators or which focus on single dimensions of development were related in Chapter 6. Examples include adjustments of life expectancy (footnote 129, page 185), political freedom indices (footnotes 133 and 141, pages 191 and 195), and happiness indices (footnote 134, page 192). This, therefore, is a none-exhaustive but nonetheless relatively comprehensive list of composite indices of economic development. The twenty-two indices are ordered more or less chronologically. In the light of Table 7.1 (page 240), composite indices generally seem to be additive

[177] The HPI for developed countries employs the percentage of population not expected to survive to age sixty, functional illiteracy rates as defined by the OECD, the percentage of population living below an income poverty line set at fifty per cent of the median disposable income, and the rate of longterm unemployment. Final index values are estimated using HPI-2 = $[(P_1^3 + P_2^3 + P_3^3 + P_4^3)/4]^{1/3}$, where P_1, P_2, P_3 and P_4 represents each of the component indices (UNDP, 1999: 163).

[178] IFAD developed indices on food security, integrated poverty, basic needs supply, relative welfare and the status of women. The last index, for example, includes indicators on maternal mortality, adult literacy, primary and secondary enrolment rates, labour force status, contraceptive use, and migrant female/male wage ratios (UN, 1994b).

ones with equally weighted components consisting of variables selected in an ad hoc manner.

The typology employed in Table 6.1 (Chapter 6, page 184), with the addition of the three classes of development measures covered in Chapters 3 to 5, as well as economic freedom[179], can be employed to assess the multidimensionality of these indices. Where a variable or component included in the particular index relates directly to a specific dimension, it is accordingly noted in Table 7.2.

Table 7.2: Dimensions of 21 composite indices of economic development

Description	A	B	C	D	E	F	G	H	I	J	K	L
1. Combined Consumption Level Index	x	x	x	x		x	x				x	
2. Human Resources Development Index		x										
3. Real Index of Consumption				x							x	
4. General Index of Development	x	x	x	x					x	x	x	
5. Indices of Well-Being	x	x	x	x		x		x	x	x		
6. Quality of Life Index		x	x	x			x		x			
7. Physical Quality of Life Index	x	x	x									
8. Composite Basic Needs Indices	x	x	x	x					x			
9. Index of Social Progress	x	x	x	x	x	x		x	x		x	
10. World Standard Distance Scales	x			x					x			
11. Human Suffering Index	x	x	x	x				x	x	x		
12. Quality of Life Rankings	x	x	x	x	x			x	x	x		
13. Combined Quality of Life Indices		x	x	x	x	x	x	x	x		x	
14. Index of Economic Freedom												x
15. Economic Freedom Indices								x	x			x
16. Human Development Index	x	x							x			
17. Capability Poverty Measure		x	x									
18. Gender-related Development Index	x	x							x		x	
19. Gender Empowerment Measure								x	x	x		
20. Global Competitiveness Indices				x				x	x			
21. Human Poverty Index (developing)	x	x	x	x								
22. Human Poverty Index (developed)	x	x								x	x	

Note: The dimensions of development distinguished here are: A - demographic dynamics, B - education, training and knowledge, C - health, food and nutrition, D - human settlement, infrastructure

[179] Economic freedom relates to the 'extent to which rightly acquired property is protected and individuals are free to engage in voluntary transactions' (Gwartney *et al.*, 1996: 12). It is measured in terms of a variety of elements of economic systems. These include trade policy, taxation, government consumption, monetary policy and inflation, capital flows and foreign investment policy, banking, wage and price controls, property rights, government regulation, and black marketeering (Johnston and Sheehy, 1995: ix-21; Gwartney *et al.*, 1996: 1-46).

and communication, E - political and social stability, F - culture, social fabric and family values, G - environmental resources and pressures, H - political and civil institutions, I - income and economic growth, J - unemployment and labour utilisation, K - poverty and inequality, L - economic freedom.

Several criticisms are levelled at composite indices for not representing improved measures of well-being[180]. Not one single element of the methodology of composite indexing is above criticism. Ram (1982b) reiterates this and puts it down to various reasons. Apart from the index number problem inherent in any construction of composite indices, the underlying data often remain deficient, results remain sensitive to the methods employed in scaling, weighting and aggregation, as well as the order in which the steps in composite indexing are completed, and results remain sample-specific (Ram, 1982b: 237-239). Accordingly, Diewert (1986, as quoted in Slottje, 1991: 684-685) claims that the best one can do is to continue searching for a composite index which balances the need for conceptual clarity and methodological simplicity. The following is a brief discussion of the main lines of critique levelled at composite indices.

Firstly, it is often argued that particular indices exclude one or more essential components of development. Perthel (1981: 6-7), for example, criticises the UNRISD's General Index of Development (GID) for its failure to adjust index values for differences in population structure and inequality and its exclusion of development domains such as justice and violence. An index equally criticised for its limited dimensionality is the Physical Quality of Life Index (PQLI). Two of its three components are health-related (Todaro, 1989: 109-112; Felipe and Resende, 1996: 187-190). Morris (1979: 41-56) in defense argues that adults die for different reasons

[180] This discussion is often informed by discussions on the Human Development Index (HDI). This is not intended to represent either a wholesale condemnation or approval of the HDI. It is simply because no other composite index, except perhaps the Physical Quality of Life Index (PQLI), has provoked such extensive debate as to its relative merit. For a detailed discussion on the HDI, consult Streeten (1995a: ix-xiv). For more details on general critique of composite indices, consult Townsend (1971: 2-

than infants and that the two health variables were justifiably included[181]. One of the most common criticisms levelled at the HDI is that it excludes other social achievements crucial to the quality of life (Lind, 1992: 96-97; Duraiappah, 1996: 3), most notably political freedom and human rights (Development Brief, 1990: 78; Srinivasan, 1994b: 240-242)[182]. The needs which the HDI does include, can be equally well met in prisons and under authoritarian rule (Hopkins, 1991: 1469-1473). Streeten (1994: 236; 1995a: xiv), though, argues against the addition of political and human rights variables to the HDI. He cites four reasons for this. In the first instance, this construct is too important to simply trade off against the other components of the HDI. In the second instance, these variables are much more volatile than the three other components. This may severely affect the intertemporal stability of index values. In the third instance, these variables are less objectively measured than the others included in the index, thus compromising the overall objectivity of the index. In the final instance, the nature of the relation between political freedom and human development is not that clearcut.

Most indices also fail to allow for gender, household, regional and other inequalities, thus restricting application to the national level (Townsend, 1971: 2-12; Oster *et al.*, 1978: 133-134; Hilhorst, 1985: 6-10; Anand and Ravallion, 1993: 136-138; Greeley, 1994: 57). Indices can, however, be applied at disaggregated levels given that the necessary disaggregated data are available (Streeten, 1994: 235). The necessary adjustments can also be effected at the component or index level. In the

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12), Oster *et al.* (1978: 133-134), Hilhorst (1985: 6-10), Anand and Ravallion (1993: 136-138), and Greeley (1994: 57).

[181] It may also be argued that the limited availability of data at the time gave analysts a limited choice as to variables suitable for composite indexing (Todaro, 1989: 109-112).

[182] This concern with such a specific and very narrow range of basic needs is reminiscent of the 1980s when analyses were confined to studying the relation between health, education, nutrition and per capita income (Wheeler, 1980). Thus, the HDI is often considered nothing more than old wine in a new bottle (Rao, 1991: 1453-1459).

case of the Gender-related Development Index, for example, each of the three component indices is adjusted for gender inequality before determining the composite index value (footnote 172, page 243). What is important, however, is the fact that most composite indices were developed for the purpose of national application and international comparisons rather than for household and/or regional application.

Secondly, it may be argued that particular components of indices be quantified with the aid of different variables (Streeten, 1995a: viii). Anand and Sen (1993, as quoted in Streeten, 1995b: 26), for example, call for the HDI to be differentiated for developed and developing countries. They argue that it should be left unchanged for low income economies but could benefit from being supplemented with tertiary enrolment ratios and infant mortality rates, respectively, in the case of high and middle income economies. The same applies to environmental indicators. As a result of differences in the level of economic development and geophysical characteristics, countries have to cope with different environmental problems (McGranahan *et al.*, 1972: 4-6; Economist, 1991: 48). So, for example, industrialised countries are more concerned with pollution emissions and LDCs are more concerned with the destruction of arable land (Pomfret, 1997: 278).

Thirdly, indices are often criticised for being unable to reveal anything that a single variable (and particularly per capita income) alone cannot reveal. This line of argument is often taken by the proponents of income-based indicators. Stewart (1985), McGillivray (1991) and Srinivasan (1994a) point to the high correlation between the HDI's three components. Felipe and Resende (1996: 187-190) highlight the high degree of multicollinearity to which the Physical Quality of Life Index (PQLI) is subject. Social indicators, in fact, are often highly correlated with economic indicators of development (Diener and Suh, 1997: 192-200). Ogwang (1994: 2011-

2014), furthermore, goes so far as to argue that indices such as the HDI reveal nothing that per capita income and life expectancy alone would not have revealed, except perhaps in the case of a few unique countries where HDI and GDP rankings differ substantially.

Fourthly, ad hoc selection is subject to severe criticism. The HDI, for example, has been made out to be a politically motivated index intended to boost the development rankings of countries making concerted efforts at addressing health and education backlogs (Economist, 1991b: 64; Todaro, 1994: 63-66; Elkan, 1995: 12). Selection may also be biased insofar as technical criteria such as the availability and accuracy of data alone drive the selection process. Ideological considerations may also introduce bias in selection (Townsend, 1971: 2-12; Oster *et al.*, 1978: 133-134; Hilhorst, 1985: 6-10; Anand and Ravallion, 1993: 136-138; Greeley, 1994: 57). Examples include accepted ideas regarding the desirability of political democracy and gender equality.

In the *fifth* instance, the accuracy and comparability of the data employed in composite indices are often criticised. Lind (1992: 96), Ogwang (1994: 2011) and Srinivasan (1994b: 240-242) consider the HDI empirically unsound and conceptually weak given the measurement errors, biases and incomparability inherent in the underlying data. Some of the underlying variables are estimates based on mathematical extrapolations rather than actual observations. Others are based on different definitions of similar concepts (Srinivasan, 1994b: 240-242). Perthel (1981: 6-7) comes to a similar conclusion regarding the UNRISD's General Index of Development (GDI). Most of the indicators related in these pages, all of which are or have the potential of being employed in composite indexing, are subject to these shortcomings (Chapter 6, pages 196 to 210).

In the *sixth* instance, there is criticism against the weighting and aggregation techniques employed in composite indexing. According to Todaro (1989: 109-112) and Rao (1991: 1453-1459), equal average weighting systems such as those employed in the majority of indices related in Table 7.1 (page 240) are not adequately justified. Often, no clear rationale is presented for preferring them to alternative weighting systems. Hopkins (1991), furthermore, argues that additive aggregation implies that one can measure apples and oranges individually and then aggregate them into some meaningful index.

Finally, there are those criticisms aimed at the supposed lack of practical value of composite indices. Oster *et al.* (1978: 133-134), Rao *et al.* (1978: 31-32), and Rao (1991: 1453-1459) claim that composite indices such as the HDI give no specific and focused policy advice. Srinivasan (1994b: 240-242) adds that the HDI has failed to bring about any significant changes in development policy. It is important, though, to note that many composite indices were never developed with this purpose in mind. Some were intended as tools for theoretical analysis whilst others were presented as alternative, simple and more visible ways of reporting on the development situation.

In the light of these criticisms of composite indices, one can reflect as follows on the four aspects of technique and method identified in Chapter 2 (page 24). The composite indices related in Table 7.1 (page 240) are *quantitative* insofar as the indices are all presented in numerical format. Yet, the indices also have a *qualitative* dimension insofar as they reflect the relative performance of nations (or other entities) on some combination of indicators. The fact that there exists no general agreement as to the meaning of (under)development, further enhances the qualitative nature of composite indices (Greeley, 1994: 57).

Composite indices, furthermore, are subject to *subjectivity* despite the *objectivity* of the methods sometimes employed in composite indexing. Principal component analysis, for example, presents a relatively objective means of selecting and weighting variables during composite indexing, but subjectivity may be introduced during the selection, scaling, weighting and/or aggregation phases of composite indexing (Economist, 1990: 78). Given the general characteristics of the indices presented in Table 7.1 (page 240), the inherent subjectivity of most indices is evident. The often-employed ad hoc selection of components and variables is the most prominent of these sources of subjectivity. Weighting and aggregation methods also, in general, remain relatively subjective. Diener and Suh (1997: 206-210) call for the use of a combination of methods during selection, scaling, weighting and aggregation in order to improve the objective quality of composite indices.

The composite indices related in Table 7.1 (page 240) are of a *cardinal* nature in the sense that these indices reflect the magnitude of differences between certain entities in terms of index values. Each ranks nations and/or regions relative to each other in terms of some combination of variables (OECD, 1976: 25-30; Ziegler and Britton, 1981: 305-306). Yet, the indices remain *ordinal* insofar as the magnitude of these differences cannot be interpreted meaningfully. So, for example, it is not possible to interpret directly the meaning of country A achieving a rating .06 higher than country B on the HDI. The ordinality of composite indices also represents a drawback insofar as index values in themselves have no clear meaning, thus limiting their interpretative value (Hopkins, 1991; Veenhoven, 1996b: 2-5). Others, though, have argued the converse. They claim that composite indices enhance research by aggregating differentials and reducing data to new and more efficient units for comparison and analysis (Babbie, 1995: 161-175; Diener and Suh, 1997: 206-210).

The *multidimensionality* of composite indices represents one of their main advantages (Table 7.2, page 245). Indices represent aggregate and relatively simple measures of a combination of complex development phenomena (Diener and Suh, 1997: 206-210). Yet, Khan (1991, as quoted in Kallmann, 1997: 13), maintains that single index values are not that useful. He argues that single index values contradict the complex and interdependent nature of the development process and remain arbitrary due to the continued debate as to the best methods of scaling and weighting.

7.6 COMPOSITE INDICES IN COMPARATIVE APPLICATION

As is the case with social indicators, the comparative application of composite indices of economic development remains problematic. To a large extent, this results from the various shortcomings of composite indices related in these pages (pages 246 to 250). Comparison bias is inherent in composite indices insofar as they are but summary measures of a number of individual survey-based indicators. Comparisons of composite indices are also problematic due to other reasons. On the one hand, differences in the same index cannot be meaningfully compared across time and space. *Intertemporal* bias results from (i) differences in the relative importance of the variables and components included in the index (Elliott, 1972: 37-56; UN, 1994b: 9; Veenhoven, 1996b: 2-5)[183], (ii) changes in the variables and components included in indices, and (iii) changes in the methods employed in weighting and aggregating index values. *Interspatial* comparisons of the same index are equally problematic. Stewart (1985: 54-66) argues that composite indices conceal inequalities in the

[183] In the case of the Combined Consumption Level Index, Bennett (1951) recognises that different countries put different values on the consumption of different items. In Nigeria's case, for example, lumber is an important commodity for ceremonial purposes, thus introducing cultural bias (Bennett, 1951: 633-642).

particular components and variables, thus restricting their value in comparative analyses. Townsend (1971: 14-24) and Streeten (1995a: x-xii) come to a similar conclusion. Ul Haq (1995: 50-54), though, maintains that composite indices remain useful in comparative analyses since index values are distributed less skew than the unindexed variables. He also points out that a more meaningful comparison and application of composite indexing can be achieved by estimating disaggregated index values (e.g. by gender, ethnicity or regional location) where the specific variables are available in disaggregate form.

On the other hand, different indices cannot be meaningfully compared, neither across space nor across time, given differences in content and methodology. Slottje (1991) illustrates the substantial differences in indices employing different weighting and aggregation methods. As a result of the ordinal nature of composite indices, indices are also problematic in terms of their interpretative value during comparative analyses (page 251). The standard practice in comparing composite indices, either with other composite indices or with individual indicators, is one of comparing the differences in the rankings nations achieve on different indices and/or indicators. Elkan (1995: 13), for example, compares rankings on the HDI and GNP per capita for a sample of 132 countries. At the extremes of this comparison the UAE's ranking on GNP per capita exceeded its HDI ranking by forty-three positions (highest downward ranking), while Sri Lanka achieved a ranking on the HDI thrirty places higher than on GNP per capita (highest upward ranking)[184]. Apart from conceptual and methodological differences and disparities in the quality of the underlying data,

[184] Similar comparisons can be found in Todaro (1994) and Ul Haq (1995). Todaro (1994: 64), for a sample of 160 countries for 1990 data, reports the highest downward and upward rankings as respectively -45 (UAE) and +55 (Vietnam). Ul Haq (1995: 52), for a sample of forty-three countries for 1994 data, reports the highest downward ranking as -72 (Gabon) and the highest upward ranking as +49 (China). McGranahan *et al.* (1972: 136-138), furthermore, compared national rankings on the UNRISD's General Index of Development (GID) and per capita GNP.

differences in rankings may also be attributable to other factors. These include differences in culture and population size. Smaller countries, for example, often achieve substantial upward rankings. Arabic nations tend to be ranked downward on the HDI, given the extent to which the gender inequalities endemic in their cultural milieu push their scores on the literacy and life expectancy component indices down. According to Beckerman and Bacon (1966: 521-529), furthermore, comparisons may be less meaningful where the sample of nations composite indices are compared for is not representative of the total income range. Thus, comparisons of index values conceal differences originating from a variety of sources and are not useful in detailed microlevel comparisons (Beckerman and Bacon, 1966; Slottje, 1991; Elkan, 1995).

In terms of the distinction between *absolute* as opposed to *relative* indicators, composite indices are all relative in nature (Todaro, 1994: 63-66). The primary aim, in fact, with composite indexing is to rate and compare nations relative to some standard of achievement. This standard is set relative to the limits of achievement employed during the scaling, weighting and aggregation of composite indices.

7.7 FOCUS OF COMPOSITE INDICES

Composite indices generally combine measures of ends and means (Ul Haq, 1995: 50-54). There has, however, been some debate as to whether indices should be based on ends, means or a combination of the two (page 223). Morris (1979: 94-96) argued that indices based on ends alone lack policy relevance insofar as policies and programmes are often defined in terms of means rather than ends. He consequently combined variables of ends and means in his Physical Quality of Life Index (PQLI) so as to highlight the important synergy between ends and means. Another reason for

employing indicators of both means and ends in composite indices is that certain ends are means in themselves, thus complicating the distinction between means and ends (page 223). Veenhoven (1996b: 5), however, claims that such combination of ends and means lacks theoretical justification and political relevance. Diener and Suh (1997: 192-200) expand on this criticism of ends and means-based indices. According to them such practice complicates the value of indices during causal analyses. Accordingly, Veenhoven (1996b: 5) argues in favour of ends-based measures since these can be directly related to policy goals. In fact, indicators are often developed expressly with the purpose of monitoring the impact of interventions targeting specific issues, e.g. primary health care (infant mortality rates), transportation (kilometres of paved roads per square kilometre), and crime (homicides and rapes per 100 000 of the population).

7.8 CLARITY, SIMPLICITY AND FLEXIBILITY OF COMPOSITE INDICES

In respect of method and technique, composite indexing is relatively complex. Yet, indices such as the PQLI and HDI are often applauded for their relative simplicity (Todaro, 1989: 109-112). In general terms, indices based on ad hoc selection, traditional 0-100 scaling, equal weighting and additive aggregation are simpler than those employing multivariate techniques in selection and weighting, standard scores in scaling, and functional aggregation. Contrary to the claim of proponents of composite indexing that index values are relatively simpler to interpret than the underlying variables (Ul Haq, 1995: 50-54), the interpretative value of composite indices remains a contested issue. In fact, the multiplicity and

multidimensionality of composite indices are often impediments rather than aids in interpretation (page 248) (Ram, 1982b: 228).

Composite indices, insofar as they represent an empirical transformation and collation of data, are relatively flexible (Ul Haq, 1995: 46-48). Changes in selection, scaling, weighting and aggregation can be effected readily, albeit at the cost of comparability.

7.9 AVAILABILITY OF COMPOSITE INDICES

The composite indices listed here perform relatively well in terms of cross-national availability (Table 7.1, page 240). The smallest and largest samples, respectively, report index estimates for thirty-one and 174 nations. Cross-national availability has improved over time as the availability of the underlying data have improved. The only indices which perform relatively well in terms of intertemporal availability are the UNDP's Human Development Index (HDI), the Economic Freedom Indices reported by the Liberty Fund, and the World Economic Forum's Global Competitiveness Indices. HDI estimates are available for 1990 to 1997, while the other two indices have been published annually since the 1980s. Subsequent estimates, though, are often based on a revised index content and/or measurement methodology, or on minor adjustments to original data. The UNDP's Gender-related Development Index (GDI), Gender Empowerment Measure (GEM), and Human Poverty Index (HPI), although introduced only recently, can be expected to be continually updated in future publications of the Human Development Report, thereby improving their intertemporal availability. The other indices, however, are primarily confined to the specific time frames to which the particular analyses apply. Ul Haq

(1995: 46) puts this down to the fact that other composite indices have either been methodologically unsound or were never applied for a sufficient period of time to allow them to be further developed, refined and tested so as to remain prominent. Rao (1991: 1459) suggests greater collaboration and coordination between agencies producing reports on composite indices. He calls for reports that are coordinated in terms of timing, content, frequency and focus.

7.10 CONCLUDING REMARKS ON COMPOSITE INDICES

On the strength of the systematic positive association between income and popular composite indices such as the HDI, many have claimed that these indices represent no real contribution to the literature on indicators research. Composite indices, furthermore, are often considered to be ideological statements rather than practically functional indicators (McGillivray, 1991). Yet, composite indices represent useful supplements to income-based development indicators (Ram, 1982a: 116). These indices remain invaluable in terms of their ability to simplify complex measurement constructs, to focus attention and to catch the eye, thus enhancing their political appeal (Streeten, 1995a: x-xii). Thus, the remainder of this thesis is dedicated to the construction of two new composite indices of economic development. The first of these measurement efforts attempts to quantify international disparities in human security (Chapter 8), whilst the second is concerned with the measurement of provincial disparities in reconstruction and development in South Africa (Chapter 9).

Section B

New Composite Indices of Economic Development

Chapter 8

The Extent of and possible Explanations for International Disparities in Human Security

8.1 BACKGROUND TO AND SCOPE OF THIS CHAPTER

Efforts at composite indexing are ultimately concerned with the philosophical question of determining and assessing 'what makes a good life' (Sen, 1992: 4; Sugden, 1993: 1947). The measures of human security presented here are based on a very specific conceptualisation of this 'good life'. The concern is with the specific dimensions of quality of life included in the UNDP's conception of human security[185]. Human security does not merely refer to the broadening of people's choice. It entails more than human development. It refers to the need of people to be able to 'exercise their choices safely and freely' and to be 'relatively confident that the opportunities they have today are not totally lost tomorrow' (UNDP, 1994: 23). In recognising that development entails a diversity of choice, this measurement effort complies with Van Nieuwenhuijze's (1985: 187) and Beukes' (1994: 405) calls for indicator research of a multidisciplinary nature.

No composite index currently exists for assessing human security as defined by the UNDP. This effort was in part motivated by this consideration. Yet, the measures developed here are neither truly novel, nor original in attempting to combine some set of development objectives in measurement. The twentieth century,

[185] The measures presented here do not purport to represent a definitive list of intrinsically valuable capabilities and functionings. As Sen (1992) rightly argues, no conception of development can do that. Hence these measures can be interpreted only within this specific conceptual context.

in fact, has witnessed the articulation of many multidisciplinary concepts of development. Engel (1990: 2), Goulet (1990: 38), and Streeten (1994: 232-233), for example, all argue in favour of such an inclusive view of development, recognising its economic, social, political and environmental elements. The wide variety of alternative, though often obscure, composite indices of development developed over the years bears further testimony to this (Chapter 7, Table 7.1, page 240).

The novelty and originality of the Human Security Indices (HSIs) developed here lie in the fact that, unlike other efforts at composite indexing, the indices have two variants which respectively represent an effort and outcomes-based development index. In attempting this, this measurement effort recognises the distinction between the assessment of the commodity-determinants of well-being (goods and services acting as inputs) as opposed to the actual well-being of the constituents of well-being (capabilities of individuals) (McGranahan, 1972: 95-100; Dasgupta *et al.*, 1994: 42).

The human security Effort index developed here includes measures of the extent to which government makes an effort at meeting certain development objectives. Efforts are assessed in terms of the delivery of those means required for meeting specific objectives. Where valid indicators for quantifying these efforts were not available, measures of the degree in which governments have committed themselves to meeting those objectives are employed as proxies. The human security Outcome index developed here includes measures reflecting the extent to which these particular development objectives have actually been achieved and the extent to which people possess the particular capabilities. The concern, therefore, is with 'those states, qualities and activities valued for their own sake' (Galston, 1980: 55).

These two sets of indices allow one to analyse the extent to which efforts at human security are translated into actual achievement. This is measured by means of

the so-called Inefficiency ratio. This ratio is calculated by dividing the Effort index by the Outcome index. A ratio of one means that outcome is commensurate with effort. Ratios smaller than one imply that efforts are translated into relatively greater achievements and vice versa. The term Inefficiency ratio is preferred to that of Efficiency ratio because larger ratios imply less success at translating effort into outcome. The measures devised here are also employed in attempting to identify those development characteristics generally associated with higher levels of effort and outcome and greater success in translating effort into actual achievement.

The idea, therefore, is not simply to show that some nations are more (or less) developed than others or to present an approximation of these differences in living conditions (Hulme and Turner, 1990: 15-23). The purpose, rather, is to develop descriptive measures of development for analytical purposes. The analysis of these new measures of development are reported on in the following pages. First, though, it is necessary to outline the methodological framework used in developing these measures.

8.2 METHODOLOGICAL FRAMEWORK FOR MEASUREMENT OF INTERNATIONAL DISPARITIES IN HUMAN SECURITY

The methodology of composite indexing has been related in detail in Chapter 7 (pages 219 to 239). The methodology of measurement employed in devising the HSIs and Inefficiency ratios is discussed in the subsequent pages. The discussion is arranged in terms of the different steps in composite indexing, i.e. selection; scaling; weighting; aggregation, and validation. Following that are some general methodological comments on this measurement effort and the nature of the resulting

HSIs and Inefficiency ratios. This section concludes with a discussion of the results of the internal and external validation of these measures.

8.2.1 Selection of variables and components of HSIs

The specific components and variables included in each of the HSIs are listed in Table 8.1. The selection of components was here driven by ad hoc rather than empirical considerations (Baster, 1972: 1-4). The seven components are those listed by the UNDP (1994: 23) as the main dimensions of human security. Despite ad hoc selection being open to severe criticism, it remains the preferred method of selection where, as in this case, composite indices are cast in a specific context. The indices must ultimately reflect the underlying measurement construct, i.e. human security as defined by the UNDP.

Table 8.1: Human Security Indices (HSIs) of effort and outcome

Component	Indicator of effort	Indicator of outcome
1. Economic security	Combined gross enrolment ratio at primary, secondary and tertiary level (percentage) (1997)	Real GDP per capita ($PPP) (1997)
2. Food security	Percentage of daily calorie requirements supplied (1990s)	Under-five mortality per 1000 population (1997)
3. Health security	Doctors per 100 000 population (1993)	Maternal mortality rate per 100 000 live births (1990-97)
4. Environmental security	Status of eight selected international environmental treaties (1994)	Protected areas as percentage of total land area (1997)
		CO_2 emissions (metric tons per capita) (1996)
		Emissions of organic water pollutants (kilogrammes per day per 1000 population) (1993-96)
5. Personal security	Police officers per 100 000 population (1990s)	Reported homicides per 100 000 population (1990s)
6. Community security	Status of six selected international human rights treaties (1994)	Nondiscrimination index (1994)
7. Political security	Political freedom ratings (1994/95)	Voter turnout (percentage) (1990s)

Data sources: Karatnycky (1995), Ul Haq (1995), Centre for International Earth Science Information Network, (1997), Kurian (1997), UNDP (1999), UN High Commissioner for Human Rights (1999), World Bank (1999a and b), World Resources Institute (1999).

Three specific guidelines are employed in indicator selection. *Firstly*, indicators need to be valid. Differences in the selected indicator must reflect differences in the particular measurement construct[186]. Discriminant ability is equally important when it comes to validity. In essence, improvements in indicators need to be equally relevant and achievable in all nations (Rao, 1991: 1453-1459). As a result, indicators exhibiting a significant plateau effect were excluded. Such indicators usually do not allow one to distinguish meaningfully between nations at the upper end of the development scale (Sen, 1993: 62-66). Inconsistencies with regard to the desirability of indicator levels can also not be tolerated (Stewart, 1985: 87-93). Calorie intake, for example, can be equally undesirable when extremely low or extremely high, thus comprising the variable's discriminant ability. Higher levels of indicators need always to reflect either improvement or deterioration.

Secondly, indicators need to be comparable in terms of the relative standardisation of the concepts and methods employed in arriving at these indicator estimates (Morris, 1979; Estes, 1984). Since these indices are primarily employed in cross-section analysis, the indicators also need to be standardised for differences in population or country size so as to enhance their value in comparative analysis. Consequently, the indicators selected to represent each of the index components allow, where required, for differences in population and country size, e.g. being expressed in per capita terms or as population ratios.

Despite statistics being reported in certain standard formats, standardisation can never be either entirely complete or perfect. Data reported in compendiums of international statistics are normally collected from different agencies, which employ

[186] According to Seers (1972b: 34), there usually are good grounds for criticising the conceptual validity of indicators. Yet, as he so aptly points out, indicators should not be criticised until devoid of any meaning. Thus, as is evident in these pages, the indicators representing each of the components are

different data sets and may use different methodologies. Hence development data are always susceptible to a certain degree of inaccuracy. This fact is allowed for in the subsequent empirical analysis of the resulting indices of development (page 281).

Finally, there is the matter of data availability. Recent statistics must be readily available for a relatively large sample of nations. HSIs and Inefficiency ratios are compiled for the largest possible number of both developed and developing countries. The idea, therefore, is to maximise the sample size. Hence, indicators for which estimates were available only for either developing or developed countries were not considered for selection.

The main point of departure, therefore, in indicator selection was selecting from the wide variety of available indicators those indicators that conceptually best matched each of the particular index components and which performed adequately in terms of validity, comparability and availability. Where adequate grounds existed for selecting indicators other than the ones that were theoretically and intuitively the most appealing, these grounds are clearly stated in order to justify the particular choice. The following indicators were selected to quantify effort and outcome with regard to each of the seven dimensions of human security.

In terms of *economic security*, per capita income is considered the main parameter of personal economic well-being. Differences in per capita income are measured using the latest available estimates of real GDP per capita ($PPP)[187]. Equally important, however, is the extent to which people can find and keep the jobs that are required to afford them an income (UNDP, 1994: 25). It therefore would

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not intended to be perfect conceptualisations of each of the components but as best reflecting differences in the particular measurement construct.

[187] Purchasing Power Parity (PPP$) represents the amount of 'goods and services (that) can be purchased with the recorded income per capita of different countries (in this case the US) depending on the relative prices of similar products (and services)' in different countries (Todaro, 1994: 698). PPPs are the 'currency converters' or 'price deflators' employed in converting broad aggregates such as GDP to a comparative basis across countries (Hill, 1984: 128, 132), rather than using current exchange rates.

have been ideal to combine per capita income and unemployment in the Outcome index of economic security. Recent data on unemployment rates, though, are neither meaningfully comparable nor available for a large sample of countries. The available estimates, furthermore, range from 1990 to 1997. As a result, unemployment rates were excluded from the Outcome index since their inclusion compromised comparability and sample size.

Education and training represent the main determinants of differences in earning potential. The combined gross enrolment ratio at the primary, the secondary and the tertiary level is employed in monitoring efforts at economic security. In order to ensure adequate discriminant ability, combined enrolment ratios are preferred to individual ones. The combined enrolment ratio represents the total number of students enrolled at all three levels of education expressed as a percentage of the population aged 6-24 (World Bank, 1997: 255). Primary and secondary enrolment are particularly susceptible to the plateau effect. Many countries have already achieved close to maximum enrolment at these two levels of education. The addition, though, of tertiary enrolment to the combined ratio substantially improves discriminant ability.

Efforts at maintaining *food security* are measured in terms of the percentage of daily calorie requirements supplied. Daily calorie supply is calculated as the total calorie equivalent of net food supplies divided by the total population and related in daily averages. Daily calorie supply is then related to the calorie requirements set by the World Health Organisation (WHO) to determine the extent to which food supplies can meet these requirements. Hence it does not represent the actual calorie consumption of individuals but the average calories for consumption provided to the total population.

In terms of outcomes, one needs to assess the extent to which this supply of calories is consumed in such a way as to limit malnutrition. Ideally, the best indicator would be estimates of the prevalence of malnutrition in children aged under five. Recent estimates, though, are available only for a small number of developing countries. In fact, data were available only for seven of the twenty-six countries included in the original sample. In order to maximise the sample size and include both developed and developing countries in the sample, the under-five mortality rate is employed as a proxy of malnutrition. Lack of nutrition, though, only partially explains child deaths. Of the ten million children aged under five who died in 1997, ninety-seven percent were from developing countries. Malnutrition in combination with infectious diseases such as pneumonia and diarrhoea caused most of these deaths (World Health Organisation, 1998: 3). It is estimated that undernutrition contributes to at least half of child deaths (DFID, 1999: 8). On this evidence, under-five mortality can be considered a valid, although not ideal proxy for nutritional outcomes.

The selection of indicators of *health security*, as mentioned in Chapter 6 (page 203), remains problematic due to the varied ways in which health care is provided and health problems are manifested in different settings. Doctors per 100 000 population was selected as the indicator best reflecting the extent to which people have access to sufficient preventative and curative health care. It was preferred to the percentage of the population with access to health services, which in measurement is confined to curative treatment of disease and injury. It also lacks discriminant ability. In the case of developed countries, it is simply reported that more than ninety-five per cent of the population have access to health services. No reference is made to specific levels of access. Thus, it does not represent an adequately discriminating indicator of efforts at maintaining health security.

The choice of an indicator was equally problematic in the case of the Outcome index of health security. The maternal mortality rate was the eventual choice. The UNDP (1994: 28) also recognises it as the health indicator with the best discriminant ability. It was considered superior to total mortality rates and indicators of disease incidence. Mortality rates include causes of death not directly related to health care, e.g. homicide and old age. Furthermore, certain of the diseases (e.g. AIDS) that cause these deaths may not be curable. Disease incidence, which the UNDP (1994: 28) places particular emphasis on, was considered inappropriate insofar as incidence is very much dependent on facilitating factors such as climate and lifestyle, e.g. malaria, tuberculosis and cancer. Thus, differences in disease incidence may be attributable to factors other than the delivery of appropriate health services.

The available indicators of *environmental security* are mostly confined to outcomes, e.g. de/reforestation, depletion of natural resources, and air pollution. Effort-based indicators are few and far between. Indicators of the extent to which national legislation and industrial regulation are sensitive to environmental issues are either non-existent or too complex for indexing purposes, and perform poorly when it comes to data availability. The only existing data that can realistically be related to national efforts at environmental protection are the extent to which nations are party to international environmental treaties. This pertains to certain treaties having entered into force in these states, or alternatively, in terms of these states being signatories to certain treaties[188]. This represents the best proxy of what Andersson (1992: 237-238) calls disparities in international environmental awareness. According to Gamble (1995, as quoted by the Centre for International Earth Science Information Network,

[188] According to the 1969 Vienna Convention on the Law of Treaties, a treaty has entered into force when the particular country is bound by it. When a country is signatory to a treaty it means that the particular country has expressed its consent to be bound by the specific treaty (Centre for International Earth Science Information Network, 1997).

1997), the international laws expounded in treaties 'work exceedingly well almost all of the time (and) compliance approaches 100 per cent'. Eight international environmental treaties are employed in estimating national environmental awareness. The treaties were selected so as to represent environmental issues of relevance to all nations. Consequently, treaties like the Convention of the Law of the Sea, on Nuclear Weapon Tests in the Atmosphere, on Marine Pollution and on Pollution from Ships had to be excluded on the grounds that these environmental treaties were more at issue in some countries than in others. The eight selected treaties include the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*, the *Convention on International Trade in Endangered Species of Wild Fauna and Flora*, the *Vienna Convention for the Protection of the Ozone Layer*, the *Convention on the Conservation of Migratory Species of Wild Animals*, the *Convention on Wetlands of International Importance*, the *Convention concerning the Protection of the World Cultural and Natural Heritage*, the *Convention on Biological Diversity*, and *the Montreal Protocol on Substances that Deplete the Ozone Layer*. For each of these treaties the total number of days that the particular treaty has been in force in the particular country or that the particular country has been a signatory to the treaty, is determined. This is done by subtracting the date the treaty entered into force or was signed by the particular country from a later date, i.e. 31 December 1994[189]. These totals are added up for each of the eight treaties for each of the countries to act as proxy for environmental awareness. The resulting indicator reflects the total number of days that the particular country has been party to the eight treaties. Totals were not averaged out over the eight treaties since some countries are not party to all

[189] The indicators used to measure outcomes with regard to human security range from 1994 to 1997 (Table 8.1, page 262). These outcomes are the result of the corresponding efforts at human security. The indicators used to measure effort can therefore not postdate those used to measure outcomes. As a

the treaties. The resulting averages would have distorted the proxy and compromised the discriminant ability of the indicator. This choice of methodology, furthermore, implies that older treaties carry a much greater weight than more recent ones. The main purpose here, though, is to find an aggregate proxy of countries' commitment to environmental issues of international importance.

When it comes to outcomes-based indicators, the multiplicity of environmental issues complicates selection. There are a multitude of environmental threats that are crucial to environmental sustainability. These concerns include air pollution, ozone depletion, climatic change (global warming), availability of fresh water, coastal and marine degradation, land degradation, deforestation and habitat loss, loss of biological diversity, environmental hazards and disasters (e.g. volcanoes and oil spills), and toxic chemicals and hazardous waste (Tolba and El-Kholy, 1992: 1-276; Duraiappah, 1996: 8-26). Hence three environmental indicators are combined in an equally weighted Outcome index of environmental security. The three selected indicators are (i) protected land area as percentage of total land area (summary indicator of the extent to which land is valued and a culture of conservation is ascribed to), (ii) CO_2 emissions in metric tons per capita (summary indicator of the quality of air), and (iii) emissions of organic water pollutants in kilograms per day per 1000 population (summary indicator of the extent to which water resources are put under pressure). These indicators are universal insofar as they represent environmental impacts equally relevant in both developing and developed nations. The three indicators, furthermore, each focus on a major environmental resource, i.e.

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result, 31 December 1994 is used to calculate the proxies of efforts at environmental and community security.

water, air and land, which provide the life-supporting systems required for both human subsistence and industrial production (Folke, 1992: 77-79)[190].

In the case of *personal security*, the UNDP (1994: 30), in addition to criminality, lists threats of violence emanating from the state (physical torture), from other states (war), and from other groups of people (ethnic tension) as elements of personal security. Comparable proxies of these three elements of personal security are not available for a sufficiently large sample of countries. These elements also overlap substantially with the components of community and political security already included in the index. Hence these three issues are excluded from this component index. The concern, rather, is with acts of violence committed by individuals and that affect individuals, i.e. crime. In terms of effort, the focus is on policing, i.e. police officers per 100 000 population. Assuming that policing is effective and efficient, relatively larger police forces represent greater efforts at policing. Outcomes with regard to personal security are monitored via the number of reported homicides per 100 000 population. Data sets on the overall incidence of crime (i.e. reported crimes per 100 000 of the population) appear suspect but are employed to assess the extent to which the use of different data sets affect composite index values (page 281). The most probable reason for this data being suspect is the differential quality of reporting systems. Victimisation rates, although superior to incidence rates in terms of allowing for the underreporting of crime, were excluded since estimates were not readily available for large samples of countries. Incidence rates are preferred to indicators related to the judicial and correctional elements of the criminal justice system insofar as the incidence of crime, even where substantially underreported, is the original

[190] Forests, the fourth major environmental resource often distinguished in environmental textbooks, were excluded from this analysis insofar as this environmental concern is not equally at issue in all nations. Some nations, due to climatic and geographic reasons, possess no forestry resources.

manifestation of these threats to personal security[191]. Arrest, conviction, sentencing and imprisonment can only follow once a crime has been committed and reported. The validity of this variety of statistic is also compromised insofar as the disparate efficiency of criminal and justice systems means that many criminals are neither arrested nor convicted.

Community security refers to the security people derive from group membership, e.g. families, racial and ethnic groups, and local communities. Group membership is also derived from gender and religious affiliation (UNDP, 1994: 31-32). The effort of governments at affording people community security is assessed in terms of the extent to which they are party to eight selected international human rights treaties. According to the UN High Commissioner for Human Rights (1999), nations, by being party to such treaties, 'assume a legal obligation to submit periodic reports outlining the legislative, judicial, administrative, and other measures they have taken to ensure the enjoyment of the rights contained in the treaty'. The selected treaties focus on the protection of the rights of some of the above-mentioned membership groups. The six treaties included here are the *Convention on the Prevention and Punishment of the Crime of Genocide* (1948), that relating to the *Status of Refugees* (1954), that *on Economic, Social and Cultural Rights* (1966), that on the *Elimination of all forms of Racial Discrimination* (1969) and *Discrimination against Women* (1979), and that on the *Rights of the Child* (1989) (UNDP, 1996: 214). The same method used in calculating the proxy of national environmental awareness employed in the Effort Index of environmental security is employed here (page 268). The total number of days that the particular treaty has been in force in the particular country or that the particular country has been a signatory to this treaty are determined for each

[191] Strijdom (1990, as quoted in Glanz and Smit, 1995: 61-69), for example, estimates that crime in South Africa is eighteen to sixty-five per cent underreported.

of the six human rights treaties. This is done by subtracting the date on which the treaty entered into force or was signed by the particular country from a later date, i.e. 31 December 1994 (see footnote 189, page 268). These totals are added up across the six treaties for each of the countries. The resulting indicator reflects the total number of days that the particular country has been party to these six treaties. As in the case of the proxy of environmental awareness, the totals were not averaged out over the six treaties so as to enhance the discriminant ability of the indicator. Similarly, this choice of methodology again implies that older treaties carry a much greater weight than more recent ones. For the same reason noted elsewhere, this is not considered problematic (page 268).

Outcomes with regard to community security can be assessed in terms of indicators dealing with the various domains of community security, e.g. family life and ethnic and religious conflict. The UNDP (1994: 32) lays particular emphasis on the latter aspect. The large number of indicators required to cover all these domains and the resultant questions as to the weighting of index components compromise the simplicity of the index. Data on these variables, furthermore, are not always readily available for large samples of countries. The choice, therefore, fell on a single proxy rather than a combination of indicators. The only appropriate proxy available was the non-discrimination index devised by Ul Haq (1995). This index reflects the extent to which nations are 'free from discrimination based on gender, religion, ethnic group, national or social origin, language or income and wealth, whether by law, by government action or inaction or through actual practice' (Ul Haq, 1995: 70). Countries are rated on a scale of zero to 100, where countries entirely free from discrimination score 100.

Political security need not be interpreted in terms of democratisation, e.g. frequent elections, political participation, free media and human rights (Handelman, 1996: 7-9). Authoritarian states, in fact, need not be repressive and in select cases outperform more democratic ones in terms of socio-economic development (Crone, 1993). Taylor (1972: 103-106) recognises these anomalies in pointing out that political change cannot be located on a single continuum, i.e. where a change in one direction denotes progress and a change in the opposite direction denotes deterioration. This requirement, which is crucial for indexing purposes, can only be met when a specific political arrangement is ascribed to. The indices presented here are scaled relative to the ideal of democratic governance. Democracy refers to a 'form of government organised in accordance with the principles of popular sovereignty, political equality, popular consultation, and majority rule' (Ranney, 1996: 94). When ascribing to this ideal, the exact meaning of democracy needs to be clearly stated. According to Taylor (1972), this task is fraught with difficulty. Democracy may be concerned with political freedom (civil and political rights), the provision of political goods (voting rights), or the maintenance of political order and stability (political violence) (Taylor, 1972: 103-106). Democracy is here defined in an inclusive manner, referring to the extent to which the political climate necessary for the complete and equal development of people's capacities to participate in society exists (MacPherson, 1966: 58; Held, 1987: 269-270). Differences in the ability of nations to actually instil democratic values are quantified using voter turnout. Higher voter turnout signifies higher levels of participation by people in the governance of their countries and vice versa. The political freedom ratings annually reported by Freedom House are used as parameter of public efforts at establishing political security. These ratings cover the whole spectrum of political rights insofar as they

measure elements of both positive and negative political rights. So, for example, these ratings take account of both the extent to which people are afforded the ability to exercise their freedom (e.g. regular elections), and also the extent to which unwanted interference with the rights of others is curbed (e.g. freedom of association) (Lloyd, 1938: 62; Berlin, 1959, as quoted in Dasgupta, 1990: 16-20; Dewey, 1970: 15-16; McColm, 1993: 78-79).

8.2.2 Scaling of variables of HSIs and composite HSIs and Inefficiency ratios

The component indicators of the HSIs developed here are rescaled with the aid of four different techniques. This enables one to assess the extent to which different methods of scaling affect index values (page 282). The conventional linear scaling transformation (LST) technique is employed in calculating *versions 1 and 2* of the HSIs (Chapter 7, page 229). The LST technique is applied respectively to the unadjusted indicator values (version 1) and their logs (version 2). In *version 3* of the indices, the data sets are converted into standardised z scores (see also Chapter 7, page 228). Finally, in *version 4* of the indices, variables are rescaled relative to the USA's achievement on each of the indicators. These index values are calculated by dividing the specific indicator value by that of the USA and multiplying it by 100 (McGranahan *et al.*, 1972: 68-136). The directionality of the indices is, where necessary, standardised by subtracting the index values from 100. A value of 100 is added to the resulting score so that USA = 100.

The LST technique is also employed in calculating the composite HSIs and corresponding Inefficiency ratios. These ratios are calculated by dividing the Effort index by the Outcome index. For the resulting ratios to be meaningful, the two sets of

indices need to be expressed in comparable terms. The Outcome indices, however, fall into both a much higher and a much narrower range than the Effort indices. So, for example, Effort index 1 ranges from 76.89 (Italy) to 19.58 (Kenya). The corresponding Outcome index ranges from 88.57 (Austria) to 47.82 (Zambia). Consequently, the LST technique is applied to each of the composite indices before calculating the Inefficiency ratios. The four sets of HSIs are rescaled relative to 0 and 100, based on the observed minimum and maximum values.

It may be argued that some of the indicators included in these indices require no rescaling since they are already expressed in percentage terms (Chapter 7, page 227). One example of such an indicator is the percentage of daily calorie requirements supplied which is included in the Effort index (Table 8.1, page 262). Yet, all the component indicators are rescaled. There are two reasons for doing so. Firstly, certain variables, such as the gross enrolment ratio included in the Effort index, are expressed in percentage terms but have values exceeding the upper boundary of 100. This requires these variables to be rescaled. Secondly, the relative performance of the countries included in the sample need not be close to either the lower or upper boundaries of the specific indicator. The main purpose here is to compare the relative performance of this specific sample of nations on the HSIs and Inefficiency ratios. One therefore needs to express the performance of any one country relative to that of the others included in the sample. Hence each of the indicators is rescaled with the aid of each of the four alternative scaling techniques.

8.2.3 Weighting of components of HSIs

One also needs to decide on the weighting system and method to be employed in aggregating component scores into one composite index. The composite scores on the Effort and Outcome indices are calculated simply as averages of the corresponding component scores. Hence the component indices of the HSIs are weighted equally. There are specific reasons why no explicit, differential weights are introduced. Equal weighting implies that one need not be concerned with the difficult task of determining the ideal balance between or priorities of these development objectives (Davis, 1945: 7-10). These new indices are thus based on the implicit assumption that their components are equally important in assessing development. Babbie (1995: 161-175) furthermore argues that equal weighting should be the norm and the burden of proof should fall on differential weighting. Likewise, no empirically based weighting techniques have been employed here. Such techniques would have seen different weights being allocated to the components of the Effort and Outcome indices. This will, in turn, undermine the comparability of the two sets of indices. It will also obstruct the purpose of employing the HSIs to calculate Inefficiency ratios that reflect the extent to which efforts are successfully translated into outcomes. The only weighting, therefore, that these indices are exposed to is the implicit weighting introduced during scaling[192].

192 The literature on composite indexing draws a distinction between the implicit and explicit weighting of index components. Implicit weighting is introduced during the scaling of variables. The wider the minimum and maximum values are apart, the higher the implicit weighting (Morris, 1979: 41-56). Assume, for example, that the minimum and maximum observed average life expectancy is 40 and 80 respectively. A difference of ten percentage points between two index scores now reflects a greater improvement in life expectancy than if the observed minimum and maximum had respectively

8.2.4 Aggregation of components of HSIs

Aggregation tends to be either of an additive or a functional nature. Whereas the former entails the mere addition of component scores to arrive at index values, the latter is based on the estimated functional relationship between certain variables (Adelman and Morris, 1972: 111-112). The component indices employed here are aggregated additively in determining the respective composite index values of the HSIs. There are various reasons for employing additive rather than functional aggregation in calculating these index values. Additive aggregation allows the resulting indices to remain relatively simple in respect of construction and interpretation. Additive aggregation removes the empirical complexity introduced during the functional aggregation of indices. It also facilitates comparability insofar as the Effort and Outcome indices need not have employed similar functions in the case of functional aggregation. Additive aggregation, furthermore, supports the stated claim that these components are valued equally and are each considered a necessary though not sufficient condition for development.

8.2.5 Validation of HSIs and Inefficiency ratios

Composite indices also need to be validated. The HSIs and Inefficiency ratios are validated using both internal and external validation. Internal validation (or item analysis) is employed in evaluating the association between each of the components of these measures (Adelman and Morris, 1972: 125-128). During external validation the association between these measures and existing development indicators is

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been 50 and 70. The scaling methods employed here to calculate the different index values cannot be employed to address this implicit weighting of index components.

analysed. The main aim with external validation is to determine whether these measures do in fact contribute to the existing body of development indicators, i.e. reveal things which other development indicators cannot. External validation can also assist in determining the relation between these indicators and each of the component indices of the HSIs and Inefficiency ratios (Stewart, 1985: 87-93).

8.2.6 General methodological remarks on HSIs and Inefficiency ratios

This measurement effort complies with most of the general guidelines for composite indexing put forward by the likes of Estes (1984) and Ul Haq (1995) (see Chapter 7). It recognises the multidimensional nature of development in that it takes cognisance of the economic, social, environmental and political aspects of development. These measures reflect development objectives that are shared internationally and nationally, thus enhancing the universality of the resulting measurement constructs. Yet, these measures remain conceptually and methodologically manageable. Validity, comparability and data availability are employed as guidelines in indicator selection to enhance their relative objectivity and comparative value. These measures are also relatively flexible. Future changes in content and coverage can be accommodated, albeit at the cost of comparability.

This measurement effort also deals with the main criticisms levelled at composite indexing (Chapter 7, pages 246 to 250). Composite indices are often criticised for excluding some essential component(s) of development and/or for being biased where component selection is performed in an ad hoc fashion. These two common criticisms are dealt with by drawing very specific conceptual boundaries within which these measures are devised and interpreted, i.e. the specific meaning

ascribed to human security by the UNDP. The criticism that some components may be better represented by indicators other than those selected to represent each of the components is addressed by employing very specific guidelines during indicator selection. The preference for equal weighting and additive aggregation is sufficiently justified in terms of allowing the direct comparison of the Effort and Outcome indices whilst maintaining the need for clarity and simplicity. With regard to the criticism that composite indices lack practical value, let it be pointed out, the indices are developed with two specific aims in mind. The HSIs are used to calculate Inefficiency ratios that reflect the extent to which efforts at human security are not translated into actual achievement. These measures are also employed to identify possible causes and consequences of higher levels of effort, outcome and inefficiency.

Lastly, a few comments on the specific nature of these measures. Four general distinctions were drawn in the discussion of the methods and techniques employed in indicator development (Chapter 2, pages 24 to 27). In terms of these criteria, the HSIs and Inefficiency ratios can be described as follows: These measures are quantitative insofar as each of the dimensions of human security is quantified with the aid of certain indicators; yet these measures remain qualitative insofar as they are based on a very specific perception of development, i.e. human security as defined by the UNDP. These measures, furthermore, true to Sachs' (1995: 2-5) call, combine <u>quantitative and qualitative</u> indicators in the assessment of development, e.g. per capita income versus political freedom ratings. These measures are <u>objective</u> insofar as they include indicators derived from the 'autonomous professional handling' of observations (Perez, 1989: 207). These new measures are <u>ordinal</u> rather than cardinal in nature, as they do quantify the magnitude of differences between countries, but without allowing the meaningful and direct interpretation of these differences (Chapter 2, page 26). A

difference, for example, in the Outcome indices of two countries cannot tell us about the extent to which their performance on each of the index components differs, e.g. by how many years life expectancy in the one country exceeds that in the other country. The index can only tell us that the one country has been relatively more successful than the other in actually achieving human security. Therefore, in Fermi's (quoted in Block, 1991: 11, as quoted in Gwartney *et al.*, 1996: 1) words, it is concerned with making distinctions rather than sharp distinctions. Lastly, these measures represent multidimensional rather than unidimensional measures, given the number of dimensions of development included in the indices.

8.2.7 Results of comparison and validation of HSIs and Inefficiency ratios

An overview of the findings from the internal and external validation of the HSIs and Inefficiency ratios calculated with the aid of the above methodology of measurement follows. The implications for composite indexing of alternative indicator selection and scaling methods are first explored.

Country data on development indicators are subject to methodological inconsistency insofar as data on the same variable are often obtained from different sources. Hence the data employed in calculating the HSIs and Inefficiency ratios are neither fully accurate nor directly comparable. According to Koutsoyiannis (1977: 40), linear correlation should be used where data are accurate, whereas rank order correlation should be applied to data that are relatively imprecise. Hence, rank order rather than linear correlation is employed in the analysis.

(i) Effect of changes in indicator selection on HSIs and Inefficiency ratios

During the calculation of the HSIs, different data sets were experimented with. This brought to the fore the extent to which indicator selection affects exercises in composite indexing. Index values were calculated in some cases using different variables than those listed in Table 8.1 (page 262). So, for instance, population per physician and per police officer, respectively, were used in calculating the Effort indices for health and personal security. These two variables were expressed as the number of physicians and police officers per 100 000 population in the original index. An alternative data set was also employed in estimating the Outcome index of personal security, i.e. reported crimes per 100 000 of the population. This data set, however, appeared suspect. Senegal, for example, supposedly had the lowest crime rate in the sample. Hence it was replaced with an alternative data set (i.e. homicides per 100 000 population) in calculating this specific Outcome index.

From the results, it is evident that changes in indicator selection do have an impact on the relative ranking of nations. These changes are least pronounced in the case of the Effort index. The association between the Effort indices based on different data sets is high and statistically significant ($r = 0.982$). This is because the alternative data sets employed in calculating the indices are merely the same data reported in a different format, e.g. doctors per 100 000 population rather than population per physician. The effect of indicator selection is more pronounced where data sets, as in the case of the Outcome index, are replaced with entirely different ones. Although the correlation coefficient is still statistically significant, it is noticeably weaker than in the case of the Effort indices, i.e. $r = 0.885$. The two different versions of the Inefficiency ratio correlate slightly less well, i.e. $r = 0.852$.

Yet, the association is still statistically significant. All three of Spearman's rank order correlation coefficients are significant at the 0.01 level using a two-tailed test.

(ii) Effect of changes in method of scaling on HSIs and Inefficiency ratios

In Table 8.2 the association between indices based on different scaling methods is reported. In version 1 and 2 of the HSIs, the conventional LST technique is employed in rescaling respectively the unadjusted and logged values of each of the variables. In version 3 index components are standardised using z scores. Version 4 is calculated by rescaling each of the index components relative to the achievement of the United States on the particular indicator.

Table 8.2: Rank order correlation between HSIs and Inefficiency ratios calculated with different scaling methods (n = 57)

Effort index	Index 1	Index 2	Index 3	Index 4
Index 1	1.000			
Index 2	0.958**	1.000		
Index 3	0.992**	0.954**	1.000	
Index 4	0.952**	0.904**	0.958**	1.000
Outcome index	Index 1	Index 2	Index 3	Index 4
Index 1	1.000			
Index 2	0.951**	1.000		
Index 3	0.993**	0.938**	1.000	
Index 4	0.934**	0.945**	0.917**	1.000
Inefficiency ratio	Ratio 1	Ratio 2	Ratio 3	Ratio 4
Ratio 1	1.000			
Ratio 2	0.515**	1.000		
Ratio 3	0.928**	0.611**	1.000	
Ratio 4	0.451**	0.224	0.368**	1.000

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients without asterisks are not statistically significant.

The Effort and Outcome indices appear to be quite robust to changes in the method of scaling (Table 8.2). The twelve correlation coefficients all fall into the 0.900 to 1.000 range. In the case of the Inefficiency ratios, the strength of the

association between ratios based on differently scaled indices varies considerably (Table 8.2). Five of the six correlation coefficients are statistically significant at the 0.01 level, but the significant coefficients range from as low as 0.368 (ratio 3 and 4) to as high as 0.928 (ratio 1 and 3). Ratios derived from index values based on different scaling methods therefore appear to be relatively more sensitive to changes in the method of scaling than the underlying index values, especially in the case of version 4 of the Inefficiency ratio.

(iii) Internal validation of HSIs and Inefficiency ratios

Internal validation is performed with the aid of correlation matrices. Table 8.3 reports on the relation between the index components of the Effort and Outcome indices respectively (page 284). The component indices are calculated by applying different scaling methods to the same, single data series, thus leaving the rank order unchanged. Hence the rank order correlation between the component indices is the same for each of the different versions of the indices. The only exception is the environmental component of the Outcome index, which is a composite of three indicators (Table 8.1, page 262). Where more than one data set is aggregated into a composite score with the aid of different scaling techniques, the association varies across the different versions of the index. The results reported in Table 8.3 refer to version 1 of the environmental index. The coefficients for the other versions are reported in footnote 9. These coefficients do not differ significantly from those reported in Table 8.3.

Table 8.3: Rank order correlation between index components of HSIs (n = 57)

Effort index	Economic security	Food security	Health security	Environmental security	Personal security	Community security	Political security
Economic security	1.000						
Food security	0.529**	1.000					
Health security	0.709**	0.678**	1.000				
Environmental security	0.442**	0.269*	0.466**	1.000			
Personal security	0.156	0.184	0.312*	-0.011	1.000		
Community security	0.456**	0.331*	0.576**	0.531**	0.206	1.000	
Political security	0.803**	0.434**	0.708**	0.431**	0.211	0.430**	1.000
Outcome index	Economic security	Food security	Health security	Environmental security[9]	Personal security	Community security	Political security
Economic security	1.000						
Food security	0.874**	1.000					
Health security	0.843**	0.922**	1.000				
Environmental security[193]	-0.698**	-0.683**	-0.700**	1.000			
Personal security	0.072	0.136	0.120	-0.151	1.000		
Community security	0.545**	0.709**	0.681**	-0.450**	0.101	1.000	
Political security	0.259	0.196	0.144	-0.080	0.014	0.030	1.000

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

The various components of the *Effort index* correlate fairly well (Table 8.3). With the exception of one component (personal security) the component indices are all positively and significantly associated with one another. This means that these components are associated with increasing efforts at human security. The two strongest links, respectively, are between economic and political security (r = 0.803) and between economic and health security (r = 0.709). The weakest of the statistically significant links is that between environmental and food security (r = 0.269). The personal security component failed to correlate with any of the other

[193] The association between the environmental component and each of the other components of versions 2, 3 and 4 of the Outcome index is respectively -0.703**, -0.683** and -0.586** (economic security), -0.685**, -0.666** and -0.578** (food security), -0.701**, -0.687** and -0.595** (health security), -0.148, -0.150 and -0.159 (personal security), -0.474**, -0.429** and -0.362** (community security), and -0.187, -0.076 and -0.064 (political security).

components of the Effort index, except for health security. Even here the extent of this correlation is relatively weak (r = 0.312). The existing indicator, though, is believed to be the one that best satisfies the selection criteria of conceptual validity, comparability and data availability. Consequently, it is not envisaged that the selection of an alternative indicator would improve the resulting index, at least not without compromising validity and sample size. There is also the possibility of excluding from the index those components that do not correlate well with other index components. This is not feasible because the exclusion of this component from the index will compromise its conceptual validity. Such an index cannot be claimed to represent a measure of efforts at human security as defined by the UNDP.

In the case of the *Outcome index*, five of the seven components correlate well with each other (Table 8.3, page 284). The strongest links are those between food and health security (r = 0.922) and between economic and food security (r = 0.874). Unlike the other components, the environmental component correlates negatively with the other six components. This implies that lower levels of achievement on environmental security are associated with higher levels of achievement on the other dimensions of human security. This may be the result of the specific nature of the variables included in the environmental index. Two of the three variables in the index are parameters of emissions of pollutants. The fact that levels of industrial pollution are generally higher in developed nations is well documented. In this context, the negative relation between environmental security and the other dimensions of human security reflects reality. Two of the components of the Outcome index failed the test of internal validation. There is a very weak link between personal security and each of the other components of the index; the same applies to political security. Neither of the two components was excluded from the index, nor were alternative data series

used to quantify them. Doing so would have compromised the conceptual validity of the index and undermined the statistical significance of the results.

The *Inefficiency ratio* can also be subjected to internal validation. This requires calculating such ratios for each of the component indices. The LST method was used to scale the variables of versions 1 and 2 of the HSIs (page 274). The index scores for each of the components of the HSIs assumed a value between 0 and 100. It is not necessary, therefore, to rescale the indices before calculating the Inefficiency ratios. In the case of versions 3 and 4 of the HSIs the scores on the index components are not reported in any comparable format. The mean and standard deviation of the different components of the HSIs vary considerably, resulting in scores on Effort and Outcome indices that are not directly comparable. The relation between the achievement of the USA on each of the components and that of the other countries included in the sample also differs substantially. This also results in index scores that are not directly comparable. Consequently, the component scores of versions 3 and 4 of the HSIs are rescaled with the aid of the LST method before calculating the corresponding Inefficiency ratio (page 274). The ratios are calculated by dividing the Effort index by the corresponding Outcome index. Table 8.4 reports on the association between the various Inefficiency ratios.

The association between the Inefficiency ratios is not particularly strong (Table 8.4, page 287). Only twenty-five of the eighty-four correlations are statistically significant at the 0.01 level. These coefficients range from -0.350 (economic and environmental security - ratio 1) to 0.662 (environmental and political security - ratio 2). Another four coefficients are statistically significant at the 0.05 level. The remaining fifty-five coefficients are statistically insignificant.

Table 8.4: Rank order correlation between Inefficiency ratios of each of the seven component indices (n = 57)

Ratio 1	Economic security	Food security	Health security	Environmental security	Personal security	Community security	Political security
Economic security	1.000						
Food security	-0.130	1.000					
Health security	-0.371**	0.242	1.000				
Environmental security	-0.350**	0.256	0.609**	1.000			
Personal security	-0.032	-0.070	0.132	-0.025	1.000		
Community security	0.185	0.058	0.163	0.212	0.043	1.000	
Political security	-0.404**	0.231	0.506**	0.489**	0.201	-0.130	1.000
Ratio 2	Economic security	Food security	Health security	Environmental security	Personal security	Community security	Political security
Economic security	1.000						
Food security	0.094	1.000					
Health security	0.006	0.402**	1.000				
Environmental security	-0.142	-0.260	-0.306*	1.000			
Personal security	0.089	-0.195	0.131	-0.113	1.000		
Community security	0.008	0.270*	0.394**	-0.432**	-0.033	1.000	
Political security	-0.118	-0.427**	-0.490**	0.662**	-0.002	-0.578**	1.000
Ratio 3	Economic security	Food security	Health security	Environmental security	Personal security	Community security	Political security
Economic security	1.000						
Food security	-0.064	1.000					
Health security	-0.460**	0.256	1.000				
Environmental security	-0.483**	0.226	0.635**	1.000			
Personal security	-0.145	-0.033	0.153	0.119	1.000		
Community security	0.077	0.115	0.182	0.135	-0.098	1.000	
Political security	-0.431**	0.233	0.505**	0.551**	0.150	-0.070	1.000

Table 8.4: Rank order correlation between Inefficiency ratios of each of the seven component indices (n = 57) (continued)

Ratio 4	Economic security	Food security	Health security	Environmental security	Personal security	Community security	Political security
Economic security	1.000						
Food security	-0.047	1.000					
Health security	-0.357**	0.339**	1.000				
Environmental security	-0.298*	0.302*	0.592**	1.000			
Personal security	-0.020	0.020	0.131	0.026	1.000		
Community security	0.165	0.184	0.182	0.159	-0.004	1.000	
Political security	-0.422**	0.248	0.494**	0.516**	0.234	-0.061	1.000

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

This lack of statistical significance is indicative of the inconsistent nature of the association between the index components of different versions of the Inefficiency ratio. The results for versions 1, 3 and 4 of the Inefficiency ratios are relatively consistent. The six links that are statistically significant are the same ones in all three cases. Only three of the sixty-three coefficients have different signs. Economic security correlates negatively with most of the index components. This implies that increasing efficiency in economic security is generally associated with deteriorating efficiency on the other components. The other components are mostly positively correlated. This implies that increasing efficiency on the one component is generally associated with increasing efficiency on the other.

In the case of version 2, though, most of the coefficients have different signs than for versions 1, 3 and 4. Of the seven statistically significant links, five refer to interactions that are statistically insignificant in the case of versions 1, 3 and 4. Only the link between political and environmental security is consistently positive and statistically significant. This implies that environmental awareness can only be

successfully translated into environmental security where people actually exercise their democratic right to vote. The link between political and health security, although consistently statistically significant, is positive for versions 1, 3 and 4 but negative for version 2. There appears to be no consistent pattern in the association between the various Inefficiency ratios. Hence, the Inefficiency ratio fails this test for internal validation. The subsequent analysis will attempt to shed more light on the usefulness of the Inefficiency ratio as a meaningful measurement construct.

(iv) External validation of HSIs and Inefficiency ratios

The four differently scaled versions of the HSIs are validated externally with the aid of twelve other indicators and indices of development. The selected indicators and indices are prominent in the measurement debate or represent good proxies of the aggregate of development (i.e. the result of the interaction between the economic, social, political and environmental elements of development). Since the emphasis here is on cross-section analysis, the most recently available estimates of these indicators and indices are employed for this purpose. Estimates were obtained for as many countries as possible of the sample of fifty-seven countries for which HSIs and Inefficiency ratios could be calculated. In the majority of cases, recent estimates were available for forty or more of the fifty-seven countries. The only exceptions are those indicators or indices that are reported for select groups of countries, e.g. developed and developing countries.

The inclusion, furthermore, of per capita income is contrary to common practice. External validators are normally variables not included in the particular index, but real GDP per capita is included in the Outcome index (Table 8.1, page

262). Since it is the indicator that best quantifies the extent to which people are afforded economic security, excluding it from the index would have introduced ambiguity in the process of indicator selection. Yet, per capita income to date remains the single most important yardstick of economic development. On these grounds alone, it could not be excluded from the list of selected validators. The association between the Effort and Outcome indices and each of the twelve external validators is reported in Tables 8.5 and 8.6.

Table 8.5: Rank order correlation between Effort indices and selected development indicators and indices

Development indicator or index	n	Effort index 1	Effort index 2	Effort index 3	Effort index 4
1. Real GDP per capita ($PPP) (1997)	57	0.767**	0.796**	0.781**	0.765**
2. Unemployment (1997)	40	0.116	-0.005	0.135	0.134
3. Life Expectancy (1997)	57	0.832**	0.850**	0.839**	0.816**
4. Human Development Index (1997)	57	0.842**	0.882**	0.843**	0.831**
5. Gender-related Development Index (1997)	55	0.851**	0.877**	0.851**	0.838**
6. Gender Empowerment Measure (1990s)	50	0.693**	0.731**	0.674**	0.695**
7. Developing Country Human Poverty Index (1997)	31	-0.634**	-0.740**	-0.631**	-0.608**
8. Developed Country Human Poverty Index (1997)	16	-0.409	0.177	-0.351	-0.595**
9. Index of Economic Freedom (1999)	57	-0.643**	-0.699**	-0.636**	-0.647**
10. Global Competitiveness Index (1999)	38	0.444**	0.567**	0.438**	0.463**
11. Human Suffering Index (1990s)	57	-0.856**	-0.891**	-0.855**	-0.853**
12. Status of Women Index (1990s)	55	0.832**	0.861**	0.819**	0.850**

Data sources: Kurian (1997), Heritage Foundation (1999), UNDP (1999), World Bank (1999a and b), World Economic Forum (1999).

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients without asterisks are not statistically significant.

The various *Effort indices* correlate well with most of the validators (Table 8.5). Of particular interest is the strong association between these new indices and other composite indices of development. The Effort indices correlate best with the Human Development Index (HDI) and Gender-related Development Index (GDI) of the UNDP and the Human Suffering Index and Status of Women Index. The

association with life expectancy and per capita income is equally strong. So, for example, a simple linear regression shows that differences in version 2 of the Effort index explains 62.8 per cent of differences in life expectancy (Figure 8.1) and 72 per cent of differences in per capita income (Figure 8.2).

Figure 8.1: Effort index 2 and life expectancy (n = 57)

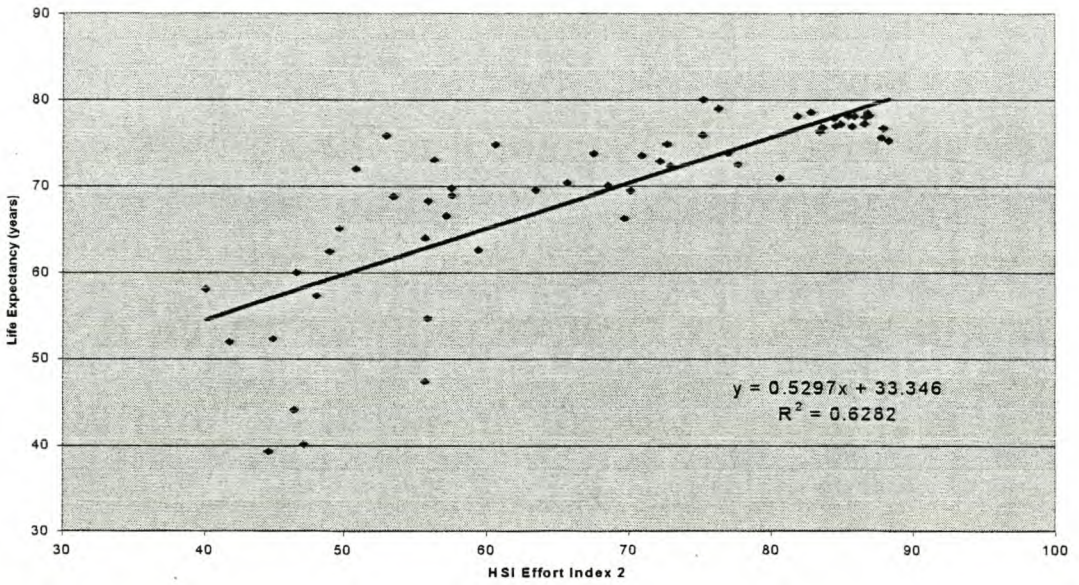
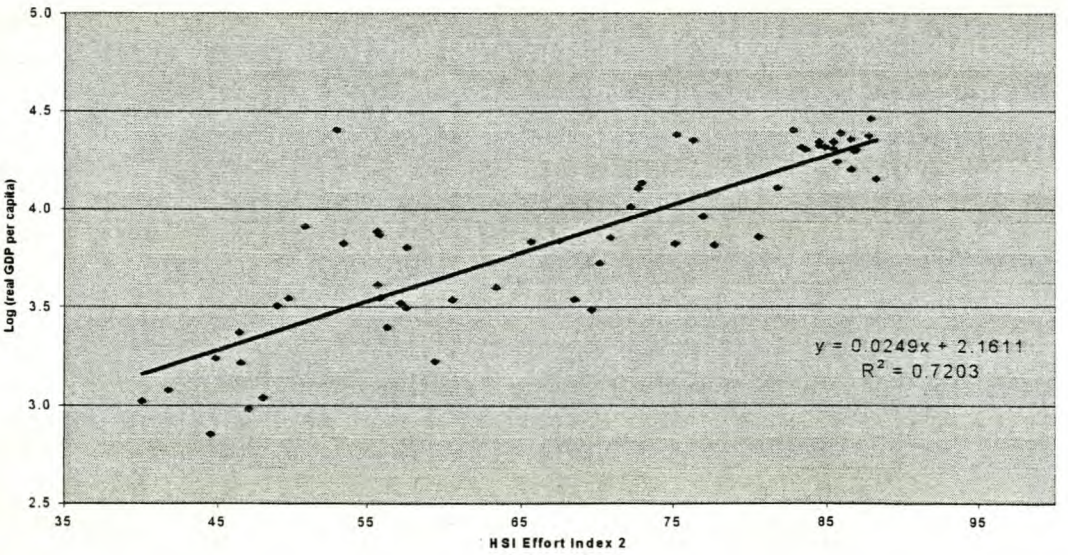


Figure 8.2: Effort index 2 and real GDP per capita (n = 57)



The association with the other development indicators is weaker, although mostly statistically significant (Table 8.5, page 290). The only validators that failed to correlate with the Effort indices are unemployment and the UNDP's Human Poverty Index for developed countries. In the case of the latter index, the relatively small sample size (n = 16) probably explains this poor association (page 290). In the case of the statistically significant coefficients, the nature of the association is consistently correct.

Table 8.6: Rank order correlation between Outcome indices and selected development indicators and indices

Development indicator or index	n	Outcome index 1	Outcome index 2	Outcome index 3	Outcome index 4
1. Real GDP per capita ($PPP) (1997)	57	0.886**	0.859**	0.819**	0.872**
2. Unemployment (1997)	40	-0.138	-0.104	-0.112	-0.075
3. Life Expectancy (1997)	57	0.872**	0.872**	0.845**	0.919**
4. Human Development Index (1997)	57	0.901**	0.891**	0.866**	0.929**
5. Gender-related Development Index (1997)	55	0.905**	0.896**	0.872**	0.933**
6. Gender Empowerment Measure (1990s)	50	0.708**	0.700**	0.685**	0.748**
7. Developing Country Human Poverty Index (1997)	31	-0.694**	-0.598**	-0.673**	-0.858**
8. Developed Country Human Poverty Index (1997)	16	-0.270	-0.155	-0.216	-0.022
9. Index of Economic Freedom (1999)	57	-0.841**	-0.814**	-0.810**	-0.800**
10. Global Competitiveness Index (1999)	38	0.678**	0.709**	0.641**	0.622**
11. Human Suffering Index (1990s)	57	-0.896**	-0.897**	-0.869**	-0.935**
12. Status of Women Index (1990s)	55	0.810**	0.793**	0.792**	0.874**

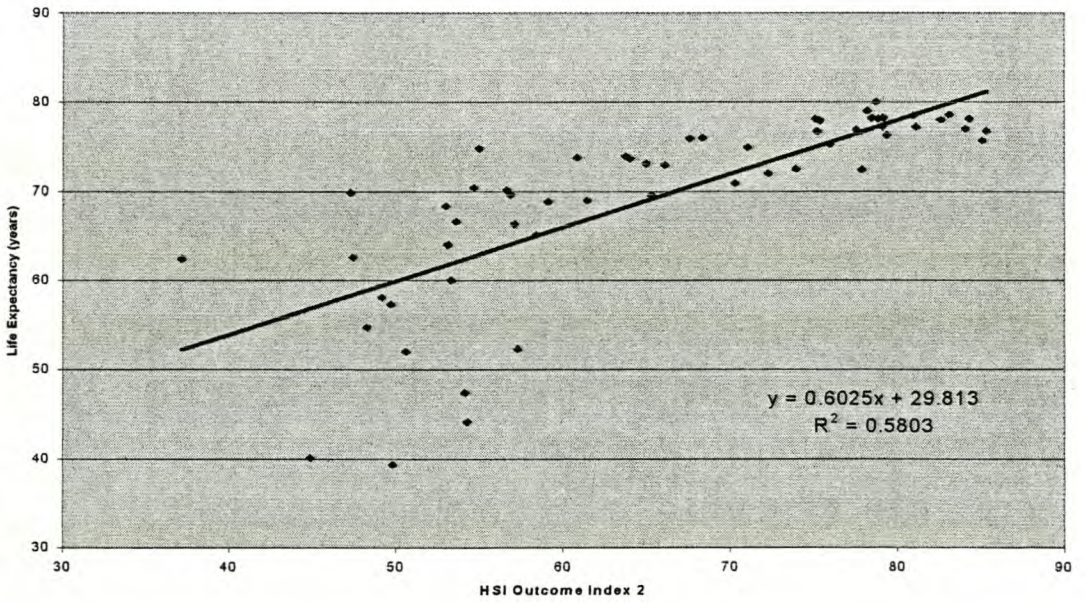
Data sources: Kurian (1997), Heritage Foundation (1999), UNDP (1999), World Bank (1999a and b), World Economic Forum (1999).

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

The *Outcome indices* correlate even better with these validators than the Effort indices (Table 8.6). The Outcome index, similar to the Effort index, correlate best with the Human Development Index and Gender-related Development Index of the UNDP and the Human Suffering Index and Status of Women Index. The association

with life expectancy is again relatively strong. In this instance, differences in version 2 of the Outcome index explain 58 per cent of the variation in life expectancy (Figure 8.3, page 293). Although very strong, the association with per capita income is spurious, as this indicator is already included in the Outcome index (Table 8.1, page 262). The association with the other validators is weaker, although statistically significant in most cases. The only validators that consistently fail to correlate with the Outcome index are again, as for the Effort indices, unemployment and the UNDP's Human Poverty Index for developed countries. Contrary to the situation in respect of the Effort indices, the nature of the association is always consistent and correct, even where the correlation coefficients are not statistically significant.

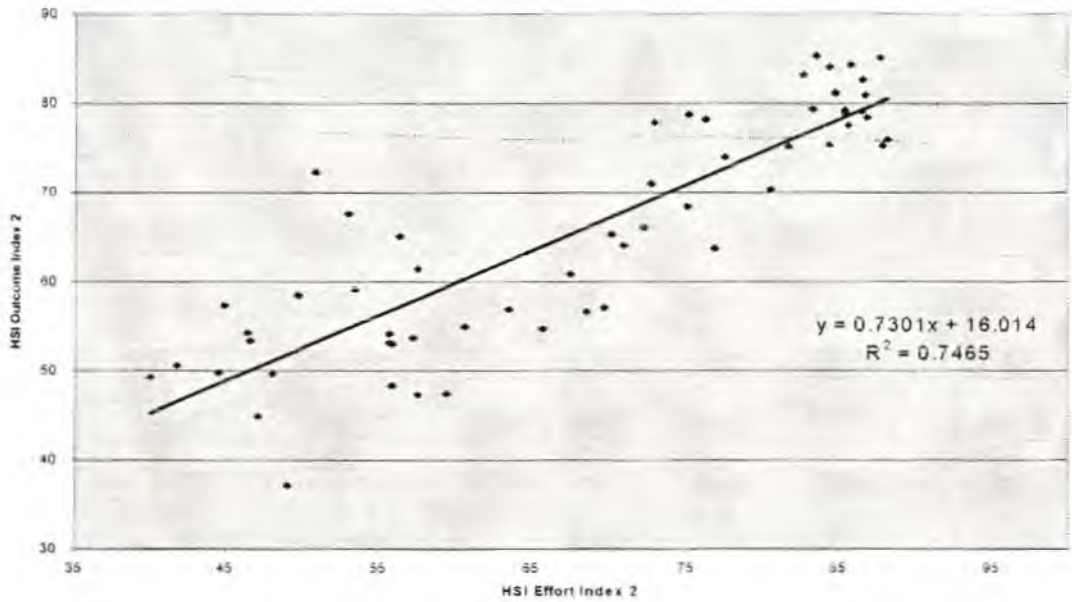
Figure 8.3: Outcome index 2 and life expectancy (n = 57)



Given the above results, one may conclude that the HSIs are valid measures of development. One may of course argue that these indices do not reveal anything more than a single variable alone reveals. Yet, the HSIs neither correlate perfectly with any of the validators (i.e. tell the exact same story), nor are any of the validators

conceptualised as measures of human security like the HSIs. That the dimensions of development that these validators represent are crucial in achieving human security is not disputed. But that each can tell only part of the tale of human security is also probably true.

Figure 8.4: Effort index 2 and Outcome index 2 (n = 57)



Before turning to the external validation of the Inefficiency ratio, it is perhaps worthwhile to assess the association between the HSIs. One would expect differences in effort to explain a large proportion of differences in outcomes. The results underscore this. So, for example, differences in Effort index 2 explain 74.7 per cent of the differences in Outcome index 2 (Figure 8.4). The rank order correlation between the other versions of the HSIs are 0.839 (version 1), 0.830 (version 3) and 0.841 (version 4). The correlation coefficients are statistically significant at the 0.01 level using a two-tailed test. This to a certain extent justifies the methodology of dividing the Effort index by the Outcome index to obtain an Inefficiency ratio that reflects the extent to which effort is actually translated into outcomes.

Validators over and above the ones listed in Tables 8.5 and 8.6 are employed in externally validating the Inefficiency ratio. Countries that have been relatively more successful in translating effort into outcomes can be expected to have made better progress over time in economic development. These measures of progress include the average annual rate of growth in GDP and GNP, both in aggregate and per capita terms. In the case of other validators, the percentage improvement in the indicators and indices is employed as validator. Table 8.7 shows these associations.

The *Inefficiency ratios* correlate poorly with these validators (Table 8.7). Only fifteen of the eighty-four correlation coefficients are statistically significant at the 0.01 level. The coefficients all relate to version 4 of the Inefficiency ratio. The coefficients range from 0.422 (Global Competitiveness Index) to 0.714 (Status of Women Index). The sign, though, of these coefficients is correct in only five instances. Higher levels of inefficiency are associated with less growth in GDP, GNP and real GDP per capita, and less improvement in life expectancy and the Index of Economic Freedom. Thus, only version 4 of the Inefficiency ratio meets this test for validity, albeit only partially. In the case of the other ten coefficients, higher levels of inefficiency are associated with higher rather than lower levels of development.

Table 8.7: Rank order correlation between Inefficiency ratios and selected development indicators and indices

Development indicator or index	n	Ratio 1	Ratio 2	Ratio 3	Ratio 4
1. Real GDP per capita ($PPP) (1997)	57	0.017	0.128	0.050	0.545**
2. Average annual growth in GDP (1990-98)	54	-0.243	-0.097	-0.245	-0.483**
3. Average annual growth in GDP per capita (1987 US$) (1975-97)	57	-0.107	-0.028	-0.146	-0.124
4. Average annual growth in GNP (1975-95)	54	-0.268	-0.163	-0.265	-0.564**
5. Average annual growth in GNP per capita (1975-95)	54	-0.126	0.029	-0.096	-0.129
6. Unemployment (1997)	40	0.386*	0.214	0.358*	0.144
7. Life expectancy (1997)	57	0.104	0.201	0.107	0.625**
8. % improvement in life expectancy (1970-97)	57	-0.113	-0.067	-0.061	-0.473**
9. Human Development Index (1997)	57	0.088	0.198	0.096	0.631**

Development indicator or index	n	Ratio 1	Ratio 2	Ratio 3	Ratio 4
10. % improvement in HDI shortfall (1-HDI) (1975-97)	44	0.138	0.211	0.200	0.376*
11. % improvement in HDI shortfall (1-HDI) (1990-97)	45	0.155	0.326*	0.205	0.455**
12. Index of Economic Freedom (1999)	57	0.112	0.020	0.117	0.066
13. % improvement in Index of Economic Freedom (1995-99)	57	-0.048	-0.031	-0.040	-0.458**
14. Global Competitiveness Index (1999)	38	-0.260	-0.257	-0.199	0.422**
15. % improvement in Global Competitiveness Index (1996-99)	36	0.043	0.017	0.024	0.436**
16. Gender-related Development Index (1997)	55	0.109	0.253	0.169	0.641**
17. Gender Empowerment Measure (1990s)	50	0.128	0.160	0.174	0.576**
18. Developing country Human Poverty Index (1997)	31	0.119	-0.469*	0.048	-0.202
19. Developed country Human Poverty Index (1997)	16	-0.211	0.178	-0.110	-0.624**
20. Human Suffering Index (1990s)	57	-0.117	-0.220	-0.113	-0.657**
21. Status of Women Index (1990s)	55	0.205	0.270*	0.182	0.714**

Data sources: Kurian (1997), Heritage Foundation (1999), UNDP (1999), World Bank (1999a/b), World Economic Forum (1996/99).

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

A further six coefficients are statistically significant at the 0.05 level. Versions 1 and 3 of the ratio correlate positively with unemployment (Table 8.7, page 295). The direction of this association is correct, i.e. higher levels of unemployment are associated with higher levels of inefficiency. Ratio 2 correlates meaningfully with the percentage improvement in the HDI shortfall (1990-97), the Human Poverty Index for developing countries, and the Status of Women Index. Ratio 4 correlates meaningfully with the percentage improvement in the HDI shortfall (1975-97). The nature, though, of these four links is incorrect. In each case higher levels of inefficiency are associated with higher rather than lower levels of development.

In the case of the statistically insignificant results, the nature of the association is correct in only nine instances. In six of these cases the validators represent measures of progress with regard to economic development. Higher Inefficiency ratios are associated with lower rates of average annual growth in GDP (ratios 1 to 3),

GNP (ratios 1 to 3), GDP per capita (ratios 1 to 4), and GNP per capita (ratios 1, 3 and 4). Higher levels of inefficiency are also associated with smaller improvements in life expectancy (ratios 1 to 3) and the Index of Economic Freedom (ratios 1 to 3). Versions 2 and 4 of the Inefficiency ratio correlate positively with unemployment but the coefficients are not statistically significant. The two other theoretically significant but statistically insignificant links are those with the indices of Economic Freedom (ratios 1 to 3) and Global Competitiveness (ratios 1 to 4). Higher levels of inefficiency are associated with lower levels of competitiveness and economic freedom. Thus, although as many as six of the nine validators indicative of progress in economic development are correctly associated with the ratios, the results are mostly statistically insignificant.

Another avenue of external validation needs to be explored before attempting to draw some final conclusions as to the validity of the new measures of human security presented here. Validation also entails an analysis of the association between component indices and a selected external validator. According to Babbie (1995: 161-175), this type of analysis is useful for distinguishing between 'good' as opposed to 'bad' indices. If the index is a 'good' one, the composite and component scores will correlate well with the validator. If, on the other hand, the index is a 'bad' one, the composite and/or some of the component scores will fail to correlate with the validator. This type of analysis requires a validator that is not included in either of the two indices, that is prominent in the measurement debate and that represents a good proxy of the aggregate of development (i.e. the economic, social, political and environmental elements of development). Life expectancy is the indicator that best meets these criteria.

Table 8.8 reports on the association between life expectancy and each of the component indices. For reasons noted elsewhere (page 283), this association does not differ across the different versions of the HSIs. The only exception is the environmental component of the Outcome index. These results are noted in footnote 10 and do not differ significantly from those reported in Table 8.8. The Inefficiency ratios are determined by dividing different sets of HSIs by each other. The ratios differ across the differently scaled versions of the HSIs. Hence Table 8.8 reports on the association between life expectancy and each of the three versions of the Inefficiency ratio.

Table 8.8: Rank order correlation between life expectancy and seven components of HSIs and Inefficiency ratio (n = 57)

Component	Effort indices	Outcome indices	Inefficiency ratio 1	Inefficiency ratio 2	Inefficiency ratio 3	Inefficiency ratio 4
1. Economic security	0.731**	0.854**	-0.575**	-0.302*	-0.665**	-0.562**
2. Food security	0.600**	0.926**	0.185	-0.516**	0.201	0.285*
3. Health security	0.821**	0.901**	0.724**	-0.477**	0.721**	0.721**
4. Environmental security	0.423**	-0.689**[194]	0.599**	0.704**	0.672**	0.604**
5. Personal security	0.350**	0.091	0.219	0.014	0.237	0.218
6. Community security	0.502**	0.605**	0.104	-0.375**	0.135	0.136
7. Political security	0.757**	0.210	0.573**	0.744**	0.572**	0.565**

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

The components of the *Effort index* all correlate positively and relatively well with life expectancy (Table 8.8). This lends further support to the argument of a

[194] The association between life expectancy and each of the different versions of the environmental component is respectively -0.687 (index 2), -0.676 (index 3), and -0.600 (version 4). All three correlation coefficients are significant at the 0.01 level using a two-tailed test.

positive relationship between life expectancy and efforts at human security (Figure 8.1, page 291). The correlation coefficients are all statistically significant at the 0.01 level and range from 0.350 to 0.757. Hence all seven components of the Effort index pass this test for validity.

These results also confirm the conclusions drawn from the internal validation of the *Outcome index* (page 285). All the components, apart from that for environmental security, are positively associated with life expectancy (Table 8.8). The lack of validity of the personal and political components of human security is also revisited. Both these components fail to correlate significantly with life expectancy. The other five correlation coefficients are statistically significant at the 0.01 level and range from 0.605 to 0.926. These five components of the Outcome index can be said to pass this test for validity.

When it comes to the *Inefficiency ratios*, the ambiguous nature of the results reported in Table 8.7 (page 295) is again evident. In only seven of the twenty-eight cases is the nature of the association meaningful and correct, i.e. higher inefficiency ratios being associated with lower levels of life expectancy (Table 8.8). The association is only consistently negative across the four versions of the Inefficiency ratio in the case of economic security. The other meaningful associations all apply to ratio 2. The food, health and community security components of this version of the ratio all correlate negatively with life expectancy. Thus, ratio 2 can be said to consistently outperform versions 1, 3 and 4 of the ratio in terms of this test for validity.

In light of Babbie's (1995: 161-175) criterion for a good index (page 297) and based on the evidence presented here, one may conclude that the Effort and Outcome indices are 'good' indices. The Effort index and its seven components correlated

relatively well with life expectancy. The Effort index also correlated fairly well with most of the other validators (Table 8.5, page 290). Two of the seven components of the Outcome index failed to correlate with life expectancy. Yet, the Outcome index on average outperformed the Effort index in terms of its association with the external validators (Table 8.6, page 292). Hence the Outcome index cannot be summarily classified as a 'bad' index. The same cannot be said for the Inefficiency ratio. According to Babbie's (1995: 161-175) criteria, these ratios are 'bad' indicators. Apart from ratio 4, the ratios failed to correlate meaningfully with most of the selected validators (Table 8.7, page 295). In addition, only some of the components of the ratios (notably ratio 2) correlated meaningfully with life expectancy (Table 8.8, page 298). Ultimately, though, this may simply imply that countries at different levels of development differ substantially and eratically in terms of the extent to which they have succeeded in translating effort into actual achievement. The UNDP, similarly, emphasises the fact that countries with similar scores on the Human Development Index (HDI) differ widely in terms of their performance on other indicators of development (UNDP, 1999: 129). In this context, it would not be uncommon for the ratios to fail the test for internal and external validity. Consequently, the Inefficiency ratios are included in subsequent analyses, despite their failing these tests. As will become evident in the following pages, these analyses do in fact go some way towards explaining why countries differ in the extent to which they are able to translate effort into actual achievement.

8.3 COMPARATIVE APPLICATION OF HSIs AND THE INEFFICIENCY RATIO

Further value can be added to efforts at composite indexing by attempting to identify the characteristics with which higher levels of effort and outcome and lower inefficiency ratios are generally associated. As a result of the lack of adequate data to allow indices to be devised for different time periods, the focus here is on cross-section analysis. Five developmental linkages are explored in the comparative application of these measures. These linkages are confined to a number of prominent issues in development studies. The nature of each of these linkages is briefly related in the following pages. The linkages are explored by assessing the relationship between these measures and each of the five issues. The indicators with which each of these issues is operationalised are noted in the subsequent discussion.

Due to lack of space, results cannot be reported on for each of the four different versions of the HSIs and Inefficiency ratios. Only version 2 of the HSIs and Inefficiency ratio is employed in the analysis. This choice can be justified as follows. Version 2 of the Effort index generally outperformed versions 1, 3 and 4 of the index on the test for external validity. The correlation coefficients for version 2 were generally slightly higher than for the other versions of the Effort index (Table 8.5, page 290). In the case of the Outcome index, version 2 of the index correlated less well with the validators than versions 1 and 4 but consistently outperformed version 3 (Table 8.6, page 292). The Inefficiency ratio obtained from these two sets of HSIs (version 2) correlates meaningfully with more external validators than either version 1 or 3 of the Inefficiency ratio. Yet, ratio 2 was outperformed by version 4 on the test for external validity (Table 8.7, page 295). Six of the seven components, however, of

ratio 4 failed to correlate meaningfully with life expectancy, whilst four of the seven components of ratio 2 did correlate meaningfully with life expectancy (Table 8.8, page 298).

Analyses are effected with the aid of correlation and regression analysis. The five linkages are explored individually in sections 8.3.1 to 8.3.5. The extent of rank order correlation between the HSIs and each of the selected indicators is briefly discussed. The regression model that best fits the indices is also discussed here. Stepwise multiple regression analysis is used to estimate these models. The selected models are the ones with the highest possible adjusted R^2 and for which the coefficients and F and t statistics are acceptable.

The Inefficiency ratio (version 2) failed to meaningfully correlate with any of the indicators employed in operationalising these issues. The ratio also failed to yield useful results when employed in regression analysis of the individual linkages. Consequently, the ratio is excluded from the individual analyses of the five linkages. The ratio is, however, included in the simultaneous regression analysis of these linkages, where meaningful and statistically significant results were obtained. These results are reported in section 8.3.6 (page 315).

8.3.1 Poverty, inequality and disparities in human security

Questions regarding the general relation between poverty, inequality and other aspects of economic development represent one of the central themes in development studies (Todaro, 1994: 159). The indicators employed in assessing this linkage include the Gini coefficient, two different headcount poverty indices, a poverty gap

measure, and the ratio between the highest and lowest quintiles of income or consumption.

The link between human security and poverty and inequality is a negative one (Table 8.9). All five of the indicators of poverty and inequality are negatively related to the Effort and Outcome index. The strength of the association ranges from -0.447 (outcome index and headcount poverty index based on national poverty line) to -0.686 (outcome index and headcount poverty index based on international poverty line). Hence higher levels of effort and outcome with regard to human security are generally associated with lower levels of poverty and inequality.

Table 8.9: Rank order correlation between HSIs and selected indicators of poverty and inequality

Indicator	n	Effort index 2	Outcome index 2
1. Ratio between highest and lowest quintiles of income or expenditure (1987-97)	44	-0.474**	-0.523**
2. Headcount poverty index (national poverty line) (1985-97)	26	-0.495*	-0.447*
3. Headcount poverty index (poverty line of $2 per capita per day) (1985-97)	26	-0.625**	-0.686**
4. Poverty gap measure (poverty line of $2 per capita per day) (1985-97)	26	-0.537**	-0.594**
5. Gini coefficient (1987-97)	44	-0.550**	-0.574**

Data sources: UNDP (1999), World Bank (1999a and b).

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

The regression results in Table 8.10 (page 304) lend further support to this argument. More specifically, human security appears to be instrumental in eradicating poverty. Higher levels of outcome with regard to human security are associated with an improved headcount poverty index. Regressions performed with the other indicators of poverty and inequality as the dependent variable paint a similar

picture. In every instance, lower levels of poverty and inequality were dependent on improved efforts and outcomes with regard to human security.

Table 8.10: Regression model for HSIs and incidence of poverty

Dependent variable: Headcount poverty index (poverty line of $2 per capita per day)						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
26	0.444	0.421	19.181	1. Outcome index 2	-2.032	4.380
				2. Constant	+166.197	6.127

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

8.3.2 Demographics and disparities in human security

There are a number of reasons why the relation between development and demographic dynamics is of particular interest. On the one hand, increasing population pressure is associated with diminishing prospects for economic development, e.g. deteriorating rates of economic growth, rising inequality, and increasing environmental degradation (Birdsall, 1980: 21-42; 1994: 175-182). Increasing populations also place an increasing burden on socio-economic infrastructure and on the planning capacity of governments. These pressures result from growing populations being increasingly youthful and dependent on the government for their livelihood, particularly in urban communities (Solimano and Chapin, 1981: 1-3; Leonard, 1989: 5-9; UNPF, 1991: 3-16). On the other hand, improved prospects for economic development are crucial in reducing population pressure, i.e. reducing fertility and mortality rates (or negotiating the demographic transition). The main factors in reducing fertility rates include improvements in education, reductions in the cost of and improvements in the availability of family planning services and contraceptive devices, and reductions in infant mortality

(Birdsall, 1980: 21-42; 1994: 182-191). Improvements in health care are also crucial in curbing mortality rates (Bengtsson and Gunnarsson, 1994: 1-3).

Thus, the relationship between human security and population pressure is postulated to be a negative one. In order to establish the nature of this relationship, the association between the HSIs and the population dependency burden (i.e. the percentage of the population younger than fifteen and older than sixty-five years) is assessed. Fertility is employed as an alternative indicator of differences in population pressure. This choice of indicators supports Lipton's (1988: 53-56) recognition of the importance of age (population dependency burden) and household size (fertility) in studies of underdevelopment. Average annual population growth is employed as an additional indicator of the demographic dynamics of development.

Table 8.11: Rank order correlation between HSIs and selected demographic indicators

Indicator	n	Effort index 2	Outcome index 2
1. Total fertility rate (1997)	57	-0.804**	-0.792**
2. Population dependency ratio (1997)	57	-0.725**	-0.739**
3. Average annual rate of population growth (1980-97)	57	-0.831**	-0.802**

Data sources: UNDP (1999), World Bank (1999a and b).

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

The Effort and Outcome index correlate strongly with all three proxies of population pressure (Table 8.11). The correlation coefficients range from -0.725 to -0.831. Higher levels of fertility, higher population dependency burdens and higher rates of population growth are generally associated with diminished prospects for human security. These results support the arguments concerning the relationship between development and population pressure expounded in the above paragraphs.

Table 8.12: Regression model for HSIs and population growth

Dependent variable: Average annual population growth						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
57	0.673	0.661	55.482	1. Effort index 2	-0.030	2.869
				2. Outcome index 2	-0.033	2.624
				3. Constant	+5.812	13.636

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

Table 8.12 presents evidence of the extent to which improvements in human security are crucial in bringing population growth under control. Countries that have made greater progress with regard to efforts at and achievements on human security have lower rates of population growth. This result supports the argument concerning the importance of socio-economic development in reducing population pressure (page 305). The regression models obtained when employing the total fertility rate and population dependency burden as the dependent variable tell a similar story.

8.3.3 Urbanisation and disparities in human security

The relationship between development and urbanisation is of a dual nature, which makes it of particular interest. Many of the elements of underdevelopment included in these indices (e.g. criminality and environmental insecurity) are symptomatic of urbanisation (Campbell, 1989: 165-166). Other aspects of human security (e.g. educational opportunities and health care services) are normally better developed in urbanised societies. People living in rural areas are also relatively more susceptible to certain symptoms of underdevelopment than are city dwellers, e.g. malnutrition and famine (Spitz, 1978: 867; Oodit and Simonis, 1993: 14-15). Urbanisation, furthermore, is indicative of increasing pressure on development

resources and service delivery systems (Sandbrook, 1982: 18-28). Yet, one can also argue that delivery in concentrated, urbanised communities is relatively easier to manage and achieve than in more geographically dispersed localities. At issue, as far as statistics go, are the level of urbanisation (i.e. percentage of total population living in urban areas) and the average annual rate of change in urban and rural populations.

Table 8.13: Rank order correlation between HSIs and selected indicators of urbanisation

Indicator	n	Effort index 2	Outcome index 2
1. Percentage population urbanised (1997)	57	0.636**	0.609**
2. Growth rate of urban population (1990-95)	57	-0.791**	-0.791**
3. Growth rate of rural population (1990-95)	57	-0.509**	-0.517**

Data sources: UNDP (1999), World Bank (1999a and b).

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

The relation between human security and the rate of growth of both urban and rural populations is negative and statistically significant at the 0.01 level (Table 8.13). This implies that the increasing rate at which pressure is being exerted on resources and delivery systems is generally associated with lower levels of human security. It may also simply imply that urbanisation is taking place at an increasing rate in less developed societies. The interaction between rates and levels of urbanisation bears further testimony to this argument. Developed nations, where the rate of urbanisation has tapered off, have generally achieved higher levels of urbanisation. Urbanisation, on the other hand, is still accelerating in developing nations. Consequently, levels of urbanisation are generally lower in these countries. Thus, one would expect higher rates and lower levels of urbanisation to be associated with lower levels of development. Given that the HSIs devised here are but alternative indicators of

development, the results underscore this hypothesis. The indices correlate positively with increasing *levels* of urbanisation and negatively with increasing *rates* of urbanisation. The strength of the former relationship ranges from 0.609 to 0.636, while that of the latter is -0.791. The correlation coefficients are statistically significant at the 0.01 level.

Table 8.14: Regression models for HSIs and the level of urbanisation and growth of urban and rural populations

Dependent variable: Effort index 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
57	0.643	0.623	31.814	1. Percentage population urbanised	+0.342	4.667
				2. Growth rate of urban population	-4.493	5.240
				3. Growth rate of rural population	+1.601	4.408
				4. Constant	+57.672	9.993
Dependent variable: Outcome index 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
57	0.528	0.501	19.757	1. Percentage population urbanised	+0.198	2.781
				2. Growth rate of urban population	-3.674	4.410
				3. Growth rate of rural population	+1.601	2.225
				4. Constant	+62.286	11.108

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

Evident from Table 8.14 is the degree to which improved prospects for human security are dependent on urban dynamics. Countries where the urbanisation process has already run its course (i.e. where a large percentage of the population is urbanised) appear to have a better chance of making greater efforts at and actually achieving human security. Similar arguments have been raised in the discussion of the correlation results.

More circumspection is required in interpreting the relationship between the HSIs and the growth rate of urban and rural populations. These growth rates are affected both by population growth and by patterns of migration. Effort and outcomes

increase as urban populations grow at a slower rate. This means that prospects for human security deteriorate as urban populations grow at an increasing rate, be it due to increased population growth or to increased migration to cities. The evidence on the relationship between human security, population growth and urban dynamics reported elsewhere supports this argument (pages 305 and 307).

The results in Table 8.14 also suggest that prospects for human security are greater in countries where rural populations grow at a faster rate. Overall population growth, though, has been shown elsewhere to be associated with worse prospects for human security (page 306). Consequently, this particular association may be attributable to changes in rural populations resulting from migration rather than from population growth. This makes sense insofar as an influx or lower out-migration of people can regenerate economic activity and public service delivery in rural areas.

8.3.4 Communications, infrastructure and disparities in human security

Disparities in development cannot be assessed without taking into account differences in infrastructural development (Boserup, 1984: 20-32). Infrastructure such as roads and railways stand central in the delivery of persons, goods and services required in meeting development objectives. Other infrastructure, such as sanitation and delivery of safe water, directly fulfil certain development needs. Communication is also of particular importance in this regard. According to Campbell (1989: 165-166) and Drèze and Sen (1993: 6-7), communication indicators represent good proxies of the general capacity of societies to avert economic, social, environmental and political crises. Garnier and Majeres (1992) reiterate this. They argue that access to information is as crucial an aspect of development as is access to basic services

(Garnier and Majeres, 1992: 68). The ability to convey information is particularly crucial in enabling governments to plan and manage the development process efficiently. This is becoming of increasing importance as the interdependence between nations with regard to communication, travel, trade and finance increases (Rose, 1995: 114).

Infrastructural development is measured with the aid of indicators reflecting differences in the dispersion of railways, roads, and airfields, and access to sanitary services and safe water. Indicators pertaining to the relative availability of communication devices such as telephones, radio and television receivers, newspapers, personal computers and the internet are employed in assessing differences in communications capacity.

Table 8.15: Rank order correlation between HSIs and selected indicators of communications capacity and infrastructure

Indicator	n	Effort index 2	Outcome index 2
A. Communications capacity			
1. Telephone mainlines per 1000 population (1997)	57	0.882**	0.887**
2. Radio receivers per 1000 population (1996)	57	0.801**	0.819**
3. TV sets per 1000 population (1997)	57	0.865**	0.859**
4. Mobile phones per 1000 population (1997)	57	0.812**	0.867**
5. Daily newspapers per 1000 population (1996)	56	0.771**	0.846**
6. Fax machines per 1000 population (1996)	55	0.797**	0.843**
7. Personal computers per 1000 population (1997)	49	0.793**	0.874**
8. Internet hosts per 10 000 population (1998)	57	0.847**	0.874**
9. Motor vehicles per 1000 population (1997)	56	0.838**	0.863**
10. Motor vehicles per kilometre of road (1997)	56	0.508**	0.583**
B. Infrastructural development			
1. % Population with access to safe water (1995)	49	0.676**	0.728**
2. % Population with access to sanitation (1995)	55	0.715**	0.850**
3. Airfields per square kilometre (1990s)	56	0.333*	0.280*
4. Railway trackage per square mile (1990s)	54	0.701**	0.689**
5. Percentage of roads paved (1997)	55	0.579**	0.634**
6. Miles of roads per square mile (1990s)	57	0.534**	0.549**

Data sources: Kurian (1997), UNDP (1999), World Bank (1999a and b).

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

The results in Table 8.15 underscore the importance of infrastructure and communications in delivering on and especially in achieving higher levels of human security. The indices correlate positively with each of the twenty indicators. The coefficients, except in one case, are statistically significant at the 0.01 level. Only in the case of airfields per square kilometre is the relation statistically significant only at the 0.05 level. The strongest communications link is that between the Effort and Outcome index and access to telephone lines. The coefficients for the other indicators range from 0.508 to 0.874. The strongest infrastructure link is that between achievement with regard to human security (Outcome index) and access to sanitation. The strength of this particular association is 0.850. The coefficients for the other indicators range from 0.333 to 0.715.

Table 8.16: Regression models for HSIs and access to telephones and sanitation

Dependent variable: Effort index 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
34	0.730	0.721	45.805	1. Access to telephones	+0.110	9.292
				2. Constant	+29.593	7.171
Dependent variable: Outcome index 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
57	0.853	0.844	90.177	1. Access to telephones	+0.072	6.972
				2. Access to sanitation	+0.384	3.017
				3. Constant	+10.918	1.260

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

In the case of the regression results (Table 8.16), the model that best fits the Effort index includes a single independent variable. The model that best fits the Outcome index includes two independent variables. The results support the arguments raised in the previous paragraphs. Communications capacity and in this case access to telephones is instrumental in producing improved efforts at human

security. The same goes for achievement in human security. In this case, access to telephones and sanitation enhances prospects for human security.

8.3.5 Value systems, ethnic homogeneity and disparities in human security

An issue of particular concern in sociology is the extent to which underdevelopment may be associated with a decline in social and family values. Broken families are often emphasised as an important element of poverty. In the United States, for example, 37.2 per cent of single parent households headed by females were below the poverty line in 1990 (Forbes, 1992: 285). In this sense, higher levels of development may be a necessary though not sufficient condition for families to have a better chance of remaining intact. Higher levels of affluence may also cause social and family values to decline, given the pressure affluence exerts on institutions such as the family. Differences in social and family values are operationalised using statistics on divorce, teen pregnancy, abortion and suicide. The ethnic homogeneity index, which is calculated as the largest percentage of the total population that belongs to the same ethnic group, is employed as a general proxy of differences in value systems. This selection of variables admittedly implies judgement as to the relative desirability of certain values.

The results of the correlation analysis are not very encouraging (Table 8.17, page 313). Only four of the ten correlation coefficients are statistically significant at the 0.01 level and another two at the 0.05 level. The other four coefficients are statistically insignificant. The relatively small sample size (n = 19) used in assessing the association with divorce and abortion can be argued to explain the lack of statistical significance. The strongest single link is that between the Outcome index

and the prevalence of teen pregnancy (r = -0.601). Hence higher levels of human security may play some role in explaining a lower prevalence of teen pregnancy. The consistently best but not very strong link is that between ethnic homogeneity and human security (r = 0.533 and 0.487). The positive association implies that nations that are ethnically more homogenous (i.e. where a larger percentage of the population belongs to the same ethnic group) are likelier to make better efforts at and achieve higher levels of human security. Three of the linkages, despite being relatively weak, do support the idea of higher levels of development being associated with deteriorating values. Higher HSIs are associated with a higher incidence of divorce, suicide and abortion.

Table 8.17: Rank order correlation between HSIs, social and family values, and ethnic homogeneity

Indicator	n	Effort index 2	Outcome index 2
1. Divorces as percentage of marriages (1996)	19	0.182	0.240
2. Suicides per 100 000 population (1990-95)	26	0.400*	0.510**
3. Births to mothers under twenty as percentage of total births (1991-97)	41	-0.364*	-0.601**
4. Legally induced abortions per 100 live births (1990s)	19	0.346	0.232
5. Ethnic homogeneity index (1990s)	57	0.533**	0.487**

Data sources: Kurian (1997), UNDP (1999), World Bank (1999a and b).

Note: The Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. The coefficients with one asterisk are significant only at the 0.05 level. Coefficients without asterisks are not statistically significant.

The direction of causality is reversed in the regression analysis (Table 8.18). The interest lies in the extent to which higher levels of human security impact on social and family values. Hence the HSIs are employed as independent variables. The two models that best fit the data, employ the prevalence of teen pregnancy as a proxy of differences in value systems. In both cases, better prospects for human security cause the prevalence of teen pregnancy to decline. As expected, actual

achievement exercises a relatively greater impact on the prevalence of teen pregnancy than effort. The model that best fits the Outcome index significantly outperforms the one that best fits the Effort index in terms of the model's statistical parameters.

Table 8.18: Regression models for HSIs, prevalence of teen pregnancy and ethnic homogeneity

Dependent variable: Incidence of teen pregnancy						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
41	0.136	0.114	6.147	1. Effort index 2	-0.160	2.479
				2. Constant	+19.166	3.939
Dependent variable: Incidence of teen pregnancy						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
41	0.325	0.308	18.806	1. Outcome index 2	-0.151	4.337
				2. Constant	+18.016	6.987
Dependent variable: Effort index 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
57	0.312	0.300	24.962	1. Ethnic homogeneity	+0.704	4.996
				2. Constant	+5.957	0.540
Dependent variable: Outcome index 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
57	0.246	0.232	17.931	1. Ethnic homogeneity	+0.255	4.235
				2. Constant	+46.837	9.955

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

In the case of ethnic homogeneity, the HSIs are employed as dependent variables. As argued in the discussion of the correlation results (page 313), ethnic homogeneity may impact on the extent to which development is delivered upon or not. The results in Table 8.18 support this idea. Greater ethnic homogeneity appears to cause prospects for human security to improve, particularly in terms of effort but also with regard to actual achievement. This may be because there is less of a risk of a diversity of interests derailing the development process.

8.3.6 Socio-economic development and disparities in human security: multiple regression results

In this section, the relationship between human security and these development issues is explored simultaneously. The purpose here is to find those development characteristics that best explain variations in effort, outcome and inefficiency. In order to ensure the statistical significance of the results, only those independent variables available for more than fifty of the fifty-seven countries are used. This is done in order to maximise the sample size. As a result, the independent variables are confined to a total of twenty-one. Stepwise multiple regression analysis is used in estimating these models.

Table 8.19: Nature of the relationship between HSIs and twenty-one selected independent variables

Positive	Negative
1. Percentage population urbanised	1. Total fertility rate
2. Growth rate of rural population	2. Population dependency ratio
3. Telephone mainlines per 1000 population	3. Average annual population growth
4. Radio receivers per 1000 population	4. Growth rate of urban population
5. TV sets per 1000 population	5. Growth rate of rural population
6. Mobile phones per 1000 population	
7. Daily newspapers per 1000 population	
8. Fax machines per 1000 population	
9. Internet hosts per 10 000 population	
10. Motor vehicles per 1000 population	
11. Motor vehicles per kilometre of road	
12. Percentage population with access to sanitation	
13. Airfields per square kilometre	
14. Railway trackage per square mile	
15. Percentage of roads paved	
16. Miles of road per square mile	
17. Ethnic homogeneity index	

A conceptual framework derived from the correlation and regression results reported in the above pages is employed to guide the selection process. Table 8.19 describes the nature of the relationship between the Effort and Outcome indices and

each of the twenty-one variables included in the analysis. The growth rate of rural population features in both columns in Table 8.19, as the correlation and regression analyses of this particular linkage provided evidence of both a positive and negative relation (pages 307 to 309). Since the Inefficiency ratio was excluded from the previous analyses (page 302), no such relationships could be specified. Regression models for which the coefficient of one or more of the independent variables do not conform with this framework are rejected. Only the regression model with the highest adjusted R^2 for which the signs of coefficients and F and t statistics are acceptable is reported here. A discussion of the multiple regression models obtained from these analyses follows.

Table 8.20: Regression model for Effort index 2 and selected parameters of social and economic development

Dependent variable: Effort index 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
44	0.880	0.867	71.330	1. Ethnic homogeneity	+0.175	4.676
				2. Growth rate of urban population	-2.266	3.597
				3. Access to telephones	+0.036	5.664
				4. Percentage population urbanised	+0.128	2.527
				5. Constant	+47.251	9.984

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

Certain conditions appear to be especially conducive to improved efforts at human security (Table 8.20). Firstly, the urbanisation process needs to be completed, i.e. urbanisation needs to taper off at high levels of urbanisation. Efforts at human security are more successful in countries where urban populations grow at a slower rate (i.e. where migration is less) and where larger proportions of the populace already live in urban settlements. In such circumstances, planning and delivery are less

constrained by changing patterns in human settlement and migration. Secondly, more people require access to telephones. Planning and delivery are understandably also dependent on an improved capacity for communication. Finally, efforts at human security are also dependent on the ethnic make-up of society. Countries in which a larger proportion of the population belong to the same ethnic group have been able to make greater efforts at human security, possibly due to the lower risk of conflict in these countries.

Table 8.21: Regression model for Outcome index 2 and selected parameters of social and economic development

Dependent variable: Outcome index 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
44	0.878	0.869	96.207	1. Access to telephones	+0.034	8.465
				2. Access to sanitation	+0.156	3.049
				3. Ethnic homogeneity	+0.087	2.643
				4. Constant	+38.389	11.507

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

There are also conditions conducive to actual outcomes with regard to human security (Table 8.21). Communications capacity and infrastructure are especially important. In countries where a greater proportion of the population have access to telephones and sanitation, higher levels of human security were achieved. Better infrastructure and communications capacity can be argued to enhance the ability of people to actually exercise the capabilities afforded them via the delivery of certain means. Ethnic homogeneity again impacts on human security. Like with effort, ethnic homogeneity enhances the prospects for human security. Here, though, it is actual achievement rather than effort that is dependent on the ethnic make-up of

society. This may be because the greater efforts at human security to which ethnic homogeneity are conducive are indeed translated into actual achievement.

Table 8.22: Regression model for Inefficiency ratio 2 and selected parameters of social and economic development

Dependent variable: Inefficiency ratio 2						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
44	0.339	0.290	7.555	1. Percentage population urbanised	+0.0035	3.887
				2. Daily newspaper circulation	-0.0002	2.085
				3. Constant	+0.864	17.272

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

In the case of the regression results reported in Table 8.22, the emphasis is on those conditions conducive to the relatively more efficient translation of effort into actual achievement. Although this model does not have as great an explanatory power as those for the Effort and Outcome indices (Tables 8.20 and 8.21), the results do yield some valuable insights. The lack of efficiency is dependent on the spatial characteristics of development. A greater centralisation of people in urban settlements causes inefficiency to increase. This is possibly the result of the greater pressures that concentration brings to bear on planning and delivery networks. Furthermore, improved efficiency requires enhanced communication. Access to communication can be argued to enhance the possibility of delivering the right means in the right localities at the right time, thereby enhancing the efficiency of efforts at development.

Given that the Inefficiency ratio did not perform well on the tests for internal and external validity (pages 286 and 297), these results are not surprising. The ratios also failed to correlate meaningfully with any of the variables used in operationalising

the five development linkages explored here. Nor did the regression analysis of the relation between the ratios and the individual linkages yield useful results. In this sense, the reservations expressed elsewhere concerning the validity of these measurement constructs appear to have been correct.

8.4 CONCLUDING REMARKS ON INTERNATIONAL DISPARITIES IN HUMAN SECURITY

Development success at the national level is about much more than political intent. Neither is it simply a case of making available to people certain public goods and services. There rather is a variety of conditions that determine whether developmental goals are actually delivered on at the national level and how efficiently these efforts are translated into achievement. The balance of these forces determines the ultimate success or failure of the efforts of national governments at human security. The majority of these forces fall into the realm of the policy maker's influence, which is primarily exercised at the national level. Thus, policy makers need to take cognisance of the extent to which certain policy interventions can be instrumental in making greater strides in achieving human security in a more efficient manner. The expansion of infrastructure and communications capacity and the proactive management of urban and population dynamics appear to be particularly important in this respect.

Chapter 9

The Extent of and possible Explanations for Provincial Disparities in Progress on Reconstruction and Development in South Africa

9.1 BACKGROUND TO AND SCOPE OF THIS CHAPTER

As mentioned in Chapter 8 (page 259), composite indices are ultimately concerned with determining and assessing 'what makes a good life' (Sen, 1992: 4; Sugden, 1993: 1947). Like the HSIs discussed in Chapter 8, the Reconstruction and Development Indices (RDIs) presented here are based on a very specific conceptualisation of this 'good life'. The concern is with the development objectives identified in the Reconstruction and Development Programme (RDP). According to the original policy document, the RDP represents an 'integrated and sustainable programme which is people-centred; contrives to provide peace and security for all; is aimed at nation-building; which links construction and development; and aims to democratise society' (ANC, 1994: 4-7). The specific objective here is to assess the extent to which South Africa's nine provinces have made progress in delivering on the RDP[195]. The RDP, like all policies, is made at the national level. Yet, national policy objectives are not achieved with equal success in the whole of the country. The purpose, therefore, is to come to a greater understanding of provincial disparities in development. Since the indicators included in the RDIs are not readily available in

[195] It would have been ideal to develop, like for the HSIs, both Effort and Outcome indices for the RDI (Chapter 8, page 260). The lack of valid indicators and readily available disaggregated data rendered

racially disaggregated format, comparisons are limited to the aggregate level of development. Most of the statistics, furthermore, are available only for the years immediately following the 1994 elections. The goals of the RDP, though, are longer term ones and delivery will not be effected in the short term. The only realistic option, therefore, is to devise an index with which to assess current progress on RDP goals. It is envisaged that the same indices can be used in monitoring future progress as future estimates of the indicators employed in the different RDIs become available.

This measurement effort represents another example of the new life the RDP and the political transition have injected into the social indicator movement in South Africa (Møller, 1997: 1-5). In being policy-based, the RDIs meet Hodge's (1997: 8-12) call for composite indices that can be used for monitoring purposes. Makinta and Schwabe (1999: 1) place similar emphasis on the need for information for guiding decision-making with regard to service delivery. Perthel (1981: 53) aired a similar idea, emphasising the need for indicators to fit into the overall planning process.

This effort at indicator development also addresses the explicit call for RDP-based development indicators in the White Paper on Reconstruction and Development. The White Paper emphasises the need for indicators communicating on progress with regard to the RDP (RSA, 1994: 17). The official 1995 RDP Review employed a variety of economic and social indicators in assessing progress on the RDP. The Review included estimates of the number of families benefiting from land redistribution, hectares of land redistributed, health clinics built, electrification connections, extension of municipal services to townships, jobs created, pupils benefiting from primary school nutrition programmes, and people acquiring access to basic services such as refuse collection, sanitation, electricity, water and telephones (RSA, 1995: 4-18).

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such an attempt impossible. However, this remains an idea with considerable appeal for future

Other studies of progress on the RDP have employed indicators such as Gini coefficients and the Living Standard Measure (LSM)[196]. Use has also been made of surveys aimed at quantifying awareness and expectations regarding future progress, actual progress and the lack thereof (Corder, 1997: 189-198). Møller (1998: 37-64) employed subjective measures of life satisfaction and happiness to compare racial perceptions of quality of life before and after the 1994 elections. The HSRC has devised a GIS-type composite index, the so-called Composite Social and Service Index (CSSI), to monitor progress with regard to development (Makinta and Schwabe, 1999: 3)[197]. Gill and Hall (1997), focusing only on the basic needs component of the RDP, devised development indices employing a Development Indicators Monitoring System (DIMS) which focuses on the provision of housing, water, sanitation, and electricity[198].

With the exception of the LSM, DIMS and the CSSI, progress on reconstruction and development can at this stage only be assessed by using voluminous tables of indicators. Neither the LSM, DIMS nor the CSSI, though, cover all the development objectives identified in the RDP. Hence, the White Paper's call

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[196] LSM estimates are reported in the All Media and Products Survey (AMPS) conducted by the South African Advertising Research Foundation (SAARF). The measure reports on the percentage of the total population and each of the racial groups falling into each of eight different LSM groups, e.g. traditional have-nots (group 1, bottom) and influential affluents (group 8, top). The LSM includes thirteen indicators covering durable ownership, shopping behaviour, size and type of community, availability of water and electricity in the home, and domestic help (Corder, 1997: 192-193). AMPS is run annually and is funded by a levy on advertising. The 1994/95 survey was based on a nation-wide area stratified probability sample of 14 498 interviews. The accuracy of results varies with response rates. Results are reportedly statistically significant at least at the ninety-five per cent level (SAARF, 1996: i-iii).

[197] The social indicators included in the index are a poverty gap measure, pupil:teacher ratios, population dependency ratios, and total household and population densities. Used as service variables are ratios of population to police stations, post offices and hospital beds; ratios of road length to district area; the proportion of 6 to 17-year-olds at schools; the percentage of fully serviced houses, number of formal houses electrified and informal houses electrified, and number of telephones (Makinta and Schwabe, 1999: 3).

[198] DIMS employs the conventional linear scale transformation (LST) method of scaling (Chapter 7, page 229). A total of fourteen indicators are employed in devising the indices, four each for housing, water and sanitation, and two for electricity. A distinction is drawn between absolute and relative needs, employing indicators expressed in absolute and relative terms, e.g. number of housing units without electricity as opposed to percentage housing units without electricity. Different indices are devised for representing absolute as opposed to relative needs (Gill and Hall, 1997: 257, 272-273).

for indicators allowing an effective communication of progress with regard to the RDP has perhaps not yet been met. The indices developed here propose to do precisely this, i.e. assess and communicate on progress on all the RDP's goals. The RDIs are also employed in identifying those non-RDP related development characteristics with which progress on reconstruction and development is generally associated. By explaining the underlying causes of the specific measurement outcomes, further value is added to this particular measurement effort.

9.2 METHODOLOGICAL FRAMEWORK FOR MEASUREMENT OF PROGRESS ON RECONSTRUCTION AND DEVELOPMENT

The methodology of composite indexing has been discussed in detail in Chapter 7 (pages 220 to 239). The methodology employed in devising the RDIs is discussed in the subsequent pages. The discussion is arranged in terms of the different steps in composite indexing, i.e. selection; scaling; weighting; aggregation; and validation. Then follow some general comments on the nature of the RDIs. This section concludes with a discussion of the results of the internal and external validation of these indices.

9.2.1 Selection of components and variables included in RDIs

The components and variables included in the RDIs are listed in Table 9.1 (page 324). *Component selection* is relatively simpler than in the case of the HSIs. A number of specific goals are identified in the key programmes described in the RDP

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without electricity as opposed to percentage housing units without electricity. Different indices are devised for representing absolute as opposed to relative needs (Gill and Hall, 1997: 257, 272-273).

(ANC, 1994: 7-12)[199]. These goals are employed in selecting the components included in each of the RDIs[200]. Indicators were obtained from recent publications of provincial development data. These data sources for the most part report indicator estimates for 1995 and 1996. Where it was not possible to quantify the particular goal with an indicator directly related to it, a suitable proxy was used. The justification for such selections, such as for environmental health and youth development, is provided in the subsequent discussion.

Table 9.1: Components and indicators included in RDIs

Index	Component	Indicator[201]	
		Mark I	Mark II
1. RDI on basic needs fulfilment	a. Land reform	Actual transfers of land as percentage of approved land claims (1994-98)	
	b. Housing	Percentage of housing programme targets achieved (1994-98)[202]	
	c. Water	Percentage of households with access to running water in dwelling (1995)	Percentage of households with tapwater in dwelling (1996)
	d. Sanitation	Percentage of households with access to full waterborne sanitation in dwelling (1995)	Percentage of households without any sanitation facilities (1996)
	e. Energy and electrification	Percentage of households with access to ESKOM or local municipality electricity grid (1995)	Percentage houses with electricity (1996)

[199] Five key policy programmes are identified in the RDP policy document. Apart from the four listed in Table 9.1, there is also a separate focus on implementing the RDP (ANC, 1994: 7-12). This programme is concerned only with the manner in which the objectives of the other four programmes are to be achieved. Hence the implementation programme is not included here as a separate component of the RDI.

[200] The goals of the RDP tie in closely with the Bill of Rights included in the Constitution. The latter includes the right to freedom from discrimination, to human dignity, life, security, political freedom, a safe environment, and information, and the right to access to basic needs such as housing, education, health care, food, water and social security (RSA, 1996: 6-24). Insofar as the Bill of Rights constitutes broad parameters for policy-making and particularly development policy, the RDIs presented here also represent a constitutionally-based assessment of the general quality of life in South Africa.

[201] Where no indicator is listed for mark II of the indices, the same indicator listed under mark I is used in calculating the corresponding index value.

[202] Targets refer to provincial targets set in the one million housing programme in 1994. The extent to which targets have been met is calculated by dividing by this target the number of houses built or under construction between March 1994 and April 1998 (Development Bank of Southern Africa, 1998: 204).

Table 9.1: Components and indicators included in RDIs (continued)

Index	Component	Indicator	
		Mark I	Mark II
1. RDI on basic needs fulfilment (continued)	f. Telecommunications	Percentage of households with access to a public phone (1995)	Percentage households with telephone in dwelling or in possession of cellular phone (1996)
	g. Transport	Percentage of households with access to a taxi rank or bus stop (1995)	
	h. Clean and healthy environment	Percentage of households living in shacks or backyard rooms (1995)	Percentage of households living in informal dwellings (1996)
	i. Nutrition	Percentage underweight children in grades 3 and 4 (1994)[203]	
	j. Health care	Percentage of households with access to a clinic or hospital (1995)	Medical officials per 1000 population (1995)
	k. Social security and welfare	Percentage of households with access to a pension pay point (1995)	
	l. Personal safety	Percentage households with access to a police station (1995)	Population per police officer (1997)
2. RDI on the development of human resources	a. Education and training	Percentage of households with access to a high school (1995)	Percentage of schools platooning (1996)[204]
	b. Sport and recreation	Percentage of households with access to a sportsfield or facilities (1995)	
	c. Youth development	Youth unemployment as percentage of total unemployment (1995)	
3. RDI on building the economy	a. Economic growth	Average annual growth in real GGP (percentage) (1980-94)	
	b. Employment	Unemployment rate (percentage) (1995)	Unemployment rate (percentage) (1996)
	c. Distribution	Percentage of population falling into Living Standard Measure (LSM) categories 1-3 (1995)	Percentage of individuals living in poverty (1993)
4. RDI on democratisation		Voter turnout in local government elections (1995/96)	

Date sources: RSA (1995), Election Task Group (1996), South African Advertising Research Foundation (1996), South African Institute for Race Relations (1996/98b), RSA (1997), Statistics South Africa (1997/98), Development Bank of Southern Africa (1998), South African Police Service (1998), Health Systems Trust (1999).

[203] Underweight children are children whose weight-for-age is under two standard deviations from the norm (Health Systems Trust, 1999: 402).

[204] Platooning refers to cases where the same premises are used by two schools or groups of pupils (South African Institute for Race Relations, 1998: 146).

An exception, however, was made in that an additional component was added to the basic needs listed in the RDP. Given the increased concern with rising levels of crime, personal safety was added to the index. At the national level, for example, levels of crime have increased by twenty-five percent between 1988 and 1992 (Glanz and Smit, 1995: xii-xiii). Of the nearly one hundred countries for which Interpol reported international crime rates in 1995, South Africa had the highest reported incidence of rape. South Africa's homicide rate was also amongst the highest (SAPS, 1998: annexure F).

As in Chapter 8 (pages 262 to 264), the main point of departure in indicator selection is selecting those indicators that conceptually best match each of the particular components and that perform adequately in terms of validity, comparability and availability. Since this analysis is geared towards interprovincial comparisons (page 320), considerations as to the availability of provincially disaggregated statistics were of particular importance. For the envisaged future comparisons required to monitor intertemporal progress towards RDP goals (page 321), indicators were selected from surveys and publications that are periodically updated.

Since equally useful indicators were available from different surveys for certain of the components, two sets of indicators were selected (Table 9.1, page 324). In mark I of the indices, indicators of access to facilities and services were obtained from the 1995 Eskom Omni Panel survey. The Panel is run annually and is based on a nation-wide representative probability sample of 5000 households[205]. The survey covers subgroups of the population often neglected in other surveys. These subgroups include, amongst others, farm labourers, deep rural communities, informal settlements and townships (South African Advertising Research Foundation, 1996: i-iii). In the mark II indices some of the indicators obtained from the Eskom Omni Panel, as well

as certain others, were replaced with indicators from alternative sources. These sources include the 1996 population census, the annual South Africa Survey of the South African Institute of Race Relations, and the 1998 Development Report of the Development Bank of Southern Africa. The use of alternative data sources allows one to assess how sensitive the RDIs are to changes in indicator selection (page 336).

The central focus here is on actual progress with regard to these nineteen development objectives. A discussion of the indicators included in each of the four RDIs follows here (Table 9.1, page 324). Where it was not possible to quantify the particular goal with an indicator directly related to it, a suitable proxy was identified. The justification for such selections is provided.

In the *RDI on basic needs fulfilment*, progress on housing is measured in terms of the extent to which RDP targets identified in 1994 have been met (footnote 202, page 324). Progress on land reform is assessed in terms of the number of hectares of land actually transferred to claimants between 1994 and 1998 as percentage of the total hectares of approved land claims. In the case of the basic need for a clean and healthy environment, the percentage of households living in shacks was selected as proxy on the grounds that expanding informal settlements remain one of the greatest threats to the environment in developing countries. The environmental threats originating in informal settlements include air pollution resulting from biomass-based cooking and heating stoves, water pollution resulting from human waste disposal, and deforestation resulting from the use of fuelwood as primary source of fuel (Duraiappah, 1996: 8-26). Nutritional status is measured in terms of the percentage of children in grades 3 and 4 that are underweight (footnote 203, page 325).

The remainder of the indicators included in the RDI on basic needs fulfilment focus on the extent to which households have access to those facilities or services

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[205] Although the statistical significance of the results varies with response rates, it is reportedly at least

required to achieve the particular end. In the case of the basic need for water, sanitation, electricity and telecommunications (mark II), access indicates whether that facility or service is available in the dwelling in which the household resides (South African Advertising Research Foundation, 1996; Statistics South Africa, 1996). In other instances where reference is made to 'access', the term refers to the availability of that facility or service in the vicinity of the household's place of residence or in the particular community in which the household resides (South African Advertising Research Foundation, 1996)[206]. Two of these indicators are replaced with alternative ones in mark II of the index. Access to clinics and hospitals and access to police stations are replaced respectively with medical officials per 1000 population and population per police officer.

The *RDI on human resource development* consists of three components. In mark I of the index, two components are operationalised using indicators of access to facilities and services similar to those set out above. Progress in delivery on education and training and on sport and recreation are assessed respectively in terms of access to secondary schools and sports facilities. In mark II of the index, the former variable is replaced with estimates of the extent to which physical schooling facilities are inadequate to cater for the demand for education, i.e. use has to be made of platooning (footnote 204, page 325). In the case of youth development, the RDP places particular emphasis on the role of training, education and job creation in empowering the youth (ANC, 1994: 9). The extent of youth unemployment can be argued to constitute a lack of progress with regard to this particular goal.

The goals identified in the key policy programme of *building the economy* are not specific enough to simplify the selection process. The Growth, Employment and

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ninety-five per cent (South African Advertising Research Foundation, 1996: i-iii).

[206] Special note: The Eskom researchers involved in the particular study have been contacted to attempt to obtain a closer definition, but without success.

Redistribution (GEAR) strategy is the macroeconomic policy framework within which the RDP goals are to be achieved (RSA, 1997). Accordingly, the three main macroeconomic objectives of GEAR are employed in devising this particular RDI. Indicators of actual performance are employed to assess progress with regard to economic growth and employment. The average annual rate of growth in real GGP and estimates of the rate of unemployment are used for this purpose.

Indicators of poverty and inequality are required to assess progress on redistribution. In mark I of the index, the percentage of the population falling into the first three categories of the Living Standard Measure (LSM), i.e. earning an average monthly income of less than R838, was used (footnote 196, page 322). In mark II the choice fell on the 1993 SALDRU-based estimate of the headcount poverty index[207]. The two indicators both represent estimates of the incidence of poverty, albeit based on different poverty lines[208].

The *RDI on democratisation* includes only one component. The democratisation programme of the RDP does not only involve the enfranchisement of all South Africans via universal suffrage. The programme also envisages the democratisation of governmental and non-governmental institutions, a democratic information programme, gender equity, and equity in the workplace (ANC, 1994: 119-135). Unfortunately, estimates of the extent to which provinces have made progress in democratising institutions and have worked towards gender and employment equity are not yet readily available. Consequently, voter turnout during local government elections is used as a general proxy of democratisation. Given that

[207] The SALDRU survey was based on a nation-wide representative survey of 9000 households. The aim of the project was to gather statistics on living standards and development (South African Advertising Research Foundation, 1996: iii).

[208] Measures of the incidence and severity of poverty and of the poverty gap were also available for 1995. Woolard and Leibbrandt (1999: 36) do not report national estimates of these poverty measures. The fourth of the scaling methods employed in devising the RDIs require such estimate (page 330). National poverty estimates can be derived from provincial estimates with the aid of population

truly representative governance requires high turnout, provinces with higher turnouts during elections are assumed to be relatively more democratic than ones where turnout is lower.

9.2.2 Scaling of variables of RDIs

Scaling enables one to point out the relation among the provinces, how far apart they are and in what direction they lie relative to each other. The variables included in the RDIs are rescaled with the aid of four different methods, i.e. the same methods used in scaling the variables in the HSIs (Chapter 8, page 227). This allows one to assess the extent to which different methods of scaling affect index values (page 338).

The conventional linear scaling transformation (LST) technique is employed to calculate *versions 1 and 2* of the RDIs (Chapter 7, page 229). The technique is applied respectively to the unadjusted indicator values (version 1) and their logs (version 2). In *version 3* of the indices, the data sets are converted into standardised z scores (Chapter 7, page 228). The fourth method employed in scaling the HSIs is also used here. When applied to the RDIs, variables are rescaled relative to the national performance on that particular indicator. Index values are calculated by dividing the specific indicator value by the national score on that same indicator and multiplying it by 100 (McGranahan *et al.*, 1972: 68-136). The directionality of the indices is standardised where necessary by subtracting the index values from 100. A value of 100 is added to the resulting scores so that all scores are expressed relative to the national index value of 100.

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statistics. The latest population statistics, though, are only available for 1996. Hence the 1993 estimates of poverty were preferred to those for 1995.

Only three of the twenty-nine variables included in mark I and II RDIs are not expressed in percentage terms (Table 9.1, page 324). Thus, it may be argued the indicators require no rescaling (Chapter 7, page 227). The main purpose here is to compare the provinces' performance on the different RDIs (page 320). To do so, one needs to express the performance of each province relative to that of the others. Their relative performance need not be close to either the lower or upper boundaries of the specific indicator, e.g. to 0 or 100 per cent. Hence all the variables included in the RDIs are rescaled.

9.2.3 Weighting of components of RDIs

One also needs to decide on the weighting system employed when aggregating component scores into one index value. The RDIs on basic needs fulfilment, human resource development, and economic performance are simple averages of the corresponding component scores. The three indices include respectively twelve, three and three components and their components are weighted equally. The RDI on democratisation includes only one component and weighting is thus not an issue. Under equal weighting one need not be concerned with the difficult task of determining the priority of each of these development objectives (Davis, 1945: 7-10). The RDIs are based on the explicit assumption that their components are equally important in assessing development. The only weighting to which these four indices are exposed is the implicit weighting introduced during scaling (Chapter 8, footnote 192, page 276).

In the case of the composite RDI two different weighting systems are experimented with. The one index is calculated as the average score on the four component indices, i.e. basic needs fulfilment, development of human resources,

economic performance and democratisation. The second composite RDI is calculated across all nineteen of the individual components (Table 9.1, page 324). Whereas the former index equally weights the four key policy programmes of the RDP, the latter index puts an equal weight on each of the specific objectives of the RDP. This procedure allows one to determine the effect of different weighting methods on index values (page 340).

9.2.4 Aggregation of components of RDIs

As with the HSIs (Chapter 8, page 277), additive aggregation is preferred to functional aggregation. Index values are determined by adding up the scores on each of the components included in the particular RDI. Hence the resulting indices are relatively simple with regard to construction and interpretation. Additive aggregation also supports the stated claim that these development objectives are valued equally and are each considered a necessary though not sufficient condition for reconstruction and development.

9.2.5 Validation of RDIs

As with the HSIs (Chapter 8, page 277), the RDIs are validated by employing both item analysis and external validation. Item analysis is concerned with the association between the various components of the RDIs. External validation focuses on the association between the RDIs and other development indicators. These validators need to be valid proxies of the aggregate of development, i.e. the result of the interaction between the economic, social, political and environmental elements of development. Provincial estimates of per capita and household income, life

expectancy, and the Human Development Index (HDI) are employed in validating the RDIs[209]. Another composite index employed as external validator is the Quality of Life ratings reported in Eskom's Omni Panel. These Quality of Life ratings reflect people's own subjective assessment of their well-being. This particular validator allows one to assess the extent to which the RDIs presented here correspond to subjective perceptions of development.

9.2.6 General methodological remarks on RDIs

This measurement effort complies with most of the general guidelines for composite indexing put forward in Chapter 7 (pages 246 to 252). It recognises the multidimensional nature of development by accounting for the economic, social, environmental and political aspects of development. The RDIs also reflect development objectives that are shared nationally. The RDIs are conceptually and methodologically manageable. Validity, comparability and data availability are used as guidelines in indicator selection, thereby enhancing the indices' relative objectivity and comparative value. The RDIs are also relatively flexible. Different components and indicators can be included in the index as policy priorities change or as new data become available. Such changes, though, will restrict the comparability of the index over time.

This measurement effort also deals in a satisfactory manner with the main criticisms levelled at composite indexing (Chapter 7, pages 246 to 250). Composite indices are often criticised for excluding some essential component(s) of development and/or for being biased where component selection is performed in an ad hoc fashion. As with the HSIs, these two criticisms are dealt with by drawing very specific

[209] The indicators included in the provincial HDIs are life expectancy, real GGP per capita, adult

conceptual boundaries within which the indices are devised and interpreted, i.e. the specific content of the RDP. Criticism that indicators other than the selected ones may better represent some components, is addressed by employing specific guidelines during indicator selection. The preference for equal weighting and additive aggregation aids the comparability of the different RDIs whilst maintaining clarity and simplicity. The RDIs, furthermore, do not lack practical value. The RDIs, which reflect provincial disparities in progress on the RDP, are employed in identifying the possible causes and consequences of these disparities.

In terms of the four general distinctions drawn in the discussion of the methods of indicator development (Chapter 2, page 24), the RDIs can be described as follows. The indices are quantitative insofar as each of the objectives of the RDP is quantified with the aid of certain indicators. The RDIs are also qualitative insofar as they are based on a very specific perception of development, i.e. development as defined in the RDP. Hence the RDIs are both quantitative and qualitative in nature. The indices are objective insofar as they include indicators derived from the 'autonomous professional handling' of observations by analysts (Perez, 1989: 207). In terms of the distinction between cardinal as opposed to ordinal indicators, the RDIs are ordinal rather than cardinal in nature. The indices quantify disparities between provinces but do so without allowing the meaningful interpretation of these differences (Chapter 2, page 26). A difference, for example, in the RDI of two provinces cannot tell us about the extent to which their performance on each of the nineteen index components differs, e.g. by what percentage unemployment in the one province exceeds that in the other province. The index can tell us only that the one province has been relatively more successful than the other in achieving the goals of the RDP. Given the variety of dimensions of development covered (Table 9.1, page

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literacy and mean years of schooling (Central Statistical Service, 1995: 1).

324), the RDIs represent multidimensional rather than unidimensional measures of development.

9.2.7 Results of comparison and validation of RDIs

The findings from the internal and external validation of the RDIs are presented here. First, however, the implications for the RDIs of changes in indicator selection and method of scaling and weighting are explored. All the different versions of the RDIs are included in this analysis. This include both the composite RDIs, the one calculated as the average score on the four component indices and the other calculated across all nineteen of the individual components (pages 331 to 332). The two composite indices respectively are indicated in the tables as *Composite RDI (4 components)* and *Composite RDI (19 components)*. Based on the results of the validation process, selected versions of the RDIs are used in the comparative application of the RDIs (page 354).

Analysis is effected with the aid of correlation analysis. According to Koutsoyiannis (1977: 40), linear correlation should be employed where dara are relatively accurate, whereas rank order correlation should be applied to data that are relatively imprecise. Provincial data on the same indicator were obtained from the same source. Hence the statistics employed in estimating the RDIs are not subject to methodological inconsistency and can be considered relatively accurate. Consequently, linear rather than rank order correlation is employed in the analysis in this chapter.

(i) Effect of changes in indicator selection on RDIs

During the calculation of the RDIs two different data sets are experimented with to assess the extent to which changes in indicator selection affect composite indices (page 326). Since the same data set is used to calculate mark I and II of the Democratisation RDI (Table 9.1, page 324), this index is excluded from this analysis.

Table 9.2: Correlation between mark I and II RDIs (n = 9)

Version	Basic Needs RDI	Human Resources RDI	Economic RDI	Composite RDI (4 components)	Composite RDI (19 components)
version 1	0.970**	0.482	0.788*	0.931**	0.947**
version 2	0.965**	0.389	0.834**	0.933**	0.956**
version 3	0.860**	0.088	0.787*	0.907**	0.876**
version 4	0.955**	-0.175	0.954**	0.930**	0.965**

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

Table 9.2 reports on the strength of the association between the mark I and the II indices. Results are reported for each of the four differently scaled versions of the RDIs. It is evident here that changes in indicator selection do have an impact on the relative performance of provinces on the different indices.

The effect is the most pronounced in the case of the Human Resources RDI. Not one of the sets of mark I and II indices correlated meaningfully. The difference between mark I and II of this index is that one component was replaced with an alternative indicator of an entirely different nature. Access of people to school facilities was replaced with an indicator assessing the extent to which existing facilities are overloaded (Table 9.1, page 324).

Seven of the twelve components of the Basic Needs RDI were replaced with alternative indicators. In the case of the Economic RDI, two of its three components

were replaced with alternative variables. Nevertheless, in the case of the Basic Needs and Economic RDIs, the mark I and II indices do correlate meaningfully. For the Basic Needs RDI the strength of the association varies between 0.860 and 0.970. The correlation coefficients for the Economic RDI range from 0.787 to 0.954. The coefficients are all statistically significant, whether at the 0.01 or 0.05 level. Unlike the Human Resources RDI, the alternative indicators are similar in nature to the ones included in mark I of the indices. The two alternative indicators included in the Economic RDI are similar estimates obtained from different sources (Table 9.1, page 324). Of the seven alternative indicators included in the Basic Needs RDI, only two are of an entirely different nature. Access to clinics and hospitals and to police stations was replaced respectively with medical officials per 1000 population and population per police officer. The remainder of the indicators are similar to those included in mark I of the index but were obtained from sources other than the Eskom Omni Panel (page 327).

The results for the composite RDIs paint a similar picture. In the mark II indices, ten of the nineteen components are represented by alternative data sets, but only three are of a different nature than the ones employed in devising the mark I indices. Consequently, the different composite RDIs correlate relatively well. The correlation coefficients are statistically significant at the 0.01 level and range from 0.876 to 0.965.

Thus, the effect of changes in indicator selection is more pronounced where indicators are replaced by ones of a different nature. Where indicators are replaced by similar indicators obtained from different data sources, the mark I and II indices do correlate relatively well, which further enhances trust in the data sources.

(ii) Effect of changes in method of scaling on RDIs

In Tables 9.3 and 9.4, the association between the differently scaled indices is reported. The LST technique is employed in respectively rescaling the unadjusted (version 1) and the logged values (version 2) of each of the variables. In version 3, index components are standardised by employing z scores. Version 4 is calculated by rescaling each of the variables relative to the national achievement on the particular variable. The RDI on democratisation is again excluded from the analysis, as this includes only one component (Table 9.1, page 324). Since the application of different methods of scaling in each case entails the consistent application of a single technique to the same set of data, the differently scaled versions of this index correlate perfectly.

Table 9.3: Correlation between differently scaled mark I RDIs (n = 9)

Basic Needs RDI	**version 1**	**version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.977**	1.000		
version 3	0.966**	0.929**	1.000	
version 4	0.876**	0.852**	0.964**	1.000
Human Resources RDI	**version 1**	**Version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.994**	1.000		
version 3	0.884**	0.876**	1.000	
version 4	0.906**	0.913**	0.976**	1.000
Economic RDI	**version 1**	**version 2**	**version 3**	**Version 4**
version 1	1.000			
version 2	0.939**	1.000		
version 3	0.921**	0.936**	1.000	
version 4	0.379	0.281	0.009	1.000
Composite RDI (4 components)	**version 1**	**version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.988**	1.000		
version 3	0.925**	0.950**	1.000	
version 4	0.534	0.503	0.420	1.000
Composite RDI (19 components)	**version 1**	**version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.987**	1.000		
version 3	0.971**	0.975**	1.000	
version 4	0.838**	0.799**	0.834**	1.000

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

The mark I RDIs are quite robust to changes in the method of scaling (Table 9.3, page 338). Versions 1, 2 and 3 of the RDIs correlate very well. The correlation coefficients are all statistically significant at the 0.01 level. The coefficients range from 0.876 to 0.994. Version 4 of the RDIs does not always correlate meaningfully with versions 1, 2 and 3 of the indices. Version 4 of the Economic and first Composite RDI does not correlate meaningfully with any of the other three versions of these particular indices. It is unclear whether this lack of statistical significance is the result of the small sample size (n = 9), the mechanics of the particular version of the index, or the nature of the data. Internal and external validation may shed further light on the validity of the Economic and first Composite RDI. Version 4 of the Basic Needs, Human Resources and second Composite RDI does correlate meaningfully with the other versions of these three indices. The coefficients range from 0.799 to 0.976 and are statistically significant at the 0.01 level.

The mark II RDIs are also relatively robust to changes in the method of scaling (Table 9.4, page 340). The results paint a similar picture to those in Table 9.3 (page 338). Apart from version 3 of the Human Resources RDI, versions 1, 2 and 3 of the different RDIs correlate fairly well. The statistically significant coefficients range from 0.778 to 0.992. Of the thirteen statistically significant coefficients, eleven are statistically significant at the 0.01 level. As in the case of the mark I RDIs, version 4 of the Economic and first Composite RDI fail to correlate meaningfully with the other versions of these indices. Once again it is unclear whether this lack of statistical significance is the result of the small sample size (n = 9), the mechanics of the particular version of the index, or the nature of the data. Version 4 of the remaining three RDIs, i.e. the Basic Needs, Human Resources and second Composite RDI, does correlate meaningfully with the other three versions of these indices, though not as well as in the case of the mark I indices (Table 9.3, page 338). Two of

the nine correlation coefficients are not statistically significant. The statistically significant coefficients range from 0.781 to 0.973. Of the seven statistically significant coefficients, six are statistically significant at the 0.01 level.

Table 9.4: Correlation between differently scaled mark II RDIs (n = 9)

Basic Needs RDI	**version 1**	**version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.988**	1.000		
version 3	0.778*	0.795*	1.000	
version 4	0.973**	0.958**	0.846**	1.000
Human Resources RDI	**version 1**	**version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.987**	1.000		
version 3	0.488	0.502	1.000	
version 4	0.781*	0.801**	0.320	1.000
Economic RDI	**version 1**	**version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.927**	1.000		
version 3	0.876**	0.925**	1.000	
version 4	0.512	0.333	0.057	1.000
Composite RDI (4 components)	**version 1**	**version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.989**	1.000		
version 3	0.863**	0.898**	1.000	
version 4	0.546	0.476	0.225	1.000
Composite RDI (19 components)	**version 1**	**version 2**	**version 3**	**version 4**
version 1	1.000			
version 2	0.992**	1.000		
version 3	0.838**	0.884**	1.000	
version 4	0.897**	0.847**	0.588	1.000

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

(iii) Effect of changes in method of weighting on RDIs

Two differently weighted composite RDIs were calculated (page 331). The strength of the association between the two composite RDIs is reported for each of the four differently scaled versions of the two indices (Table 9.5, page 341).

Table 9.5: Correlation between differently weighted RDIs (n = 9)

Version	Composite RDIs mark I	Composite RDIs mark II
version 1	0.872**	0.804**
version 2	0.863**	0.799**
version 3	0.984**	0.971**
version 4	0.826**	0.771*

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

The two differently weighted composite RDIs correlate relatively well (Table 9.5). Seven of the eight correlation coefficients are statistically significant at the 0.01 level. These coefficients range from 0.804 to 0.984. In the case of version 4 of the composite indices, the coefficient for the mark II indices is statistically significant only at the 0.05 level (r = 0.771). Thus, the use of different methods of weighting does influence efforts at composite indexing. The impact, however, need not be that great, as is evident from the relatively high degree of correlation reported in Table 9.5.

(iv) Internal validation of RDIs

Internal validation is performed with the aid of correlation analysis. Table 9.6 reports (page 342) on the relation between the index components of the mark I and II RDIs. Since index values are calculated by applying different scaling methods to the same data series, this association is the same for each of the differently scaled versions of the RDIs. Given the relatively large number of index components (19) and the small sample size (n = 9), and in the interest of readability, only correlation coefficients that are statistically significant at the 0.01 level are reported here. Where the correlation coefficients are similar for the same link (such as in linkage 1 reported

in Table 9.6), the same indicators were employed to quantify the particular index components of the mark I and II indices (Table 9.1, page 324).

Table 9.6: Correlation between index components of RDIs (n = 9)

Mark I RDIs		Mark II RDIs	
Index components	**r**	**Index components**	**r**
1. Housing; sport and recreation	-0.821	1. Housing; sport and recreation	-0.821
2. Water; sanitation	0.928	2. Water; energy and electrification	0.951
3. Water; energy and electrification	0.977	3. Water; telecommunications	0.987
4. Water; employment	0.841	4. Water; health care	0.929
5. Water; redistribution	0.918	5. Water; education and training	0.902
6. Sanitation; energy and electrification	0.945	6. Water; employment	0.908
7. Sanitation; telecommunications	0.862	7. Sanitation; employment	0.827
8. Sanitation; employment	0.872	8. Energy and electrification; telecommunications	0.901
9. Sanitation; redistribution	0.981	9. Energy and electrification; health care	0.807
10. Energy and electrification; employment	0.824	10. Energy and electrification; education and training	0.878
11. Energy and electrification; redistribution	0.952	11. Energy and electrification; employment	0.946
12. Telecommunications; health care	0.847	12. Telecommunications; health care	0.951
13. Telecommunications; education and training	0.885	13. Telecommunications; education and training	0.865
14. Telecommunications; employment	0.877	14. Telecommunications; employment	0.851
15. Telecommunications; redistribution	0.851	15. Health care; education and training	0.849
16. Clean and healthy environment; nutrition	-0.852	16. Education and training; employment	0.921
17. Health care; education and training	0.814	17. Youth development; economic growth	-0.938
18. Health care; employment	0.803		
19. Education and training; employment	0.955		
20. Employment; redistribution	0.885		

Note: Correlation coefficients are significant at the 0.01 level using a two-tailed test.

The components of both the mark I and the mark II RDIs do not correlate to a great extent (Table 9.6). Of the total of 171 links, only twenty (mark I) and seventeen (mark II) are statistically significant at the 0.01 level. The coefficients range from 0.803 to 0.987. Thirty-three of the thirty-seven correlation coefficients are positive. This supports the measurement aim of including in the RDIs components that are associated with improved delivery on the RDP.

One probable reason for the general lack of correlation between the index components, as well as for a few statistically significant coefficients being negative, is that provinces often have little control over the policies and policy actions that determine outcomes with regard to these development objectives. In many instances, policies and policy actions are coordinated by national government. Where provinces do have some autonomy, they do not always attach the same priority to the nineteen development objectives included in the RDI. Provinces also face different resource constraints. Provinces, furthermore, are not equally adept at applying their resources so as to achieve their development objectives. Hence, progress, as reflected in certain index components, may not be associated with progress on other components when compared across different provinces. It may also mean that improved delivery on one index component is accompanied by a lack of progress on another in all nine provinces, hence some negative correlations. The results reported in Table 9.6 (page 342) imply that improved delivery on housing and a clean and healthy environment are associated, respectively, with a lack of progress in delivery on sport and recreation and on nutrition (RDI mark I). In the mark II indices, improved delivery on housing is not associated with improved sport and recreation, as is progress on youth development and economic growth.

These results pose a great threat to this measurement effort. According to the general guidelines for composite indexing, components that fail to correlate meaningfully with other components included in that index should be excluded from the index. Alternatively, the variables concerned should be quantified with the aid of different indicators. Neither of these two options presents a feasible course of action. The exclusion of certain of these components from the RDI will compromise its conceptual validity. Such an index cannot be claimed to represent a measure of progress on the RDP if land reform, transport, social security and welfare, personal

safety, and democratisation are excluded. Thus, we continue with the nineteen selected components. Given that indicator selection was guided by very specific guidelines (page 326), changes in indicator selection was not a serious option. Internal validation, therefore, fails to provide clearcut evidence of the validity of the RDIs. Consequently, it leaves the external validation of the indices to determine whether the RDIs presented here are valid measures of progress on reconstruction and development.

(v) External validation of RDIs

The RDIs are validated externally with the aid of nine indicators and indices of development. The selected validators are prominent in the measurement debate or represent good proxies of the aggregate of development (page 332). External validators should, ideally, not be related to the validated indices. One of the composite indices employed as validator does overlap with the RDIs, as education and training features in both the Human Development Index (HDI) and the RDI (Table 9.1, page 324). Yet, completely different indicators are employed to quantify this particular component of the HDI (footnote 209, page 333). Despite this overlap, the HDI is not excluded from the list of validators. Its inclusion allows one to determine the extent to which the RDIs correlate with a composite index of development employed to assess progress on certain components of the RDP. The degree of overlap, moreover, is negligible insofar as it concerns only one of the nineteen components included in the RDI. The association between the mark I and II indices and each of the nine external validators is reported in Tables 9.7 and 9.8. Results are reported for each of the four differently scaled versions of the RDIs.

Table 9.7: Correlation between mark I RDIs and nine other selected development indicators and indices (n = 9)

Development indicator or index	Basic Needs RDI	Human Resource RDI	Economic RDI	Democracy RDI	Composite RDI (4 components)	Composite RDI (19 components)
Version 1						
1. Average annual income of head of household (1996)	0.788*	0.181	0.837**	-0.065	0.573	0.818**
2. Personal income per capita (1994)	0.856**	0.053	0.843**	0.206	0.740*	0.882**
3. Real GGP per capita (1994)	0.803**	-0.246	0.847**	0.314	0.704*	0.799**
4. Average monthly household income (1995)	0.963**	-0.111	0.913**	0.325	0.828**	0.963**
5. Average annual per capita income (1995)	0.962**	-0.163	0.942**	0.363	0.849**	0.965**
6. Life expectancy estimates (1991-96)	0.844**	0.048	0.785*	0.124	0.657	0.847**
7. Life expectancy (1994)	0.824**	0.034	0.917**	0.316	0.829**	0.888**
8. Human Development Index (1991)	0.889**	-0.298	0.876**	0.437	0.808**	0.877**
9. Average Quality of Life Rating (1995)	0.635	-0.589	0.552	0.787*	0.753*	0.601
Version 2						
1. Average annual income of head of household (1996)	0.717*	0.223	0.874**	-0.064	0.619	0.806**
2. Personal income per capita (1994)	0.799**	0.109	0.854**	0.213	0.777*	0.875**
3. Real GGP per capita (1994)	0.758*	-0.175	0.812**	0.324	0.736*	0.795*
4. Average monthly household income (1995)	0.911**	-0.069	0.914**	0.321	0.853**	0.954**
5. Average annual per capita income (1995)	0.901**	-0.115	0.944**	0.364	0.878**	0.953**
6. Life expectancy estimates (1991-96)	0.817**	0.111	0.783*	0.131	0.697*	0.855**
7. Life expectancy (1994)	0.705*	0.077	0.843**	0.324	0.810**	0.816**
8. Human Development Index (1991)	0.849**	-0.230	0.814**	0.445	0.823**	0.866**
9. Average Quality of Life Rating (1995)	0.581	-0.578	0.566	0.774*	0.748*	0.581

Four of the mark I RDIs perform extremely well on this test for validity (Table 9.7). Versions 1, 2 and 3 of the Basic Needs and Economic RDI and the two composite RDIs correlate meaningfully with most of the validators. Only nine of the 108 correlation coefficients pertaining to these four indices are not statistically significant.

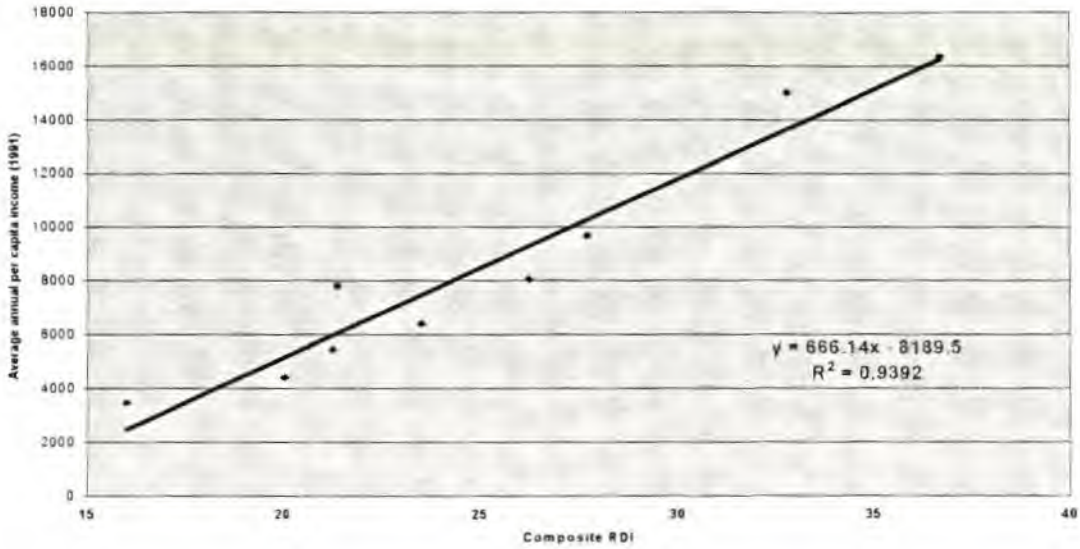
Table 9.7: Correlation between mark I RDIs and nine other selected development indicators and indices (n = 9) (continued)

Development indicator or index	Basic Needs RDI	Human Resource RDI	Economic RDI	Democracy RDI	Composite RDI (4 components)	Composite RDI (19 components)
Version 3						
1. Average annual income of head of household (1996)	0.730*	0.128	0.824**	-0.065	0.721*	0.775*
2. Personal income per capita (1994)	0.846**	-0.055	0.915**	0.206	0.849**	0.874**
3. Real GGP per capita (1994)	0.837**	-0.336	0.881**	0.314	0.778*	0.823**
4. Average monthly household income (1995)	0.962**	-0.113	0.987**	0.325	0.953**	0.978**
5. Average annual per capita income (1995)	0.965**	-0.169	0.968**	0.363	0.941**	0.969**
6. Life expectancy estimates (1991-96)	0.834**	-0.019	0.881**	0.124	0.810**	0.857**
7. Life expectancy (1994)	0.785*	-0.085	0.802**	0.316	0.796*	0.801**
8. Human Development Index (1991)	0.922**	-0.342	0.912**	0.437	0.867**	0.901**
9. Average Quality of Life Rating (1995)	0.797*	-0.587	0.662	0.787*	0.735*	0.726*
Version 4						
1. Average annual income of head of household (1996)	0.583	0.267	0.254	-0.065	0.500	0.698*
2. Personal income per capita (1994)	0.759*	0.129	-0.008	0.206	0.371	0.707*
3. Real GGP per capita (1994)	0.831**	-0.161	0.056	0.314	0.434	0.779*
4. Average monthly household income (1995)	0.876**	0.058	-0.001	0.325	0.444	0.815**
5. Average annual per capita income (1995)	0.896**	-0.002	0.131	0.363	0.578	0.903**
6. Life expectancy estimates (1991-96)	0.757*	0.160	-0.096	0.124	0.266	0.653
7. Life expectancy (1994)	0.669*	0.090	0.431	0.316	0.784*	0.878**
8. Human Development Index (1991)	0.917**	-0.158	0.025	0.437	0.475	0.847**
9. Average Quality of Life Rating (1995)	0.888**	-0.488	-0.123	0.787*	0.362	0.718*

Data sources: South African Advertising Research Foundation (1996), South African Institute of Race Relations (1996/98b), Development Bank of Southern Africa (1998).

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

Figure 9.1: Composite RDI (19 components, mark I, version 3) and average annual per capita income (1995) (n = 9)



The strongest link is that between average annual per capita income and the third version of the second Composite RDI (i.e. r = 0.969) (Table 9.7, page 346). Differences in this version of the Composite RDI explain as much as 93.9 per cent of differences in the average LSM (Figure 9.1). The remaining statistically significant correlation coefficients pertaining to these four indices range from 0.697 to 0.968. The nature of the relationship is consistently positive. Higher RDIs are associated with higher scores on the validators. Only one of the validators, namely the average Quality of Life Rating (1995), generally fails to correlate with the four indices. Only five of the twelve correlation coefficients pertaining to this validator are statistically significant and then only at the 0.05 level. Consequently, the average Quality of Life Rating (1995) may be considered a poor validator.

Version 4 of the mark 1 RDIs correlates meaningfully with most of the validators in only the case of the Basic Needs RDI and the second composite RDI (Table 9.7, page 346). Sixteen of the eighteen correlation coefficients pertaining to these two indices are statistically significant. The statistically significant coefficients

range from 0.669 to 0.917. The Human Resource RDI does not correlate meaningfully with the validators in the case of all four versions of this index. Apart from its meaningful association with the average Quality of Life Rating (1995), the Democratisation RDI also fails to correlate meaningfully with the ten validators.

Table 9.8: Correlation between mark II RDIs and nine other selected development indicators and indices (n = 9)

Development indicator or index	Basic Needs RDI	Human Resource RDI	Economic RDI	Democracy RDI	Composite RDI (4 components)	Composite RDI (19 components)
Version 1						
1. Average annual income of head of household (1996)	0.769*	-0.171	0.487	-0.065	0.294	0.694*
2. Personal income per capita (1994)	0.854**	-0.008	0.443	0.206	0.527	0.825**
3. Real GGP per capita (1994)	0.876**	-0.147	0.546	0.314	0.603	0.858**
4. Average monthly household income (1995)	0.934**	-0.113	0.574	0.325	0.645	0.919**
5. Average annual per capita income (1995)	0.956**	-0.160	0.662	0.363	0.694*	0.955**
6. Life expectancy estimates (1991-96)	0.859**	-0.032	0.351	0.124	0.438	0.790*
7. Life expectancy (1994)	0.812**	0.083	0.624	0.316	0.672*	0.867**
8. Human Development Index (1991)	0.944**	-0.095	0.587	0.437	0.732*	0.951**
9. Average Quality of Life Rating (1995)	0.639	-0.007	0.301	0.787*	0.806**	0.709*
Version 2						
1. Average annual income of head of household (1996)	0.756*	-0.133	0.544	-0.064	0.343	0.716*
2. Personal income per capita (1994)	0.854**	0.057	0.491	0.213	0.571	0.855**
3. Real GGP per capita (1994)	0.862**	-0.068	0.527	0.324	0.628	0.867**
4. Average monthly household income (1995)	0.919**	-0.049	0.639	0.321	0.690*	0.947**
5. Average annual per capita income (1995)	0.921**	-0.103	0.705*	0.364	0.731*	0.965**
6. Life expectancy estimates (1991-96)	0.882**	0.040	0.395	0.131	0.483	0.832**
7. Life expectancy (1994)	0.760*	0.095	0.570	0.324	0.659	0.830**
8. Human Development Index (1991)	0.928**	-0.023	0.558	0.446	0.746*	0.954**
9. Average Quality of Life Rating (1995)	0.585	0.100	0.393	0.773*	0.829**	0.713*

Development indicator or index	Basic Needs RDI	Human Resource RDI	Economic RDI	Democracy RDI	Composite RDI (4 components)	Composite RDI (19 components)
Version 3						
1. Average annual income of head of household (1996)	0.504	0.591	0.524	-0.065	0.489	0.534
2. Personal income per capita (1994)	0.772*	0.777*	0.591	0.206	0.747*	0.792*
3. Real GGP per capita (1994)	0.798*	0.680*	0.644	0.314	0.791*	0.819**
4. Average monthly household income (1995)	0.830**	0.729*	0.731*	0.325	0.845**	0.861**
5. Average annual per capita income (1995)	0.776*	0.692*	0.756*	0.363	0.832**	0.819**
6. Life expectancy estimates (1991-96)	0.791*	0.767*	0.529	0.124	0.712*	0.796*
7. Life expectancy (1994)	0.498	0.746*	0.532	0.316	0.623	0.558
8. Human Development Index (1991)	0.856**	0.743*	0.692*	0.437	0.879**	0.884**
9. Average Quality of Life Rating (1995)	0.733*	0.361	0.430	0.787*	0.772*	0.731*
Version 4						
1. Average annual income of head of household (1996)	0.680*	-0.458	0.017	-0.065	0.195	0.597
2. Personal income per capita (1994)	0.823**	-0.199	-0.243	0.206	0.137	0.639
3. Real GGP per capita (1994)	0.905**	-0.193	-0.146	0.314	0.302	0.775*
4. Average monthly household income (1995)	0.899**	-0.129	-0.221	0.325	0.243	0.738*
5. Average annual per capita income (1995)	0.930**	-0.170	-0.079	0.363	0.398	0.840**
6. Life expectancy estimates (1991-96)	0.834**	-0.185	-0.332	0.124	0.034	0.600
7. Life expectancy (1994)	0.746*	-0.062	0.198	0.316	0.601	0.824**
8. Human Development Index (1991)	0.971**	-0.031	-0.172	0.437	0.377	0.850**
9. Average Quality of Life Rating (1995)	0.747*	0.354	-0.275	0.787*	0.365	0.647

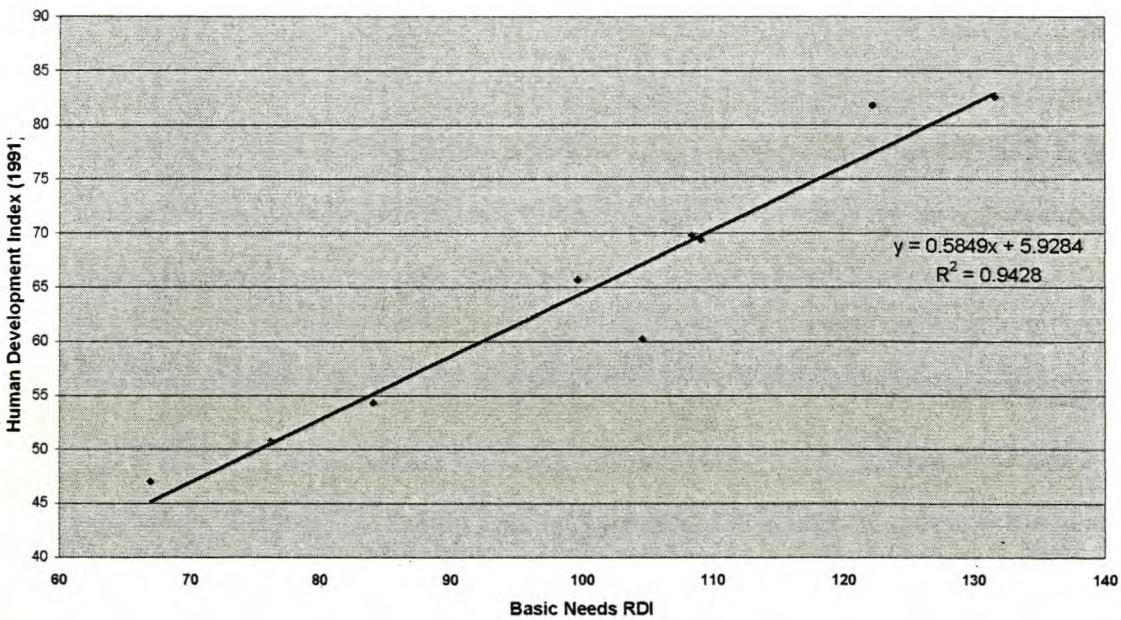
Data sources: South African Advertising Research Foundation (1996), South African Institute of Race Relations (1996/98b), Development Bank of Southern Africa (1998).

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

The statistically significant links between the validators and the mark II indices are again consistently positive (Table 9.8, page 348). Yet, only two of the mark II RDIs perform well on this test for validity. All four versions of the Basic Needs RDI and the second composite RDI correlate meaningfully with most of the

validators. Only ten of the seventy-two correlation coefficients pertaining to these two indices are not statistically significant. The strongest link is that between the Human Development Index (HDI) and the fourth version of the Basic Needs RDI (i.e. r = 0.971). Differences in the HDI explain 94.28 per cent of differences in this particular version of the Basic Needs RDI (Figure 9.2). The remaining statistically significant correlation coefficients pertaining to these two indices range from 0.694 to 0.965.

Figure 9.2: Basic Needs RDI (mark II, version 4) and Human Development Index (1991) (n = 9)



Mark II of the Economic RDI and first composite RDI do not perform as well on this test for validity as the corresponding mark I indices (Table 9.7, page 345). In the case of the Economic RDI, only four of the thirty-six correlation coefficients are statistically significant and then only at the 0.05 level. The coefficients range from 0.692 to 0.756. Three of the four coefficients pertain to version 3 of the Economic RDI. The first Composite RDI, which weights the four main RDIs equally, correlates

meaningfully with the validators in only fifteen instances. These correlation coefficients range from 0.672 to 0.879. Ten of these fifteen coefficients are statistically significant only at the 0.05 level. Four of the seventeen significant coefficients pertain to version 1 of the index, four to version 2, and seven to version 3. Version 4 of this Composite RDI fails to correlate meaningfully with any of the validators.

As in Table 9.7 (page 345), the RDI on democratisation fails to correlate with any of the validators, except for the average Quality of Life Rating (1995) (Table 9.8, page 348). Version 3 of the Human Resource RDI correlates meaningfully with seven of the nine validators, even though these seven correlation coefficients are statistically significant only at the 0.05 level. The coefficients range from 0.680 to 0.777. Hence only version 3 of the mark II Economic, Human Resources and first Composite RDI can be argued to pass this test for validity, albeit relatively poorly.

In the light of the above results (pages 344 to 351), one may conclude that the mark I Basic Needs and Economic RDIs and the two mark I composite RDIs are indeed valid measures of progress on reconstruction and development. These four RDIs correlated well with the majority of the validators. In the case of the mark II indices, only the Basic Needs RDI and the second Composite RDI correlated with the majority of the validators. The mark I indices are preferred above the mark II indices insofar as more of the mark I indices comprehensively passed this test for validity. It is moreover evident that the mark I and II RDIs on human resource development and democratisation do not represent valid indicators. These two indices fail to correlate with most of the validators. Hence the mark II RDIs and the mark I RDIs on democratisation and human resource development are excluded from the subsequent comparative application of the indices (page 354).

These results also refute the common argument that composite indices do not reveal anything that a single variable alone cannot reveal. The different RDIs do not correlate perfectly with any of the validators. Nor are any of the validators, like the RDIs, conceptualised as measures of progress on reconstruction and development. That the dimensions of development that these validators represent are perhaps crucial in making progress on the RDP, is not disputed. Yet, each can tell only part of the tale of progress on reconstruction and development.

As with the HSIs, an alternative avenue of external validation can be explored by assessing the association between the index components and a select validator. According to Babbie (1995: 161-175), this type of analysis is useful for distinguishing between 'good' as opposed to 'bad' indices. If the index is a 'good' one, the individual component scores should correlate well with the validator. If, on the other hand, the index is a 'bad' one, some or all of the indivudual component scores will fail to correlate with the validator.

This test for validity requires a validator that is not in any way directly related to the indicators included in the RDIs and that also represents a general proxy of quality of life. Life expectancy is the only such indicator. In the preceding analysis, two different estimates of life expectancy were used. Table 9.9 (page 353) reports on the association between these estimates of life expectancy and each of the nineteen index components of the mark I and II RDIs. For reasons noted elsewhere (page 338), this association does not differ across the differently scaled versions of the RDI components. Where the correlation coefficients are similar for components of the mark I and II indices, this is because the same indicator was employed to quantify the particular index component in both mark I and mark II (Table 9.1, page 324).

Table 9.9: Correlation between life expectancy and nineteen RDI index components (n = 9)

Index component	Life expectancy (1991-96)		Life expectancy (1994)	
	RDI mark I	RDI mark II	RDI mark I	RDI mark II
1. Land reform	-0.420	-0.420	-0.492	-0.492
2. Housing	0.258	0.258	0.206	0.206
3. Water	0.711*	0.888**	0.709*	0.851**
4. Sanitation	0.851**	0.710*	0.810**	0.489
5. Energy and electrification	0.786*	0.832**	0.753*	0.808**
6. Telecommunications	0.900**	0.862**	0.721*	0.848**
7. Transport	0.328	0.328	0.427	0.427
8. Clean and healthy environment	-0.449	-0.598	0.154	-0.143
9. Nutrition	0.255	0.255	0.059	0.059
10. Health care	0.742*	0.866**	0.382	0.919**
11. Social security and welfare	-0.021	-0.021	0.128	0.128
12. Personal safety	0.431	0.653	0.676*	0.251
13. Education and training	-0.508	-0.715*	-0.544	-0.582
14. Sport and recreation	0.832**	0.832**	0.768*	0.768*
15. Youth development	-0.229	-0.229	-0.154	-0.154
16. Economic growth	-0.521	-0.521	-0.024	-0.024
17. Employment	0.868**	0.726*	0.746*	0.738*
18. Redistribution	0.864**	0.349	0.770*	0.297
19. Democratisation	0.124	0.124	0.316	0.316

Data sources: Development Bank of Southern Africa (1998), South African Institute of Race Relations (1998b).

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

Given Babbie's (1995) criterion for a 'good' index (page 352) and based on the evidence presented in Table 9.9, one would have to conclude that the RDIs are 'bad' indices. More than half of the index components fail to correlate meaningfully with life expectancy. In the case of the 1991-96 estimates of life expectancy, only eight each of the nineteen correlation coefficients for the mark I and II indices are statistically significant. The statistically significant coefficients range from 0.710 (sanitation) to 0.900 (telecommunications). The RDIs performed equally poorly on this test of validity when employing the 1994 estimates of life expectancy. Respectively eight and six of the correlation coefficients for the mark I and II indices are statistically significant. The statistically significant coefficients range from 0.676

(personal safety) to 0.919 (health care). As many as nine of the nineteen index components consistently failed to correlate with life expectancy.

One would also expect progress on the RDP to be associated with improvements in life expectancy. Hence, one would expect the index components to be positively associated with life expectancy. The statistically significant correlation coefficients are all positive, except in one instance (Table 9.9, page 353). The negative association between life expectancy and education and training is statistically significant ($r = -0.715$), albeit only at the 0.05 level. However, as many as twenty-one of the forty-six statistically insignificant coefficients have negative signs.

Ultimately, though, the RDIs did perform relatively well on the normal test for external validity (pages 344 to 351). The Basic Needs, Economic and Composite RDIs, moreover, did correlate fairly well with these estimates of life expectancy. Thus, the unfavourable conclusions drawn from Table 9.9 cannot entirely condemn the RDIs.

9.3 COMPARATIVE APPLICATION OF RDIs

The different RDIs paint a similar picture with regard to the relative progress of the provinces on reconstruction and development. The Western Cape, Gauteng and Northern Cape generally rank highest, whilst the Eastern Cape, Northern Province and Mpumalanga consistently rank amongst the poorest performers. The relatively high levels of correlation reported in the previous pages bear testimony to this. The purpose here, though, is to add even further value to this effort at composite indexing. This is done by attempting to identify the characteristics with which progress on the RDP are generally associated. As a result of the lack of adequate data to allow indices to be devised for different years, the focus is on cross-section analysis. Four

developmental linkages featuring prominently in development studies are explored in a comparative analysis of the RDIs. The nature of each of these linkages is briefly discussed in the following pages. The indicators used to operationalise each of the issues are noted in the subsequent discussion.

The relationship between the RDIs and each of the four issues is explored with the aid of correlation and regression analysis. Due to lack of space, the correlation and regression results cannot be reported for each of the different versions of the RDIs. Only certain versions of the RDIs are employed in this analysis. As more mark I indices than mark II indices correlated meaningfully with the majority of external validators, only the mark I indices are included in the analysis. Only three of the six types of RDIs are used, namely the Basic Needs and Economic RDIs and the second composite version of the RDI, the three RDIs which correlated meaningfully with the majority of the external validators. Only version 3 of the RDIs is included in the analysis. The correlation coefficients pertaining to this version of the selected three RDIs consistently exceeded those of versions 1, 2 and 4 of the same indices in terms of size and statistical significance (pages 344 to 351).

The relationship between the selected RDIs and the four development issues is explored individually in sections 9.3.1 to 9.3.4. The extent of correlation between the RDIs and each of the selected indicators is discussed briefly. The regression model that best fits the RDIs is also discussed. Stepwise multiple regression is used to estimate the models. The best fitting model is the one with the highest possible adjusted R^2 for which the coefficients and F and t statistics are acceptable.

9.3.1 Poverty, inequality and progress on reconstruction and development

The relation between poverty, inequality and development is a central theme of development studies (Todaro, 1994: 159). The indicators here employed in assessing this linkage are the Gini coefficient, two different estimates of the headcount poverty index and the RDIs. Table 9.10 reports on the extent of correlation between the three selected RDIs and these three indicators of poverty and inequality.

Table 9.10: Correlation between RDIs and three selected indicators of poverty and inequality (n = 9)

Indicator	1. Gini coefficient (1993)	2. Headcount poverty index (1993)[210]	3. Headcount poverty index (1995)[211]
Basic needs RDI	-0.656	-0.561	-0.830**
Economic RDI	-0.768*	-0.610	-0.889**
Composite RDI (19 components)	-0.668*	-0.583	-0.855**

Data sources: Development Bank of Southern Africa (1998), Woolard and Leibbrandt (1999).

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

The 1995 headcount poverty index correlates meaningfully with all three RDIs (Table 9.10). The correlation coefficients are statistically significant at the 0.01 level and range from 0.830 to 0.889. In the case of the 1993 estimates of the Gini coefficient, two of the three coefficients are statistically significant, albeit only at the 0.05 level. The strength of the association ranges from 0.668 to 0.768. The 1993 headcount poverty index failed to correlate meaningfully with any of the three RDIs. All nine correlation coefficients have negative signs, as expected: progress on

[210] The source makes no reference to the particular poverty line that was used in deriving the 1993 headcount poverty index (Development Bank of Southern Africa, 1998: 210-211).

[211] The 1995 headcount poverty index is based on a poverty line of R2200 per adult equivalent per annum in 1995 prices. In order to tie the poverty line to the international 'dollar a day' per capita line,

reconstruction and development in a province is generally associated with lower levels of poverty and inequality. The strongest link is that between the 1995 headcount poverty index and the Economic RDI (r = -0.889). Lower levels of poverty and inequality imply less of a burden on the economy and can free resources to be employed toward more productive ends. This, in turn, can enhance progress on economic growth, job creation and redistribution. Other development initiatives have an equally important role to play. Lower levels of poverty and inequality in provinces are associated with overall progress on reconstruction and development. Improved basic needs fulfilment at the provincial level is also associated with lower levels of poverty. The relationship, therefore, between poverty and inequality and progress on reconstruction and development is a dual one that runs in both directions.

Table 9.11: Regression model for Economic RDI and the headcount poverty index and Gini coefficient

Dependent variable: Economic RDI						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
9	0.928	0.904	38.536	1. Headcount poverty index (1995)	-0.392	5.299
				2. Gini coefficient (1993)	-1.116	3.385
				3. Constant	+63.483	3.291

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

The regression results in Table 9.11 lend further support to the above argument that lower levels of poverty and inequality are associated with economic progress. Differences in the 1995 headcount poverty index and 1993 Gini coefficient 'explain' 90.4 per cent of differences in the Economic RDI, although the direction of causality is unclear.

Woolard and Leibbrandt (1999: 26) assumed that the average household consists of two adults and three children.

9.3.2 Demographics and progress on reconstruction and development

There are a number of reasons why the relation between development and demographics is of particular interest. On the one hand, increasing population pressure is associated with diminished prospects for development, e.g. deteriorating rates of economic growth, rising inequality, and increasing environmental degradation (Birdsall, 1980: 21-42; 1994: 175-182). Increasing populations also place a burden on infrastructure, delivery structures and the planning capacity of government. These pressures result from growing populations being increasingly more youthful and dependent on the government for their livelihood (Solimano and Chapin, 1981: 1-3; Leonard, 1989: 5-9; UNPF, 1991: 3-16). On the other hand, progress on development is crucial in reducing population pressure, i.e. reducing fertility and mortality rates in order to negotiate the demographic transition. The main strategies for reducing fertility rates include improvements in education and reductions in the cost of and improvements in the availability of family planning services and contraceptive devices (Birdsall, 1980: 21-42; 1994: 182-191). Improvements in health care are crucial in curbing mortality rates (Bengtsson and Gunnarsson, 1994: 1-3).

Various indicators of these consequences of and strategies for alleviating population pressure are included in the RDIs. Hence, the indices are ideal for assessing the link between population dynamics and progress on reconstruction and development. In order to establish the nature of this relationship, the association between the RDIs and the population dependency burden is assessed. Different estimates of the population dependency burden are employed for this purpose. The three sets of estimates were obtained from different publications and were calculated differently. The 1995 estimate was calculated as the ratio of dependents (the population younger than fifteen and older than sixty-four years) to the working age

population (those persons aged 15-64). The 1996 estimates, which were obtained from two different sources, were calculated as the percentage of the total population younger than fifteen and older than sixty-four years. The total fertility rate is employed as an alternative indicator of population pressure. The results of the correlation analysis are reported in Table 9.12.

Table 9.12: Correlation between RDIs and four selected demographic indicators (n = 9)

Indicator	1. Population dependency burden (1995)	2. Population dependency burden (1996)	3. Population dependency burden (1996)	4. Total fertility rate (1991-96)
Basic needs RDI	-0.637	-0.861**	-0.817**	-0.910**
Economic RDI	-0.606	-0.915**	-0.876**	-0.885**
Composite RDI (19 components)	-0.631	-0.868**	-0.832**	-0.890**

Data sources: South African Institute of Race Relations (1996/98b), Development Bank of Southern Africa (1998), Statistics South Africa (1998).

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients without an asterisk are not statistically significant.

Nine of the twelve correlation coefficients in Table 9.12 are statistically significant at the 0.01 level. The 1995 estimates of the population dependency burden failed to correlate meaningfully with any of the three RDIs. The statistically significant coefficients range from 0.817 to 0.915. The coefficients are all negative. Thus, there exists strong evidence that population pressure poses a serious threat to prospects for reconstruction and development. This is true in respect of the arguments expounded in the above paragraph (pages 357 to 358).

The ranking of the provinces on the RDIs is also still very much indicative of the Apartheid legacy. The correlation between the percentage of the population that is not white (i.e. African, Coloured and Asian) and the Basic Needs, Economic and Composite RDIs is, respectively, 0.925, 0.958 and 0.937. The coefficients all have negative signs and are all statistically significant at the 0.01 level using a two-tailed

test. Differences in the percentage of population that are not white explain as much as 87.8 per cent of differences in the Composite RDI (Figure 9.3).

Figure 9.3: Composite RDI and percentage of population not white (1996) (n = 9)

Data source: Statistics South Africa (1998: Table 2.6).

In the case of the Basic Needs and Economic RDIs, this percentage is respectively 85.5 and 91.8. Provinces with larger white populations generally perform better on the RDIs, whereas provinces with smaller white populations generally perform more poorly. Thus, the Western Cape, Gauteng and Northern Cape generally rank highest, whilst the Eastern Cape, Northern Province and Mpumalanga consistently rank amongst the poorest performers. This suggests that levels of development achieved in the Apartheid era still critically influence current disparities in development. Moreover, it implies that past inequities continue to exist and that the RDP has not yet succeeded in eradicating these disparities.

As argued elsewhere (page 358), the relationship between population pressure and development is a dual one. Model A shows how progress on basic needs

fulfilment (e.g. health, nutrition and education) may aid provinces in reducing population pressure. Differences in the Basic Needs RDI explain 81.3 per cent of differences in total fertility rates (Table 9.13).

Table 9.13: Regression models for Basic Needs RDI and the total fertility rate and population dependency burden

Model A: Dependent variable Total fertility rate (1991-96)						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
9	0.828	0.813	33.591	1. Basic needs RDI	-0.057	5.796
				2. Constant	+5.498	15.039
Model B: Dependent variable Basic Needs RDI						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
9	0.926	0.902	37.644	1. Total fertility rate (1991-96)	-10.369	4.591
				2. Population dependency burden (1996)	-0.584	2.832
				3. Constant	+94.172	13.816

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

Model B presents evidence of the extent to which population pressure may threaten prospects for reconstruction and development (Table 9.13). Provinces with lower total fertility rates and population dependency burdens have a better chance of making progress on basic needs fulfilment. Differences in the total fertility rate and population dependency burden explain as much as 90.2 per cent of differences in the Basic Needs RDI.

9.3.3 Urbanisation and progress on reconstruction and development

Some of the aspects of underdevelopment included in the RDIs are symptomatic of urbanisation (Campbell, 1989: 165-166). On the one hand, people living in rural areas may be relatively more susceptible than city dwellers to

symptoms of underdevelopment such as malnutrition. On the other hand, people residing in cities are relatively more exposed than their rural counterparts to crime (Spitz, 1978: 867; Oodit and Simonis, 1993: 14-15). Urbanisation, furthermore, is indicative of increasing pressure on resources and delivery structures (Sandbrook, 1982: 18-28). Yet, one can also argue that progress in concentrated, urbanised communities is relatively easier to manage and achieve than in more geographically dispersed localities. The statistic employed to operationalise this linkage is the level of urbanisation, i.e. the percentage of the population living in urban areas. Estimates of urbanisation levels for 1994, 1995 and 1996 are employed for this purpose. The three sets of estimates were obtained from different sources.

Table 9.14: Correlation between RDIs and level of urbanisation (n = 9)

Indicator	1. Percentage population urbanised (1994)	2. Percentage population urbanised (1995)	3. Percentage population urbanised (1996)
Basic needs RDI	0.905**	0.923**	0.905**
Economic RDI	0.958**	0.960**	0.910**
Composite RDI (19 components)	0.913**	0.929**	0.914**

Data sources: South African Advertising Research Foundation (1996), Development Bank of Southern Africa (1998), Statistics South Africa (1998).

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test.

The nine correlation coefficients reported in Table 9.14 are all statistically significant at the 0.01 level. The coefficients range from 0.905 to 0.958 and are all positive. Hence higher levels of urbanisation are generally associated with progress with regard to the RDP. This supports the above argument that progress in concentrated, urbanised communities is relatively easier to manage and achieve than progress in communities that are geographically more dispersed, but could also be indicative of economic activity levels encouraging urbanisation.

Table 9.15: Regression model for Economic RDI and the level of urbanisation

Dependent variable: Economic RDI						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
9	0.921	0.910	81.785	1. Percentage population urbanised (1995)	+0.358	9.044
				2. Constant	-43.628	18.120

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.01 level using a two-tailed test.

Evident from Table 9.15 is the degree to which economic development is associated with urban dynamics. Provinces characterised by higher levels of urbanisation are more likely to make progress in delivering on the economic objectives of the RDP. Differences in the level of urbanisation explain 91.0 per cent of the differences in the Economic RDI. Business is likely to benefit more from economies of scale and increased turnover in concentrated, urbanised areas where markets are generally larger and infrastructure better developed. Again the evidence supports the idea that progress on this particular aspect of the RDP is more likely to succeed in areas where people are more concentrated (page 362).

9.3.4 Family, social and political values and progress on reconstruction and development

An issue of particular concern in sociology is the extent to which development may be associated with changes in family and social values. Higher levels of affluence may cause social and family values to decline, given the pressure affluence exerts on traditional institutions such as the family, church and school. Equally important in affecting delivery on policy objectives are political structures and processes. Hence the inclusion of political values in this analysis.

Family values are operationalised with the aid of estimates of the percentage of households in each province that consist of single parent households with children[212]. These estimates may admittedly include households in which a parent works as a migrant labourer. Despite this apparent drawback, the indicator is considered a good proxy of family values. Parents who are migrant labourers are normally absent from their households for extended periods of time. Their absence still implies a social loss to the particular family. Employed as proxies of a decline in social values, are estimates of the incidence of murder, rape and drug related offences. Employed as a proxy of single-party dominance, is the highest percentage vote going to a single party in the local government elections. This selection of variables admittedly implies a rather subjective judgement regarding the relative desirability of certain social and political characteristics. Table 9.16 reports on the association between the selected three RDIs and each of these proxy indicators.

Table 9.16: Correlation between RDIs and five selected proxies of family, social and political values (n = 9)

Indicator	1. Percentage single parent households (1995)	2. Reported murders per 100 000 population (1996)	3. Reported rapes per 100 000 population (1996)	4. Reported drug related crimes per 100 000 population (1996)	5. Highest percentage vote for a single party in local elections (1995/96)
Basic needs RDI	-0.757*	0.893**	0.796*	0.775*	-0.871**
Economic RDI	-0.821**	0.800**	0.836**	0.700*	-0.781*
Composite RDI (19 components)	-0.729*	0.870**	0.774*	0.755*	-0.850**

Data sources: Election Task Group (1996), South African Advertising Research Foundation (1996), South African Institute of Race Relations (1998a), South African Police Service (1998).

Note: Correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

[212] These estimates exclude so-called single person households that consist of hostel and institution dwellers and live-in domestic workers (South African Advertising Research Foundation, 1996: H2-3).

The correlation results are encouraging (Table 9.16, page 364). The correlation coefficients are all statistically significant, be it at the 0.05 or the 0.01 level and range from 0.700 to 0.893. The results suggest that progress on the RDP is generally associated with a decrease in the number of single parent families. The strongest link is that between the Economic RDI and the percentage of single parent households (r = -0.821). This makes sense insofar as the reason for household members becoming migrant workers and leaving behind single parent households (page 364) is probably economic in nature, i.e. a lack of job opportunities in local communities.

The results also imply that levels of crime are generally higher in provinces that have come closer to meeting RDP objectives (Table 9.16, page 364). The correlation coefficients pertaining to the three crime indicators are all positive. The strongest link is that between the reported incidence of murder and progress on basic needs fulfilment (r = 0.893). These results contradict the traditional hypothesis concerning the relationship between crime and economic development. The Durkheimian modernisation perspective on crime and development states that crime is normally higher in communities with low economic status. Low economic status includes low income, unemployment, poverty, lack of education, and substandard housing (Bennett, 1991: 1-2; Leavitt, 1992: 1; Li, 1995: 1; Agnew, 1999: 1). Higher RDIs, though, imply improved economic status. The RDIs were also found to be associated with lower levels of poverty and inequality (Table 9.10, page 356).

However, the modernisation perspective also claims that crime rates are normally higher in heterogeneous societies that experience rapid urbanisation and industrialisation (Li, 1995: 1; Tsushima, 1996: 1; Alshuwaikhat and Garba, 1997: 1-3). The RDIs have been shown to be positively linked to urbanisation (Tables 9.14 and 9.15, pages 362 to 363). Moreover, South Africa, given its ethnic and cultural

diversity, is a very heterogeneous society. Hence the higher prevalance of crime may be the result of the heterogeneity of society and of increased urbanisation, rather than being directly associated with progress on reconstruction and development.

The proxy of single party dominance correlates meaningfully but negatively with the RDIs (Table 9.16, page 364). The strongest link is that between single party dominance and progress on basic needs fulfillment (r = -0.871). Provinces in which the majority vote is relatively smaller, generally perform better on the RDIs. This suggests that multiparty democracy and political representativeness are conducive to progress. This makes sense insofar as opposition parties are supposed to keep authorities on their toes with regard to progress on development objectives.

Yet, the particular relationship may also be explained in terms of the racial composition of provincial populations (page 359). Party politics are in general still divided along racial lines. The ANC's supporters are predominantly African, whereas the persons who vote for the main opposition parties (the Democratic and National parties) are mostly white. Whites, during the Apartheid era, benefited more from development initiatives and today reside in areas that are better developed. Hence the negative relation between single party dominance and progress on reconstruction and development may be attributable to demographics and the political economy of the past rather than to current political dynamics.

Table 9.17: Regression model for Basic Needs RDI and single party dominance

Dependent variable: Basic Needs RDI						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
9	0.759	0.725	22.105	1. Highest percentage vote for a single party in local elections (1995/96)	-0.431	4.702
				2. Constant	+63.776	10.541

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.01 level using a two-tailed test.

As in the case of the correlation results (Table 9.16, page 364), the evidence presented in Table 9.17 (page 366) suggests that progress on basic needs fulfilment is associated with single party dominance. The lower the single party dominance in provincial politics, the better the province's performance on basic needs fulfilment. Differences in single party dominance explain 72.5 per cent of differences in the Basic Needs RDI. As argued above, the results may rather indicate the extent to which the Apartheid legacy influences assessments of current disparities in development. Both existing levels of development and also voting patterns are dependent on the racial composition of provincial populations. In this context, past inequities continue to exist and the RDP has not yet succeeded in eradicating these disparities.

9.3.5 Socio-economic and political development and progress on reconstruction and development: multiple regression results

In this section, the relationship between the RDIs and the above four development issues is explored simultaneously. Multiple regression analysis is employed for this purpose. The aim here is to determine those development characteristics that are associated with provincial disparities in progress on reconstruction and development. Because of the apparent indirect link between crime and progress on reconstruction and development (page 365), the three crime indicators are excluded from this analysis. Five parameters of socio-economic development that were not explored in the above analyses were added to the set of variables employed in this analysis. These variables cover issues such as education and training, the HIV/AIDS problem, public transport, and ethnic diversity. The following specific indicators were added to the analysis:

- average pass rates in Senior Certificate exams
- percentage of the population aged twenty and above that have at least matric
- percentage of women attending antenatal clinics who are HIV+
- percentage of households whose normal means of transport is a taxi or bus
- ethnic homogeneity index (i.e. the percentage of households in each province who speak the most commonly spoken language)

Stepwise multiple regression is used to estimate the models. The models with the highest adjusted R^2 values and for which the coefficients and F and t statistics are acceptable are reported here. A conceptual framework derived from the correlation and regression results reported in the above pages is employed to guide the selection process. Table 9.18 describes the nature of the a priori relationship between the RDIs and each of the eleven variables.

Table 9.18: Nature of the a priori assumed relationship between RDIs and eleven selected independent variables (n = 9)

Positive	Negative
1. Percentage population urbanised (1994)	1. Gini coefficient (1993)
2. Percentage population urbanised (1995)	2. Headcount poverty index (1993)
3. Percentage population urbanised (1996)	3. Headcount poverty index (1995)
	4. Population dependency burden (1996)
	5. Population dependency burden (1996)
	6. Total fertility rate (1991-96)
	7. Highest percentage vote for a single party in local elections (1995/96)
	8. Percentage households that consist of single parents with children (1995)

Regression models for which the coefficient of one or more of the independent variables does not conform with this framework are rejected. In the case of the five additional new variables that were added to the analysis (page 367), no a priori relationship is specified. Where these variables do feature in the regression models,

their inclusion is accepted or rejected on purely theoretical grounds. The following is a discussion of the regression models obtained from this analysis. The models that best fit the Basic Needs and Economic RDIs are reported in Tables 9.19 and 9.20 respectively. Table 9.21 reports on the model that best fits the composite RDI.

Table 9.19: Regression model for Basic Needs RDI and selected parameters of social, political and economic development

Dependent variable: Basic needs RDI						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
9	0.928	0.903	40.472	1. Percentage population urbanised (1995)	+0.181	3.730
				2. Highest percentage vote for a single party in local elections (1995/96)	-0.204	2.492
				3. Constant	+39.124	5.203

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

According to the results in Table 9.19, differences in the level of urbanisation and single-party dominance explain 90.3 per cent of differences in the Basic Needs RDI. Progress on basic needs fulfilment is more successful in urbanised communities. Progress in concentrated, urbanised communities is relatively easier to manage and achieve than in communities that are geographically more dispersed. Similar arguments were put forward in the discussion of the RDIs' association with urbanisation (pages 362 to 363). Multiparty democracy and political representativeness are also associated with basic needs fulfilment. Because of the importance of population composition in explaining voting patterns and past levels of development (pages 359 and 366), this does not necessarily mean that opposition parties play an important role in keeping authorities on their toes with regard to basic needs fulfilment.

The regression model that best explains disparities in the Economic RDIs includes five independent variables (Table 9.20). These five variables explain as much as 99.9 per cent of differences in this index. All five of these relationships are featured in analyses presented elsewhere (pages 354 to 369).

Table 9.20: Regression model for Economic RDI and selected parameters of social, political and economic development

Dependent variable: Economic RDI						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
9	1.000	0.999	1306.539	1. Percentage population urbanised (1995)	+0.051	2.428
				2. Headcount poverty index (1995)	-0.329	19.024
				3. Senior Certificate pass rate (1994-97)	+0.085	5.439
				4. Population dependency burden (1996)	-0.699	8.063
				5. Gini coefficient (1993)	-0.329	4.657
				6. Constant	+24.656	3.025

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.05 level using a two-tailed test.

As in the case of the Basic Needs RDI, development efforts have been more successful in concentrated, urban areas (Table 9.20). Provinces in which a greater proportion of the population is urbanised have made greater progress on the economic objectives of the RDP, i.e. economic growth, employment and redistribution. Business is likely to benefit more from economies of scale and increased turnover in concentrated, urbanised areas where markets are generally larger and infrastructure is better developed. Redistribution programmes may also be relatively easier to manage successfully in concentrated, urban areas than in areas where people are geographically more dispersed.

Economic progress is coupled with lower levels of poverty and inequality (Table 9.20). The headcount poverty index and the Gini coefficient are generally

lower in provinces that have scored higher on the Economic RDI. Lower levels of poverty and inequality imply less of a burden on the economy and can free resources to be employed toward more productive ends. This, in turn, can enhance economic growth, job creation and redistribution.

Progress on the economic objectives of the RDP is also associated with improved education and training (Table 9.20, page 370). Provinces that since 1994 have achieved higher average pass rates in the Senior Certificate exams, have performed better on the Economic RDI. In general, higher pass rates mean that workers are better equipped to contribute to the economy.

Population pressure remains an important obstacle to economic development. According to the results presented in Table 9.20 (page 370), progress on the economic objectives of the RDP is associated with lower population dependency burdens. In terms of future progress, therefore, it is imperative that the population burden be reduced, i.e. total fertility rates be brought under control. This can free resources to be employed toward relatively more productive ends, e.g. investing more in small business development rather than having to spend more on childcare allowances and primary health care. This, in turn, can enhance economic growth and job creation.

Table 9.21: Regression model for composite RDI and selected parameters of social, political and economic development

Dependent variable: Composite RDI (19 components)						
n	R^2	Adjusted R^2	F	Independent variables	Coefficient	t
9	0.864	0.844	44.384	1. Percentage population urbanised (1995)	+0.225	6.662
				2. Constant	+12.599	6.116

Note: R^2 is significant at the 0.01 level using the F test. The t-statistics are significant at the 0.01 level using a two-tailed test.

As with the Basic Needs and Economic RDIs (pages 369 and 370), progress on the RDP is to a large extent associated with levels of urbanisation (Table 9.21). Provinces in which a great proportion of the population is urbanised are more successful in the nineteen development objectives of the RDP. As mentioned elsewhere (page 362), development in concentrated, urbanised communities is relatively easier to manage and achieve than in communities that are geographically more dispersed, but could also be indicative of economic activity levels encouraging urbanisation. What these results however also do imply is that there are problems with regard to progress in rural areas. Hence government needs to identify the reasons why progress in rural areas has not materialised and also implement appropriate measures to improve delivery.

9.4 CONDLUDING REMARKS ON DISPARITIES IN PROGRESS ON RECONSTRUCTION AND DEVELOPMENT

Progress on reconstruction and development is not simply a case of moving closer to meeting the objectives described in the RDP. Government also needs to address other areas of concern which have been shown to be closely associated with progress on reconstruction and development. Most of these concerns relate to issues which government can actively pursue via appropriate policies. Government has been shown to need to facilitate the demographic transition and improve secondary education in order to enhance progress on reconstruction and development. Sustained improvements, moreover, in poverty and inequality can free resources to be employed in pursuing other RDP objectives. Progress on the RDP has been shown to be more successful in urban areas. Hence government needs to identify and address the reasons why progress in rural areas has lagged behind. According to the evidence

presented here, the incidence of crime is higher in provinces that have made greater strides toward achieving RDP objectives. Past inequities, moreover, appear to persist. Provincial disparities in progress on reconstruction and development remain closely tied to the racial composition of provincial populations or, in other words, the greater affluence of whites. Expeditious interventions are required to address these issues and concerns, otherwise the RDP cannot ensure a better life for all.

Chapter 10

Conclusion

This thesis on the measurement of economic development had two main aims, as set out in the introduction, namely to present an overview of existing indicators of development (section A: Chapters 3 to 7) and to present two new composite indices of development (section B: Chapters 8 and 9). The following general conclusions can be drawn regarding these two objectives.

10.1 EVALUATION AND COMPARISON OF EXISTING DEVELOPMENT INDICATORS

The overview of development indicators presented in this thesis underlines the imperfect nature of the measurement of economic development. Few existing measures of economic development performed equally well on all the different dimensions of measurement. In general, the sum collection of existing data on economic development has performed as follows on each of the seven dimensions of measurement.

10.1.1 Content of development indicators

The *content* of the variety of development indicators presented here illustrates the many diverse aspects of development. These indicators range from economic to social, environmental and political. In many cases, though, development indicators

are characterised by a lack of conceptual clarity. This highlights the importance for efforts in indicator development to establish clear conceptual boundaries before proceeding with actual measurement and subsequent analysis. Consequently, the two new measurement efforts described in this thesis were cast in a very specific conceptual framework.

10.1.2 Method and technique of measurement of economic development

In terms of *method and technique*, existing development indicators are generally of a quantitative rather than a qualitative nature. Quantitative measures allow for greater analytical rigour and more application opportunities, especially in the positivist tradition of modern science. The lack, however, of qualitative measures implies that certain well documented and debated aspects of development are not, as yet, adequately represented when it comes to measurement. Yet, this should not detract from the fact that a number of the indicators presented here are quantitative presentations of qualitative assessments of development, e.g. the happiness indices.

The existing measures of development presented in these pages all involve the autonomous, professional handling of collected data to arrive at some aggregate measure or indicator. In this sense, these indicators are all relatively objective. But, sources of subjectivity such as respondent and interviewer bias still unavoidably enter into measurement in the 'dismal science'. Furthermore, there are subjectively assessed indicators, such as poverty estimates based on subjective poverty lines and happiness indices. These indicators, though, are only subjective insofar as they represent respondent-based assessments of development. The calculation of these indicators still involves relatively objective methods and techniques.

Most development indicators described here are cardinal in nature and do allow an exact interpretation of the difference between entities. Certain indicators, such as composite indices of development, are ordinal and only allow judgements as to the relative preference of one state or situation over another. This perhaps explains why this type of indicator has not achieved the status accorded to other measures of economic development. The advantage of cardinal indicators is that they enhance analytical rigour, whereas analysis based on ordinal measures can uncover only the general, broad dynamics of development.

The majority of development indicators are uni-dimensional. These indicators measure only one particular aspect of economic development, e.g. economic growth, levels of education and nutrition, and the extent of democratisation. Composite indices of development are few in comparison with the number of uni-dimensional indicators. These indices are simply an aggregation of a selection of uni-dimensional indicators into one composite indicator. Composite indices, furthermore, rarely feature in development analysis; apart, that is, from being used to present broad-based and general comparisons of progress on development.

10.1.3 Comparative application of development indicators

Comparisons of development indicators across time and space are fraught with difficulty. These difficulties originate primarily from inconsistently applied methodologies and changes over time in methodology. Until such time as the necessary standardisation has been achieved, comparative analysis will remain an imperfect presentation of reality. Sadly, the resource constraints faced by developing countries make it unlikely that these problems will be done away with in the near

feature. This is unfortunate insofar as comparative analysis represents a strong focus of development studies. Hence, all that users of data can do is to adequately clarify and to allow for the particular shortcomings of indicators in their interpretation of results of comparative analysis.

The *level of measurement* is confined mostly to individuals and households, although data are usually aggregated at the regional or national level. Indicators of employment, unemployment and underemployment, of poverty and inequality, and of the social aspects of economic development are derived from data obtained from population censuses and from household surveys. Even where administrative records are employed as sources of data, the unit of measurement is the individual or household. Indicators of income and economic growth, which are derived from the system of national accounts, are the only exceptions. Even these indicators, however, are translated into per capita estimates with the aid of population estimates. This is as it should be, given that people are the central focus of development.

Development indicators are predominantly *relative*, i.e. expressed in relation to some other aspect of development or criterion for standardisation. Many indicators are expressed as a ratio or percentage of some greater entity, e.g. the percentage of GDP earned in the primary, secondary and tertiary sectors. The most popular criterion for standardisation is population size. So, for example, social indicators of development are often expressed in per capita terms or as ratio per 1000 population. Because of the importance of comparative analysis in development studies, absolute measures as such have limited use, apart from being employed to compile relative measures of development.

10.1.4 Focus of development indicators

When it comes to *focus*, it can be argued that a sufficient balance exists between measures of 'means' (inputs) and 'ends' (outputs). The indicators described in these pages abound with examples of such measures. In many instances, individual indicators represent a measure of both 'means' and 'ends', depending on their specific interpretation. The ideal, though, would be to be able to measure both input and output with regard to each and every aspect of development. Unfortunately, there are many aspects of development for which only measures either of input or of output are available. The attempt at compiling composite indices of efforts and outcomes with regard to human security described in these pages illustrates this shortcoming. Hence, this issue of measurement still remains to be further explored in indicator development.

10.1.5 Simplicity and clarity of development indicators

With regard to *simplicity and clarity*, certain development indicators are evidently simpler and clearer than others, in terms of both methodology and interpretation. So, for example, social indicators of development obtained from household surveys are generally simpler than indicators of income and economic growth or poverty and inequality. In general, though, development indicators are all relatively complex in terms of methodology. This perhaps explains why politicians, administrators and even researchers often incorrectly interpret statistics when failing to investigate the specific methodology of measurement adequately.

10.1.6 Availability of development indicators

Apart from comparability, *data availability* is perhaps the most serious shortcoming of existing development indicators. Whereas established development indicators such as GDP per capita, population growth and unemployment rates are available for most countries, data pertaining to alternative or more recent development issues are often relatively scarce. Data availability, furthermore, is particularly poor in developing countries. For these countries, reliable estimates of development indicators are generally available for select years only. Where data are available, it is often not possible to disaggregate it to levels or by criteria that will greatly enhance their usefulness. This is particularly worrying insofar as these countries are in greater need and must develop at a rapid rate to catch up with developed nations. The lack of development indicators makes it difficult to study development adequately, not to speak of monitoring the effect of policy interventions. However, the continued efforts of the United Nations, the World Bank and other international development agencies to invest in capacity building in survey work and in information management in developing countries must be applauded.

10.1.7 Flexibility of development indicators

Lastly, existing indicators of development are generally *inflexible*. The reason for this is that changes in content will always require changes in method and techniques. Sometimes, changes in method and technique are effected to improve the quality of the particular indicator, especially with regard to comparability. Such changes mean that these new measures are not comparable with the original,

unchanged version of the same indicator. Hence, adjustments in content and method and technique can only come at the cost of intertemporal and interspatial comparability.

The usefulness, though, of development indicators far outweighs their shortcomings. The art of measurement remains imperfect, but so does economic science in general. Development indicators are an indispensable tool for development economists in plying their trade. Development studies will be much the poorer without indicators that attempt to quantify the extent of disparities in development across both time and space. Researchers must continue to work at further enhancing the measurement of economic development.

10.2 NEW COMPOSITE INDICES OF ECONOMIC DEVELOPMENT: DISPARITIES IN HUMAN SECURITY AND RECONSTRUCTION AND DEVELOPMENT

Central in much of the existing literature on indicator development is the search for a single, ideal, all-encompassing indicator of economic development. The overview of existing indicators of development presented in this thesis has distinguished between a variety of types of indicators, i.e. indicators of income and economic growth, employment and unemployment, poverty and inequality, and the social aspects of development. In the literature on development indicators a strong argument is often made for per capita income as being such an ideal measure. Proponents of income-based indicators argue that alternative indicators of development reveal nothing that income alone cannot reveal. These alternative

indicators are often belittled as contributing little, if anything, to the literature on development indicators. The relatively strong association between GDP per capita and alternative indicators of development has been well documented. Even the new composite indices of development presented in these pages correlate fairly well with income-based measures. Yet, these so-called alternative indicators each presents a different view of economic development. These indicators offer a glimpse of aspects of economic development disguised in the aggregate of per capita income. Development studies will be much the poorer without such a kaleidoscope of indicators, especially insofar as there is an increasing recognition of the interdependence between the economic, social, political and environmental aspects of development. The World Bank, for example, is promulgating a Comprehensive Framework of Development that recognises these interdependencies between economic, social, political, environmental and cultural development.

The two new composite indices of development presented in these pages are grounded in such a holistic approach to the measurement of economic development. The UNDP's concept of human security and the content of the Reconstruction and Development Programme (RDP) were used to guide the efforts at composite indexing presented in these pages. In both cases, the content of these frameworks, the one conceptual in nature and the other policy-based, bears testimony to such a multidimensional approach to development. In this context, composite indices of development do represent good measures of aggregate disparities in development. In fact, the composite indices of development presented in these pages performed relatively well on the tests for external validity to which they were subjected. Consequently, the indices are considered acceptable proxies of overall progress on human security and reconstruction and development. However, the aggregation of so

many aspects of economic development into one index value also limits the usefulness of the resulting index in statistical and econometric analysis insofar as the specific underlying dynamics of causal relationships cannot be readily identified.

These two measurement efforts endeavoured to address two specific gaps in indicator development. Composite indices of human security (HSIs) and Inefficiency ratios were employed to quantify the extent of international disparities in human security. The measurement results presented in these pages make it clear that there exist substantial disparities, both in terms of effort and outcome, as well as the extent to which efforts are translated into outcomes. Much remains to be done to narrow the development divide between rich and poor nations in respect of income and the social, environmental and political aspects of human security. The comparative application, furthermore, of these indices suggests that improved communications capacity may greatly enhance prospects for human security. In this context, it is encouraging that international development agencies are making great efforts at improving the access of developing countries to information technology and the internet. The importance of infrastructure in progress on human security means that institutions such as the World Bank will continue to play an important role in investing resources in infrastructure in developing countries. Urban and population dynamics have proved to be equally important in progress on human security. Further research into the link between the individual elements of human security and patterns of urbanisation and demographic change will therefore be of great value in understanding exactly why some countries outperform others with regard to progress on human security.

Composite indices of reconstruction and development (RDIs) were employed to assess overall progress on the nineteen development objectives of the Reconstruction and Development Programme (RDP) in each of South Africa's nine

provinces. As in the case of human security, provinces are also not on an equal footing regarding the level of development. According to the measurement results presented in these pages, the development divide between Gauteng and the Western Cape *versus* the Eastern Cape and Northern Province is substantial. The ongoing challenge, therefore, for Government is to narrow this divide and ensure progress on reconstruction and development in poorer provinces. Government has committed itself to many of the development issues that have been shown to be associated with progress on reconstruction and development. So, for example, Government emphasises the importance of negotiating demographic transition, improving the performance of the educational system, eradicating poverty and inequality, and recognising political representativeness and multi-party democracy. The recent commitment, moreover, of Government to improved service delivery is justified by the lack of delivery on the RDP in rural areas highlighted in the analysis presented in these pages. Unfortunately, though, development requires more than political will.

10.3 A FINAL WORD

Development indicators have many shortcomings and the measurement of economic development remains an imperfect science. Yet, development indicators and indices remain important measuring rods of progress on economic development. For this reason, continued efforts at indicator development and comparative analysis of development indicators are crucial in further enhancing our understanding of economic development. The measurement results and comparative analysis presented in these pages represent an attempt at contributing meaningfully to this measurement debate.

Appendix A

Human Security Indices (HSIs) and Inefficiency Ratios for a Sample of Fifty-Seven Developed and Developing Countries: Index Values and Data Sources

Human Security Effort Indices version 1 Country	Economic Security Effort Index	Food Security Effort Index	Health Security Effort Index	Environmental Security Effort Index	Personal Security Effort Index	Community Security Effort Index	Political Security Effort Index	Composite Effort Index
Argentina	67.69	59.46	51.55	55.64	5.39	79.46	75.00	63.00
Australia	100.00	55.41	43.22	93.28	16.98	93.51	100.00	89.50
Austria	78.46	71.62	62.98	46.54	16.22	89.21	100.00	80.35
Bangladesh	-	10.81	3.10	41.02	2.19	19.91	66.67	1.63
Belgium	100.00	81.08	70.35	42.11	11.65	87.72	100.00	87.18
Botswana	53.85	25.68	3.49	23.73	9.80	31.17	75.00	20.99
Canada	98.46	50.00	42.44	82.36	- 0.03	86.06	100.00	78.94
Chile	64.62	36.49	20.54	80.28	16.22	80.79	83.33	60.07
China	52.31	50.00	21.90	42.91	4.97	57.80	-	22.74
Colombia	55.38	48.65	19.96	32.95	18.26	91.83	58.33	46.13
Costa Rica	47.69	67.57	24.03	50.67	15.86	79.25	91.67	58.72
Denmark	83.08	77.03	54.46	92.57	12.49	97.08	100.00	93.01
Egypt	56.92	72.97	38.76	82.70	12.96	77.25	16.67	54.19
Finland	98.46	43.24	51.74	81.61	11.65	77.54	100.00	80.16
France	87.69	87.84	53.88	77.52	11.85	93.92	91.67	89.99
Ghana	10.77	22.97	0.39	75.72	12.06	71.35	41.67	23.98
Greece	67.69	86.49	74.61	54.97	20.29	89.72	83.33	83.31
Guatemala	18.46	32.43	17.05	54.86	11.09	61.10	41.67	24.40
Hungary	60.00	72.97	64.92	73.62	10.41	91.48	91.67	80.36
India	30.77	39.19	8.91	83.97	8.88	59.94	50.00	35.43
Indonesia	44.62	64.86	1.94	32.44	5.06	9.63	8.33	7.31
Iraq	24.62	12.16	9.50	19.08	56.73	59.05	-	10.80
Ireland	81.54	100.00	31.98	42.50	25.09	48.35	91.67	69.59
Italy	72.31	83.78	100.00	91.17	10.91	88.42	91.67	98.29
Jamaica	43.08	50.00	10.66	10.79	17.82	75.22	75.00	35.65
Japan	76.92	60.81	33.91	53.12	15.86	25.71	83.33	52.09
Jordan	47.69	59.46	30.23	82.40	11.85	60.12	50.00	50.15
Kenya	23.08	13.51	2.52	35.10	4.42	41.78	16.67	0.00
Korea Republic	84.62	82.43	24.22	11.13	18.26	53.14	83.33	53.92
Kuwait	33.85	33.78	34.11	-	100.00	19.56	33.33	28.81
Malawi	61.54	-	-	39.12	3.87	12.98	75.00	13.58
Malaysia	46.15	68.92	7.95	39.24	9.66	0.02	41.67	18.75
Morocco	21.54	59.46	6.20	64.53	8.65	78.22	33.33	33.04
Nepal	36.92	13.51	0.58	51.73	7.11	40.66	58.33	17.59
Netherlands	96.92	55.41	49.22	62.44	14.87	76.06	100.00	77.88
New Zealand	92.31	81.08	40.31	55.66	11.85	85.94	100.00	80.87
Norway	92.31	56.76	64.73	100.00	8.42	100.00	100.00	94.36
Panama	58.46	24.32	22.67	69.19	43.91	82.04	75.00	58.44
Paraguay	44.62	50.00	12.60	31.77	25.09	56.63	58.33	34.78
Philippines	72.31	28.38	1.74	35.76	5.99	81.38	58.33	35.97
Poland	64.62	63.51	43.60	61.30	20.86	71.81	83.33	66.63
Portugal	86.15	93.24	56.01	81.64	11.27	52.65	100.00	84.25
Senegal	-	21.62	0.97	79.28	10.10	64.31	41.67	19.82
South Africa	89.23	41.89	11.05	62.94	8.32	-	75.00	37.08
Spain	87.69	97.30	77.13	68.66	12.96	67.32	91.67	89.59
Sri Lanka	47.69	31.08	4.07	61.73	8.42	58.56	41.67	28.46
Sweden	100.00	41.89	57.56	93.58	23.51	98.70	100.00	92.65
Switzerland	67.69	63.51	57.95	89.57	11.65	30.47	100.00	69.53
Thailand	36.92	41.89	4.26	32.59	14.27	7.99	50.00	12.46
Trinidad & Tobago	47.69	37.84	17.05	24.61	27.88	29.90	91.67	34.20
Tunisia	53.85	81.08	12.60	88.04	22.79	88.18	25.00	57.44
Turkey	40.00	77.03	19.57	17.72	4.18	64.47	33.33	29.22
United Kingdom	100.00	71.62	31.40	86.34	18.26	82.69	91.67	84.50
United States	90.77	83.78	47.09	71.53	22.44	30.77	100.00	75.79
Uruguay	64.62	32.43	59.50	64.06	46.55	88.31	83.33	73.92
Zambia	21.54	6.76	1.36	43.69	13.99	47.33	58.33	13.70
Zimbabwe	50.77	5.41	2.33	32.73	9.80	19.80	33.33	4.19

Human Security Outcome Indices version 1 Country	Economic Security Outcome Index	Food Security Outcome Index	Health Security Outcome Index	Environmental Security Outcome Index	Personal Security Outcome Index	Community Security Outcome Index	Political Security Outcome Index	Composite Outcome Index
Argentina	33.89	90.52	93.65	54.90	95.40	78.75	82.11	68.17
Australia	68.90	99.05	99.73	34.97	96.09	66.25	100.00	80.72
Austria	75.48	99.53	99.67	69.35	97.91	87.50	90.53	99.99
Bangladesh	1.20	50.24	43.48	65.97	97.91	50.00	77.89	18.21
Belgium	77.88	98.58	99.67	35.94	95.54	90.00	95.79	90.67
Botswana	24.66	78.67	83.61	79.70	79.22	31.25	81.05	43.27
Canada	76.93	98.58	99.93	41.78	93.86	68.75	72.63	76.33
Chile	42.47	95.73	95.99	72.78	95.54	62.50	90.53	77.40
China	8.55	79.62	93.98	57.23	98.33	65.00	-	23.83
Colombia	21.55	87.68	93.65	69.22	-	60.00	47.37	15.68
Costa Rica	20.99	95.26	96.66	65.26	89.26	91.25	73.68	69.28
Denmark	81.20	99.05	99.73	55.42	99.44	87.50	90.53	97.50
Egypt	8.27	67.30	88.96	59.97	99.16	56.25	50.53	33.55
Finland	68.69	100.00	99.60	34.97	99.86	93.75	71.58	81.93
France	75.34	99.53	99.33	53.20	94.84	75.00	74.74	83.17
Ghana	3.29	51.18	50.84	71.20	98.19	47.50	68.42	19.59
Greece	42.61	98.10	99.67	49.77	97.07	56.25	80.00	66.16
Guatemala	11.98	75.83	87.63	81.31	59.00	56.25	38.95	26.71
Hungary	22.93	96.68	99.40	41.91	95.40	68.75	58.95	52.33
India	3.39	50.71	70.90	68.18	90.52	43.75	65.26	20.33
Indonesia	9.82	69.67	74.25	69.29	99.86	37.50	93.68	41.84
Iraq	8.79	44.08	79.60	60.59	82.57	-	98.95	13.96
Ireland	70.67	98.58	99.67	38.44	98.61	81.25	69.47	77.81
Italy	69.19	99.05	99.53	54.52	94.14	81.25	87.37	87.75
Jamaica	9.65	96.68	92.31	49.48	57.46	81.25	68.42	42.25
Japan	82.54	99.05	99.13	40.79	99.58	50.00	62.11	69.57
Jordan	9.68	90.52	90.30	61.54	90.93	50.00	49.47	37.76
Kenya	1.70	60.66	56.86	70.71	95.12	56.25	68.42	26.29
Korea Republic	45.51	99.05	98.33	48.64	98.88	81.25	67.37	71.62
Kuwait	86.94	95.73	99.00	27.48	85.77	43.75	84.21	65.96
Malawi	-	-	58.86	77.91	97.35	56.25	84.21	13.97
Malaysia	26.25	96.68	98.06	50.54	98.19	75.00	75.79	65.13
Morocco	9.19	67.77	75.59	61.58	99.44	31.25	61.05	24.94
Nepal	1.34	52.61	-	73.19	97.49	50.00	65.26	1.81
Netherlands	72.08	99.05	99.53	46.44	76.43	93.75	76.84	80.42
New Zealand	59.01	98.58	98.66	57.79	96.65	81.25	92.63	87.58
Norway	83.89	100.00	99.93	33.77	97.91	87.50	82.11	87.77
Panama	22.82	92.42	96.66	75.24	78.52	68.75	77.89	62.25
Paraguay	11.55	86.26	87.63	69.50	78.52	43.75	84.21	44.41
Philippines	9.93	82.46	86.29	67.01	59.00	56.25	83.16	38.34
Poland	20.53	96.68	100.00	47.62	96.65	75.00	50.53	53.38
Portugal	47.92	98.10	99.33	40.63	95.40	87.50	70.53	71.75
Senegal	3.60	43.13	66.22	77.30	99.58	70.00	43.16	23.93
South Africa	23.57	71.09	84.95	53.74	10.88	50.00	91.58	17.90
Spain	53.78	99.53	99.87	53.05	97.63	87.50	81.05	83.32
Sri Lanka	6.29	92.89	98.33	76.02	88.56	62.50	80.00	59.55
Sweden	67.42	100.00	99.87	49.69	88.42	100.00	85.26	89.72
Switzerland	86.68	99.53	99.93	44.04	97.77	87.50	44.21	78.85
Thailand	21.13	83.89	86.96	68.77	90.24	62.50	65.26	50.48
Trinidad & Tobago	21.66	93.84	94.31	31.27	91.49	62.50	66.32	44.40
Tunisia	16.22	86.26	88.96	56.83	100.00	68.75	100.00	63.90
Turkey	19.93	80.57	88.29	60.40	98.61	50.00	89.47	53.47
United Kingdom	70.74	98.58	99.73	54.56	97.77	81.25	75.79	85.43
United States	100.00	98.10	99.53	37.75	89.54	81.25	37.89	73.38
Uruguay	30.00	91.94	94.65	47.62	92.89	75.00	95.79	67.71
Zambia	0.88	6.16	56.86	74.20	85.77	68.75	42.11	0.01
Zimbabwe	5.80	63.98	81.61	68.78	91.21	81.25	60.00	41.33

Human Security Inefficiency Ratios version 1 Country	Economic Security Inefficiency Ratio	Food Security Inefficiency Ratio	Health Security Inefficiency Ratio	Environmental Security Inefficiency Ratio	Personal Security Inefficiency Ratio	Community Security Inefficiency Ratio	Political Security Inefficiency Ratio	Composite Inefficiency Ratio
Argentina	2.00	0.66	0.55	1.01	0.06	1.01	0.91	0.92
Australia	1.45	0.56	0.43	2.67	0.18	1.41	1.00	1.11
Austria	1.04	0.72	0.63	0.67	0.17	1.02	1.10	0.80
Bangladesh	-	0.22	0.07	0.62	0.02	0.40	0.86	0.09
Belgium	1.28	0.82	0.71	1.17	0.12	0.97	1.04	0.96
Botswana	2.18	0.33	0.04	0.30	0.12	1.00	0.93	0.48
Canada	1.28	0.51	0.42	1.97	- 0.00	1.25	1.38	1.03
Chile	1.52	0.38	0.21	1.10	0.17	1.29	0.92	0.78
China	6.12	0.63	0.23	0.75	0.05	0.89	1.00	0.95
Colombia	2.57	0.55	0.21	0.48	1.00	1.53	1.23	2.94
Costa Rica	2.27	0.71	0.25	0.78	0.18	0.87	1.24	0.85
Denmark	1.02	0.78	0.55	1.67	0.13	1.11	1.10	0.95
Egypt	6.88	1.08	0.44	1.38	0.13	1.37	0.33	1.62
Finland	1.43	0.43	0.52	2.33	0.12	0.83	1.40	0.98
France	1.16	0.88	0.54	1.46	0.12	1.25	1.23	1.08
Ghana	3.28	0.45	0.01	1.06	0.12	1.50	0.61	1.22
Greece	1.59	0.88	0.75	1.10	0.21	1.60	1.04	1.26
Guatemala	1.54	0.43	0.19	0.67	0.19	1.09	1.07	0.91
Hungary	2.62	0.75	0.65	1.76	0.11	1.33	1.56	1.54
India	9.07	0.77	0.13	1.23	0.10	1.37	0.77	1.74
Indonesia	4.54	0.93	0.03	0.47	0.05	0.26	0.09	0.17
Iraq	2.80	0.28	0.12	0.31	0.69	1.00	-	0.77
Ireland	1.15	1.01	0.32	1.11	0.25	0.60	1.32	0.89
Italy	1.05	0.85	1.00	1.67	0.12	1.09	1.05	1.12
Jamaica	4.47	0.52	0.12	0.22	0.31	0.93	1.10	0.84
Japan	0.93	0.61	0.34	1.30	0.16	0.51	1.34	0.75
Jordan	4.93	0.66	0.33	1.34	0.13	1.20	1.01	1.33
Kenya	13.61	0.22	0.04	0.50	0.05	0.74	0.24	0.00
Korea Republic	1.86	0.83	0.25	0.23	0.18	0.65	1.24	0.75
Kuwait	0.39	0.35	0.34	-	1.17	0.45	0.40	0.44
Malawi	1.00	1.00	-	0.50	0.04	0.23	0.89	0.97
Malaysia	1.76	0.71	0.08	0.78	0.10	0.00	0.55	0.29
Morocco	2.34	0.88	0.08	1.05	0.09	2.50	0.55	1.33
Nepal	27.50	0.26	1.00	0.71	0.07	0.81	0.89	9.74
Netherlands	1.34	0.56	0.49	1.34	0.19	0.81	1.30	0.97
New Zealand	1.56	0.82	0.41	0.96	0.12	1.06	1.08	0.92
Norway	1.10	0.57	0.65	2.96	0.09	1.14	1.22	1.08
Panama	2.56	0.26	0.23	0.92	0.56	1.19	0.96	0.94
Paraguay	3.86	0.58	0.14	0.46	0.32	1.29	0.69	0.78
Philippines	7.28	0.34	0.02	0.53	0.10	1.45	0.70	0.94
Poland	3.15	0.66	0.44	1.29	0.22	0.96	1.65	1.25
Portugal	1.80	0.95	0.56	2.01	0.12	0.60	1.42	1.17
Senegal	-	0.50	0.01	1.03	0.10	0.92	0.97	0.83
South Africa	3.79	0.59	0.13	1.17	0.76	-	0.82	2.07
Spain	1.63	0.98	0.77	1.29	0.13	0.77	1.13	1.08
Sri Lanka	7.58	0.33	0.04	0.81	0.10	0.94	0.52	0.48
Sweden	1.48	0.42	0.58	1.88	0.27	0.99	1.17	1.03
Switzerland	0.78	0.64	0.58	2.03	0.12	0.35	2.26	0.88
Thailand	1.75	0.50	0.05	0.47	0.16	0.13	0.77	0.25
Trinidad & Tobago	2.20	0.40	0.18	0.79	0.30	0.48	1.38	0.77
Tunisia	3.32	0.94	0.14	1.55	0.23	1.28	0.25	0.90
Turkey	2.01	0.96	0.22	0.29	0.04	1.29	0.37	0.55
United Kingdom	1.41	0.73	0.31	1.58	0.19	1.02	1.21	0.99
United States	0.91	0.85	0.47	1.89	0.25	0.38	2.64	1.03
Uruguay	2.15	0.35	0.63	1.35	0.50	1.18	0.87	1.09
Zambia	24.38	1.10	0.02	0.59	0.16	0.69	1.39	1,370.34
Zimbabwe	8.76	0.08	0.03	0.48	0.11	0.24	0.56	0.10

Human Security Effort Indices version 2 Country	Economic Security Effort Index	Food Security Effort Index	Health Security Effort Index	Environmental Security Effort Index	Personal Security Effort Index	Community Security Effort Index	Political Security Effort Index	Composite Effort Index
Argentina	77.55	66.87	88.15	80.97	40.96	97.89	52.90	66.66
Australia	100.00	63.13	85.01	97.72	63.12	99.38	100.00	97.17
Austria	85.64	77.55	91.73	75.36	62.19	98.95	100.00	92.16
Bangladesh	0.01	14.47	39.55	71.47	26.00	85.20	43.53	0.01
Belgium	100.00	85.37	93.71	72.27	55.60	98.79	100.00	96.40
Botswana	66.03	32.48	41.44	55.41	52.21	89.31	52.90	32.45
Canada	99.04	58.00	84.68	93.63	0.02	98.62	100.00	75.15
Chile	75.11	44.36	71.80	92.79	62.19	98.04	64.37	67.65
China	64.66	58.00	72.93	72.85	39.50	94.97	- 0.02	36.33
Colombia	67.38	56.69	71.29	64.86	64.59	99.21	35.61	53.13
Costa Rica	60.43	74.07	74.57	78.02	61.74	97.86	79.16	72.74
Denmark	88.90	82.07	89.13	97.47	56.97	99.72	100.00	98.93
Egypt	68.71	78.69	83.06	93.76	57.70	97.63	7.91	61.38
Finland	99.04	51.33	88.22	93.33	55.60	97.66	100.00	90.31
France	92.06	90.72	88.94	91.65	55.93	99.42	79.16	94.07
Ghana	17.38	29.36	12.48	90.88	56.27	96.90	22.69	13.55
Greece	77.55	89.66	94.77	80.59	66.73	99.00	64.37	86.61
Guatemala	28.09	40.01	68.51	80.52	54.62	95.48	22.69	32.49
Hungary	71.32	78.69	92.28	89.97	53.38	99.18	79.16	84.03
India	43.06	47.19	57.20	94.26	50.30	95.30	28.75	40.23
Indonesia	57.50	71.71	32.25	64.40	39.82	78.55	3.79	20.08
Iraq	35.87	16.20	58.29	49.45	88.05	95.17	- 0.02	18.60
Ireland	87.83	99.89	79.64	72.55	71.07	93.34	79.16	89.81
Italy	81.10	87.53	100.01	96.97	54.30	98.87	79.16	94.09
Jamaica	56.00	58.00	60.29	35.46	64.09	97.38	52.90	42.62
Japan	84.52	68.09	80.69	79.50	61.74	87.55	64.37	72.92
Jordan	60.43	66.87	78.64	93.64	55.93	95.33	28.75	59.04
Kenya	33.98	17.91	36.27	66.75	37.41	92.00	7.91	3.56
Korea Republic	89.97	86.46	74.71	36.16	64.59	94.20	64.37	68.18
Kuwait	46.46	41.48	80.79	- 0.00	100.00	85.04	17.28	26.90
Malawi	72.60	- 0.13	0.00	70.02	35.12	81.28	52.90	9.35
Malaysia	58.97	75.24	55.22	70.11	51.93	21.97	22.69	22.49
Morocco	32.06	66.87	50.99	85.70	49.79	97.74	17.28	35.60
Nepal	49.75	17.91	16.49	78.67	46.07	91.75	35.61	16.59
Netherlands	98.08	63.13	87.33	84.65	60.44	97.49	100.00	92.07
New Zealand	95.11	85.37	83.76	80.98	55.93	98.61	100.00	94.63
Norway	95.11	64.39	92.22	100.03	49.29	99.99	100.00	95.01
Panama	70.03	30.93	73.54	87.95	82.68	98.18	52.90	63.97
Paraguay	57.50	58.00	63.20	63.79	71.07	94.78	35.61	48.49
Philippines	81.10	35.54	30.68	67.30	42.90	98.11	35.61	32.88
Poland	75.11	70.51	85.16	84.06	67.30	96.96	64.37	77.96
Portugal	91.02	94.86	89.64	93.34	54.94	94.12	100.00	100.00
Senegal	0.01	27.78	22.55	92.38	52.79	95.95	22.69	10.05
South Africa	93.09	49.96	60.91	84.90	49.04	-	52.90	32.75
Spain	92.06	97.90	95.36	87.70	57.70	96.37	79.16	96.55
Sri Lanka	60.43	38.54	43.96	84.28	49.29	95.09	22.69	33.78
Sweden	100.00	49.96	90.12	97.83	69.74	99.87	100.00	96.93
Switzerland	77.55	70.51	90.24	96.39	55.60	89.10	100.00	88.60
Thailand	49.75	49.96	44.72	64.54	59.62	76.84	28.75	27.83
Trinidad & Tobago	60.43	45.78	68.51	56.43	73.25	88.93	79.16	56.94
Tunisia	66.03	85.37	63.20	95.82	69.10	98.84	12.38	62.35
Turkey	52.92	82.07	70.94	47.51	36.44	95.97	17.28	36.40
United Kingdom	100.00	77.55	79.31	95.17	64.59	98.25	79.16	92.94
United States	94.11	87.53	86.54	89.03	68.79	89.19	100.00	99.20
Uruguay	75.11	40.01	90.72	85.47	83.90	98.86	64.37	76.47
Zambia	32.06	9.16	27.07	73.41	59.22	93.14	35.61	14.65
Zimbabwe	63.27	7.34	35.02	64.66	52.21	85.15	17.28	13.25

Human Security Outcome Indices version 2 Country	Economic Security Outcome Index	Food Security Outcome Index	Health Security Outcome Index	Environmental Security Outcome Index	Personal Security Outcome Index	Community Security Outcome Index	Political Security Outcome Index	Composite Outcome Index
Argentina	72.07	55.02	47.48	40.40	62.43	88.42	97.12	60.14
Australia	90.23	89.82	89.70	33.58	65.31	80.45	99.99	85.68
Austria	92.61	94.39	87.85	46.46	75.31	93.45	98.54	97.40
Bangladesh	10.56	17.03	9.95	66.99	75.31	68.26	96.35	25.02
Belgium	93.42	85.95	87.85	29.17	62.97	94.82	99.36	87.00
Botswana	64.20	37.10	31.41	65.79	33.10	50.39	96.93	35.24
Canada	93.10	85.95	96.80	36.60	57.19	82.13	95.33	85.10
Chile	77.78	70.41	55.03	54.49	62.97	77.84	98.54	70.26
China	39.98	38.14	48.38	46.55	78.47	79.59	-	21.07
Colombia	60.93	49.41	47.48	59.92	0.01	76.04	89.09	36.41
Costa Rica	60.29	68.55	57.96	54.16	46.44	95.49	95.54	64.73
Denmark	94.51	89.82	89.70	39.34	90.25	93.45	98.54	99.48
Egypt	39.29	27.09	38.17	45.20	86.65	73.24	90.03	41.39
Finland	90.15	100.00	86.18	32.03	97.12	96.81	95.11	100.01
France	92.56	94.39	80.74	42.12	60.37	86.14	95.74	86.57
Ghana	22.57	17.49	12.38	82.61	77.37	66.16	94.46	33.50
Greece	77.86	82.60	87.85	37.13	70.12	73.24	96.74	78.70
Guatemala	47.26	34.20	36.22	75.63	18.93	73.24	86.24	33.10
Hungary	62.43	74.60	81.95	36.20	62.43	82.13	92.28	68.76
India	23.06	17.26	21.50	64.60	48.88	62.86	93.77	21.31
Indonesia	42.92	28.87	23.61	60.54	97.12	56.93	99.04	44.17
Iraq	40.55	14.20	27.64	41.13	36.70	0.00	99.84	0.00
Ireland	90.89	85.95	87.85	25.21	80.87	89.90	94.68	87.54
Italy	90.34	89.82	84.65	43.33	58.05	89.90	98.02	87.17
Jamaica	42.53	74.60	44.28	20.67	18.16	89.90	94.46	36.92
Japan	94.94	89.82	77.54	34.94	92.31	68.26	93.04	86.21
Jordan	42.61	55.02	40.37	50.77	49.76	68.26	89.73	40.45
Kenya	13.93	22.69	14.66	73.97	61.38	73.24	94.46	27.95
Korea Republic	79.54	89.82	68.59	39.31	83.57	89.90	94.23	84.46
Kuwait	96.30	70.41	75.70	29.56	40.82	62.86	97.48	63.17
Malawi	0.02	- 0.03	15.49	90.83	71.71	73.24	97.48	26.29
Malaysia	65.73	74.60	66.39	39.60	77.37	86.14	95.95	72.84
Morocco	41.49	27.44	24.54	48.52	90.25	50.39	92.79	34.20
Nepal	11.56	18.21	- 0.00	83.72	72.56	68.26	93.77	26.10
Netherlands	91.41	89.82	84.65	38.06	30.50	96.81	96.15	79.25
New Zealand	86.22	85.95	71.78	42.05	67.92	89.90	98.87	83.79
Norway	95.36	100.00	96.80	32.39	75.31	93.45	97.12	97.94
Panama	62.31	59.59	57.96	57.50	32.42	82.13	96.35	55.79
Paraguay	46.46	47.02	36.22	75.47	32.42	62.86	97.48	40.87
Philippines	43.15	41.57	34.47	62.17	18.93	73.24	97.30	32.84
Poland	59.75	74.60	100.00	38.91	67.92	86.14	90.03	76.28
Portugal	80.86	82.60	80.74	36.23	62.43	93.45	94.90	80.38
Senegal	24.01	13.79	18.91	81.29	92.31	82.95	87.74	41.78
South Africa	63.09	30.01	32.87	42.59	2.47	68.26	98.71	23.11
Spain	83.82	94.39	94.10	42.17	73.44	93.45	96.93	94.35
Sri Lanka	33.82	60.88	68.59	72.13	45.19	77.84	96.74	57.85
Sweden	89.67	100.00	94.10	40.22	44.95	100.00	97.67	90.88
Switzerland	96.22	94.39	96.80	38.55	74.36	93.45	88.09	95.40
Thailand	60.45	43.48	35.32	54.52	48.31	77.84	93.77	45.55
Trinidad & Tobago	61.05	63.67	49.32	29.03	50.99	77.84	94.00	49.17
Tunisia	54.17	47.02	38.17	35.64	100.00	82.13	99.99	58.42
Turkey	59.04	39.24	37.17	47.20	80.87	68.26	98.37	50.43
United Kingdom	90.92	85.95	89.70	41.11	74.36	89.90	95.95	91.26
United States	99.97	82.60	84.65	36.29	46.96	89.90	85.84	78.90
Uruguay	69.03	58.37	50.33	28.63	54.42	86.14	99.36	55.21
Zambia	8.14	1.54	14.66	79.43	40.82	82.13	87.38	16.02
Zimbabwe	32.26	24.79	29.42	60.64	50.37	89.90	92.54	35.54

Human Security Inefficiency Ratios version 2 Country	Economic Security Inefficiency Ratio	Food Security Inefficiency Ratio	Health Security Inefficiency Ratio	Environmental Security Inefficiency Ratio	Personal Security Inefficiency Ratio	Community Security Inefficiency Ratio	Political Security Inefficiency Ratio	Composite Inefficiency Ratio
Argentina	1.08	1.22	1.86	2.00	0.66	1.11	0.54	1.11
Australia	1.11	0.70	0.95	2.91	0.97	1.24	1.00	1.13
Austria	0.92	0.82	1.04	1.62	0.83	1.06	1.01	0.95
Bangladesh	0.00	0.85	3.97	1.07	0.35	1.25	0.45	0.00
Belgium	1.07	0.99	1.07	2.48	0.88	1.04	1.01	1.11
Botswana	1.03	0.88	1.32	0.84	1.58	1.77	0.55	0.92
Canada	1.06	0.67	0.87	2.56	0.00	1.20	1.05	0.88
Chile	0.97	0.63	1.30	1.70	0.99	1.26	0.65	0.96
China	1.62	1.52	1.51	1.56	0.50	1.19	1.00	1.72
Colombia	1.11	1.15	1.50	1.08	4,978.23	1.30	0.40	1.46
Costa Rica	1.00	1.08	1.29	1.44	1.33	1.02	0.83	1.12
Denmark	0.94	0.91	0.99	2.48	0.63	1.07	1.01	0.99
Egypt	1.75	2.90	2.18	2.07	0.67	1.33	0.09	1.48
Finland	1.10	0.51	1.02	2.91	0.57	1.01	1.05	0.90
France	0.99	0.96	1.10	2.18	0.93	1.15	0.83	1.09
Ghana	0.77	1.68	1.01	1.10	0.73	1.46	0.24	0.40
Greece	1.00	1.09	1.08	2.17	0.95	1.35	0.67	1.10
Guatemala	0.59	1.17	1.89	1.06	2.89	1.30	0.26	0.98
Hungary	1.14	1.05	1.13	2.49	0.86	1.21	0.86	1.22
India	1.87	2.73	2.66	1.46	1.03	1.52	0.31	1.89
Indonesia	1.34	2.48	1.37	1.06	0.41	1.38	0.04	0.45
Iraq	0.88	1.14	2.11	1.20	2.40	22,176.94	- 0.00	6,784.40
Ireland	0.97	1.16	0.91	2.88	0.88	1.04	0.84	1.03
Italy	0.90	0.97	1.18	2.24	0.94	1.10	0.81	1.08
Jamaica	1.32	0.78	1.36	1.72	3.53	1.08	0.56	1.15
Japan	0.89	0.76	1.04	2.28	0.67	1.28	0.69	0.85
Jordan	1.42	1.22	1.95	1.84	1.12	1.40	0.32	1.46
Kenya	2.44	0.79	2.47	0.90	0.61	1.26	0.08	0.13
Korea Republic	1.13	0.96	1.09	0.92	0.77	1.05	0.68	0.81
Kuwait	0.48	0.59	1.07	- 0.00	2.45	1.35	0.18	0.43
Malawi	4,530.04	5.13	0.00	0.77	0.49	1.11	0.54	0.36
Malaysia	0.90	1.01	0.83	1.77	0.67	0.26	0.24	0.31
Morocco	0.77	2.44	2.08	1.77	0.55	1.94	0.19	1.04
Nepal	4.30	0.98	- 4,476.55	0.94	0.63	1.34	0.38	0.64
Netherlands	1.07	0.70	1.03	2.22	1.98	1.01	1.04	1.16
New Zealand	1.10	0.99	1.17	1.93	0.82	1.10	1.01	1.13
Norway	1.00	0.64	0.95	3.09	0.65	1.07	1.03	0.97
Panama	1.12	0.52	1.27	1.53	2.55	1.20	0.55	1.15
Paraguay	1.24	1.23	1.74	0.85	2.19	1.51	0.37	1.19
Philippines	1.88	0.85	0.89	1.08	2.27	1.34	0.37	1.00
Poland	1.26	0.95	0.85	2.16	0.99	1.13	0.71	1.02
Portugal	1.13	1.15	1.11	2.58	0.88	1.01	1.05	1.24
Senegal	0.00	2.01	1.19	1.14	0.57	1.16	0.26	0.24
South Africa	1.48	1.67	1.85	1.99	19.86	-	0.54	1.42
Spain	1.10	1.04	1.01	2.08	0.79	1.03	0.82	1.02
Sri Lanka	1.79	0.63	0.64	1.17	1.09	1.22	0.23	0.58
Sweden	1.12	0.50	0.96	2.43	1.55	1.00	1.02	1.07
Switzerland	0.81	0.75	0.93	2.50	0.75	0.95	1.14	0.93
Thailand	0.82	1.15	1.27	1.18	1.23	0.99	0.31	0.61
Trinidad & Tobago	0.99	0.72	1.39	1.94	1.44	1.14	0.84	1.16
Tunisia	1.22	1.82	1.66	2.69	0.69	1.20	0.12	1.07
Turkey	0.90	2.09	1.91	1.01	0.45	1.41	0.18	0.72
United Kingdom	1.10	0.90	0.88	2.31	0.87	1.09	0.83	1.02
United States	0.94	1.06	1.02	2.45	1.46	0.99	1.16	1.26
Uruguay	1.09	0.69	1.80	2.98	1.54	1.15	0.65	1.39
Zambia	3.94	5.94	1.85	0.92	1.45	1.13	0.41	0.91
Zimbabwe	1.96	0.30	1.19	1.07	1.04	0.95	0.19	0.37

Human Security Effort Indices version 3 Country	Economic Security Effort Index	Food Security Effort Index	Health Security Effort Index	Environmental Security Effort Index	Personal Security Effort Index	Community Security Effort Index	Political Security Effort Index	Composite Effort Index
Argentina	0.27	0.28	0.86	-0.06	-0.71	0.63	0.22	62.54
Australia	1.46	0.12	0.52	1.45	0.05	1.13	1.07	90.77
Austria	0.67	0.74	1.31	-0.42	0.00	0.98	1.07	81.27
Bangladesh	-2.22	-1.60	-1.08	-0.64	-0.92	-1.48	-0.06	0.34
Belgium	1.46	1.11	1.61	-0.60	-0.30	0.92	1.07	87.31
Botswana	-0.24	-1.03	-1.06	-1.34	-0.42	-1.08	0.22	20.39
Canada	1.40	-0.09	0.49	1.01	-1.06	0.87	1.07	76.93
Chile	0.16	-0.61	-0.38	0.93	0.00	0.68	0.50	61.14
China	-0.29	-0.09	-0.33	-0.57	-0.73	-0.14	-2.31	23.51
Colombia	-0.18	-0.14	-0.40	-0.97	0.14	1.07	-0.34	47.33
Costa Rica	-0.46	0.59	-0.24	-0.26	-0.02	0.62	0.79	59.39
Denmark	0.84	0.95	0.97	1.42	-0.24	1.26	1.07	93.82
Egypt	-0.12	0.80	0.35	1.02	-0.21	0.55	-1.75	56.92
Finland	1.40	-0.35	0.87	0.98	-0.30	0.56	1.07	80.50
France	1.01	1.37	0.95	0.82	-0.28	1.14	0.79	90.70
Ghana	-1.82	-1.13	-1.19	0.74	-0.27	0.34	-0.90	25.06
Greece	0.27	1.32	1.78	-0.09	0.27	1.00	0.50	85.86
Guatemala	-1.54	-0.77	-0.52	-0.09	-0.33	-0.02	-0.90	25.39
Hungary	-0.01	0.80	1.39	0.66	-0.38	1.06	0.79	80.95
India	-1.09	-0.51	-0.85	1.07	-0.48	-0.06	-0.62	36.20
Indonesia	-0.58	0.48	-1.12	-0.99	-0.73	-1.84	-2.03	8.13
Iraq	-1.31	-1.55	-0.82	-1.52	2.66	-0.09	-2.31	20.29
Ireland	0.78	1.84	0.08	-0.59	0.58	-0.47	0.79	72.47
Italy	0.44	1.21	2.79	1.36	-0.34	0.95	0.79	99.94
Jamaica	-0.63	-0.09	-0.78	-1.85	0.11	0.48	0.22	36.09
Japan	0.61	0.33	0.15	-0.16	-0.02	-1.27	0.50	53.68
Jordan	-0.46	0.28	0.01	1.01	-0.28	-0.05	-0.62	51.89
Kenya	-1.37	-1.50	-1.10	-0.88	-0.77	-0.70	-1.75	0.01
Korea Republic	0.90	1.16	-0.23	-1.84	0.14	-0.30	0.50	54.86
Kuwait	-0.97	-0.71	0.16	-2.29	5.49	-1.49	-1.19	46.22
Malawi	0.05	-2.02	-1.20	-0.72	-0.81	-1.73	0.22	12.10
Malaysia	-0.52	0.64	-0.88	-0.72	-0.43	-2.19	-0.90	20.01
Morocco	-1.43	0.28	-0.95	0.30	-0.49	0.59	-1.19	33.74
Nepal	-0.86	-1.50	-1.18	-0.22	-0.59	-0.74	-0.34	17.17
Netherlands	1.35	0.12	0.76	0.21	-0.09	0.51	1.07	78.56
New Zealand	1.18	1.11	0.41	-0.06	-0.28	0.86	1.07	80.82
Norway	1.18	0.17	1.38	1.72	-0.51	1.36	1.07	94.49
Panama	-0.07	-1.08	-0.30	0.48	1.82	0.72	0.22	64.57
Paraguay	-0.58	-0.09	-0.70	-1.01	0.58	-0.18	-0.34	37.59
Philippines	0.44	-0.92	-1.13	-0.86	-0.67	0.70	-0.34	34.56
Poland	0.16	0.43	0.54	0.17	0.31	0.36	0.50	68.94
Portugal	0.95	1.58	1.04	0.98	-0.32	-0.32	1.07	85.34
Senegal	-2.22	-1.18	-1.16	0.89	-0.40	0.09	-0.90	20.72
South Africa	1.07	-0.40	-0.76	0.23	-0.51	-2.19	0.22	37.40
Spain	1.01	1.73	1.88	0.46	-0.21	0.20	0.79	91.15
Sri Lanka	-0.46	-0.82	-1.04	0.18	-0.51	-0.11	-0.90	28.77
Sweden	1.46	-0.40	1.10	1.46	0.48	1.31	1.07	95.20
Switzerland	0.27	0.43	1.11	1.30	-0.30	-1.11	1.07	70.98
Thailand	-0.86	-0.40	-1.03	-0.98	-0.12	-1.90	-0.62	13.93
Trinidad & Tobago	-0.46	-0.56	-0.52	-1.30	0.77	-1.13	0.79	36.92
Tunisia	-0.24	1.11	-0.70	1.24	0.43	0.94	-1.47	61.38
Turkey	-0.75	0.95	-0.42	-1.58	-0.79	0.10	-1.19	28.75
United Kingdom	1.46	0.74	0.05	1.17	0.14	0.75	0.79	86.15
United States	1.12	1.21	0.68	0.58	0.41	-1.09	1.07	78.80
Uruguay	0.16	-0.77	1.18	0.28	1.99	0.95	0.50	80.83
Zambia	-1.43	-1.76	-1.15	-0.54	-0.14	-0.51	-0.34	14.35
Zimbabwe	-0.35	-1.81	-1.11	-0.98	-0.42	-1.48	-1.19	4.70

Human Security Outcome Indices version 3 Country	Economic Security Outcome Index	Food Security Outcome Index	Health Security Outcome Index	Environmental Security Outcome Index	Personal Security Outcome Index	Community Security Outcome Index	Political Security Outcome Index	Composite Outcome Index
Argentina	-0.07	0.32	0.30	-0.10	0.34	0.63	0.57	70.84
Australia	1.08	0.70	0.63	-0.96	0.38	-0.02	1.51	80.90
Austria	1.29	0.72	0.62	0.59	0.48	1.09	1.01	99.95
Bangladesh	-1.15	-1.45	-2.43	0.36	0.48	-0.86	0.35	19.70
Belgium	1.37	0.68	0.62	-0.90	0.35	1.22	1.29	90.96
Botswana	-0.38	-0.20	-0.25	1.00	-0.51	-1.84	0.51	42.91
Canada	1.34	0.68	0.64	-0.65	0.26	0.11	0.07	74.35
Chile	0.21	0.55	0.42	0.71	0.35	-0.21	1.01	78.86
China	-0.90	-0.16	0.32	0.02	0.50	-0.08	-3.73	24.75
Colombia	-0.48	0.20	0.30	0.53	-4.70	-0.34	-1.25	11.64
Costa Rica	-0.50	0.53	0.46	0.39	0.02	1.28	0.13	73.33
Denmark	1.48	0.70	0.63	0.03	0.56	1.09	1.01	97.57
Egypt	-0.91	-0.70	0.04	0.11	0.54	-0.54	-1.09	36.22
Finland	1.07	0.74	0.62	-0.93	0.58	1.42	0.02	82.43
France	1.29	0.72	0.61	-0.13	0.31	0.44	0.18	81.70
Ghana	-1.08	-1.41	-2.03	0.59	0.49	-0.99	-0.15	20.69
Greece	0.21	0.65	0.62	-0.33	0.43	-0.54	0.46	67.21
Guatemala	-0.79	-0.33	-0.03	1.06	-1.58	-0.54	-1.69	25.82
Hungary	-0.43	0.59	0.61	-0.61	0.34	0.11	-0.65	55.40
India	-1.07	-1.43	-0.94	0.47	0.09	-1.19	-0.31	22.05
Indonesia	-0.86	-0.60	-0.76	0.54	0.58	-1.51	1.17	44.63
Iraq	-0.90	-1.73	-0.47	0.12	-0.34	-3.46	1.45	14.97
Ireland	1.14	0.68	0.62	-0.81	0.51	0.76	-0.09	77.11
Italy	1.09	0.70	0.62	-0.11	0.28	0.76	0.84	87.53
Jamaica	-0.87	0.59	0.22	-0.33	-1.66	0.76	-0.15	44.72
Japan	1.53	0.70	0.60	-0.68	0.57	-0.86	-0.48	66.03
Jordan	-0.87	0.32	0.12	0.18	0.11	-0.86	-1.14	39.25
Kenya	-1.13	-0.99	-1.70	0.58	0.33	-0.54	-0.15	28.12
Korea Republic	0.31	0.70	0.55	-0.36	0.53	0.76	-0.20	73.08
Kuwait	1.67	0.55	0.59	-1.35	-0.17	-1.19	0.68	61.63
Malawi	-1.19	-3.67	-1.59	0.90	0.45	-0.54	0.68	17.75
Malaysia	-0.32	0.59	0.54	-0.27	0.49	0.44	0.24	68.60
Morocco	-0.88	-0.68	-0.68	0.18	0.56	-1.84	-0.54	25.96
Nepal	-1.14	-1.35	-4.79	0.69	0.45	-0.86	-0.31	0.01
Netherlands	1.18	0.70	0.62	-0.46	-0.66	1.42	0.29	79.20
New Zealand	0.75	0.68	0.57	0.10	0.41	0.76	1.12	89.15
Norway	1.57	0.74	0.64	-1.00	0.48	1.09	0.57	86.79
Panama	-0.44	0.40	0.46	0.81	-0.55	0.11	0.35	64.45
Paraguay	-0.81	0.13	-0.03	0.52	-0.55	-1.19	0.68	46.11
Philippines	-0.86	-0.03	-0.10	0.42	-1.58	-0.54	0.62	39.81
Poland	-0.51	0.59	0.64	-0.39	0.41	0.44	-1.09	56.36
Portugal	0.39	0.65	0.61	-0.66	0.34	1.09	-0.04	73.86
Senegal	-1.07	-1.77	-1.19	0.87	0.57	0.18	-1.47	25.95
South Africa	-0.41	-0.54	-0.17	-0.15	-4.13	-0.86	1.06	15.92
Spain	0.58	0.72	0.64	-0.15	0.46	1.09	0.51	84.98
Sri Lanka	-0.98	0.42	0.55	0.83	-0.02	-0.21	0.46	63.69
Sweden	1.03	0.74	0.64	-0.29	-0.03	1.74	0.73	90.47
Switzerland	1.66	0.72	0.64	-0.47	0.47	1.09	-1.42	76.17
Thailand	-0.49	0.03	-0.07	0.52	0.07	-0.21	-0.31	52.05
Trinidad & Tobago	-0.47	0.47	0.33	-1.13	0.14	-0.21	-0.26	46.91
Tunisia	-0.65	0.13	0.04	-0.02	0.59	0.11	1.51	68.71
Turkey	-0.53	-0.12	0.01	0.13	0.51	-0.86	0.95	56.30
United Kingdom	1.14	0.68	0.63	-0.06	0.47	0.76	0.24	85.08
United States	2.10	0.65	0.62	-0.84	0.03	0.76	-1.75	67.72
Uruguay	-0.20	0.38	0.35	-0.39	0.21	0.44	1.29	71.54
Zambia	-1.16	-3.40	-1.70	0.73	-0.17	0.11	-1.53	1.39
Zimbabwe	-0.99	-0.85	-0.36	0.50	0.12	0.76	-0.59	44.93

Human Security Inefficiency Ratios version 3 Country	Economic Security Inefficiency Ratio	Food Security Inefficiency Ratio	Health Security Inefficiency Ratio	Environmental Security Inefficiency Ratio	Personal Security Inefficiency Ratio	Community Security Inefficiency Ratio	Political Security Inefficiency Ratio	Composite Inefficiency Ratio
Argentina	1.99	0.66	0.55	1.07	0.06	1.01	0.91	0.88
Australia	1.45	0.56	0.43	5.79	0.18	1.41	1.00	1.12
Austria	1.04	0.72	0.63	0.58	0.17	1.02	1.10	0.81
Bangladesh	0.02	0.22	0.07	0.58	0.02	0.40	0.86	0.02
Belgium	1.28	0.82	0.71	2.27	0.12	0.97	1.04	0.96
Botswana	2.18	0.33	0.04	0.24	0.12	1.00	0.93	0.48
Canada	1.28	0.51	0.42	2.84	- 0.00	1.25	1.38	1.03
Chile	1.52	0.38	0.21	0.94	0.17	1.29	0.92	0.78
China	6.03	0.63	0.23	0.75	0.05	0.89	1.00	0.95
Colombia	2.56	0.56	0.21	0.42	- 238.18	1.53	1.23	4.06
Costa Rica	2.26	0.71	0.25	0.70	0.18	0.87	1.24	0.81
Denmark	1.02	0.78	0.55	1.62	0.13	1.11	1.10	0.96
Egypt	6.78	1.08	0.44	1.36	0.13	1.37	0.33	1.57
Finland	1.43	0.43	0.52	4.69	0.12	0.83	1.40	0.98
France	1.16	0.88	0.54	1.53	0.13	1.25	1.23	1.11
Ghana	3.15	0.45	0.01	0.94	0.12	1.50	0.61	1.21
Greece	1.59	0.88	0.75	1.30	0.21	1.60	1.04	1.28
Guatemala	1.53	0.43	0.19	0.55	0.19	1.09	1.07	0.98
Hungary	2.61	0.75	0.65	2.40	0.11	1.33	1.56	1.46
India	8.71	0.77	0.13	1.11	0.10	1.37	0.77	1.64
Indonesia	4.48	0.93	0.03	0.41	0.05	0.26	0.09	0.18
Iraq	2.76	0.28	0.12	0.31	0.69	- 676.57	- 0.00	1.36
Ireland	1.15	1.01	0.32	1.88	0.25	0.60	1.32	0.94
Italy	1.05	0.85	1.00	1.77	0.12	1.09	1.05	1.14
Jamaica	4.41	0.52	0.12	0.26	0.31	0.93	1.10	0.81
Japan	0.93	0.61	0.34	1.90	0.16	0.52	1.34	0.81
Jordan	4.86	0.66	0.33	1.29	0.13	1.20	1.01	1.32
Kenya	12.53	0.22	0.04	0.44	0.05	0.74	0.24	0.00
Korea Republic	1.86	0.83	0.25	0.27	0.18	0.65	1.24	0.75
Kuwait	0.39	0.35	0.34	0.66	1.17	0.45	0.40	0.75
Malawi	408.81	0.87	- 0.00	0.42	0.04	0.23	0.89	0.68
Malaysia	1.75	0.71	0.08	0.88	0.10	0.00	0.55	0.29
Morocco	2.31	0.88	0.08	1.01	0.09	2.51	0.55	1.30
Nepal	24.79	0.26	203.59	0.61	0.07	0.82	0.89	1,716.84
Netherlands	1.34	0.56	0.49	1.68	0.19	0.81	1.30	0.99
New Zealand	1.56	0.82	0.41	0.93	0.12	1.06	1.08	0.91
Norway	1.10	0.57	0.65	6.89	0.09	1.14	1.22	1.09
Panama	2.55	0.26	0.23	0.77	0.56	1.19	0.96	1.00
Paraguay	3.82	0.58	0.14	0.41	0.32	1.30	0.69	0.82
Philippines	7.19	0.34	0.02	0.49	0.10	1.45	0.70	0.87
Poland	3.13	0.66	0.44	1.54	0.22	0.96	1.65	1.22
Portugal	1.80	0.95	0.56	2.83	0.12	0.60	1.42	1.16
Senegal	0.01	0.50	0.01	0.86	0.10	0.92	0.97	0.80
South Africa	3.77	0.59	0.13	1.26	0.77	0.00	0.82	2.35
Spain	1.63	0.98	0.77	1.38	0.13	0.77	1.13	1.07
Sri Lanka	7.42	0.34	0.04	0.68	0.10	0.94	0.52	0.45
Sweden	1.48	0.42	0.58	2.12	0.27	0.99	1.17	1.05
Switzerland	0.78	0.64	0.58	2.45	0.12	0.35	2.26	0.93
Thailand	1.74	0.50	0.05	0.42	0.16	0.13	0.77	0.27
Trinidad & Tobago	2.19	0.40	0.18	2.73	0.31	0.48	1.38	0.79
Tunisia	3.30	0.94	0.14	1.59	0.23	1.28	0.25	0.89
Turkey	2.00	0.96	0.22	0.29	0.04	1.29	0.37	0.51
United Kingdom	1.41	0.73	0.31	1.61	0.19	1.02	1.21	1.01
United States	0.91	0.85	0.47	3.35	0.25	0.38	2.64	1.16
Uruguay	2.15	0.35	0.63	1.60	0.50	1.18	0.87	1.13
Zambia	20.89	1.09	0.02	0.51	0.16	0.69	1.39	10.29
Zimbabwe	8.56	0.09	0.03	0.43	0.11	0.24	0.56	0.10

Human Security Effort Indices version 4 Country	Economic Security Effort Index	Food Security Effort Index	Health Security Effort Index	Environmental Security Effort Index	Personal Security Effort Index	Community Security Effort Index	Political Security Effort Index	Composite Effort Index
Argentina	84.04	87.23	109.39	79.56	27.15	258.20	- 50.00	68.04
Australia	106.38	85.11	91.84	127.97	76.63	303.85	100.00	94.02
Austria	91.49	93.62	133.47	67.86	73.37	289.88	100.00	90.33
Bangladesh	37.23	61.70	7.35	60.76	13.47	64.70	- 100.00	28.54
Belgium	106.38	98.58	148.98	62.16	53.88	285.06	100.00	90.80
Botswana	74.47	69.50	8.16	38.53	45.98	101.29	- 50.00	41.06
Canada	105.32	82.27	90.20	113.93	3.99	279.64	100.00	83.81
Chile	81.91	75.18	44.08	111.25	73.37	262.54	-	72.67
China	73.40	82.27	46.94	63.19	25.35	187.83	- 500.00	13.96
Colombia	75.53	81.56	42.86	50.37	82.10	298.40	- 150.00	57.97
Costa Rica	70.21	91.49	51.43	73.17	71.84	257.54	50.00	74.19
Denmark	94.68	96.45	115.51	127.07	57.47	315.47	100.00	95.32
Egypt	76.60	94.33	82.45	114.36	59.45	251.04	- 400.00	40.21
Finland	105.32	78.72	109.80	112.97	53.88	251.97	100.00	87.08
France	97.87	102.13	114.29	107.71	54.73	305.18	50.00	88.77
Ghana	44.68	68.09	1.63	105.39	55.62	231.85	- 250.00	38.37
Greece	84.04	101.42	157.96	78.71	90.74	291.56	-	86.36
Guatemala	50.00	73.05	36.73	78.56	51.47	198.56	- 250.00	36.71
Hungary	78.72	94.33	137.55	102.70	48.57	297.27	50.00	86.77
India	58.51	76.60	19.59	116.00	42.05	194.77	- 200.00	42.77
Indonesia	68.09	90.07	4.90	49.72	25.73	31.31	- 450.00	- 0.00
Iraq	54.26	62.41	20.82	32.54	246.31	191.88	- 500.00	25.29
Ireland	93.62	108.51	68.16	62.66	111.23	157.13	50.00	72.93
Italy	87.23	100.00	211.43	125.26	50.71	287.33	50.00	95.79
Jamaica	67.02	82.27	23.27	21.88	80.19	244.43	- 50.00	56.94
Japan	90.43	87.94	72.24	76.32	71.84	83.54	-	58.10
Jordan	70.21	87.23	64.49	113.98	54.73	195.35	- 200.00	49.66
Kenya	53.19	63.12	6.12	53.15	22.99	135.77	- 400.00	10.04
Korea Republic	95.74	99.29	51.84	22.32	82.10	172.67	-	61.76
Kuwait	60.64	73.76	72.65	8.00	431.03	63.57	- 300.00	51.73
Malawi	79.79	56.03	0.82	58.32	20.65	42.18	- 50.00	34.03
Malaysia	69.15	92.20	17.55	58.46	45.37	0.07	- 250.00	18.68
Morocco	52.13	87.23	13.88	91.00	41.05	254.16	- 300.00	36.80
Nepal	62.77	63.12	2.04	74.54	34.48	132.12	- 150.00	35.02
Netherlands	104.26	85.11	104.49	88.31	67.61	247.16	100.00	85.70
New Zealand	101.06	98.58	85.71	79.59	54.73	279.27	100.00	85.88
Norway	101.06	85.82	137.14	136.62	40.10	324.95	100.00	96.99
Panama	77.66	68.79	48.57	96.99	191.57	266.60	- 50.00	77.21
Paraguay	68.09	82.27	27.35	48.87	111.23	184.01	- 150.00	48.41
Philippines	87.23	70.92	4.49	53.99	29.73	264.43	- 150.00	47.45
Poland	81.91	89.36	92.65	86.84	93.20	233.34	-	75.21
Portugal	96.81	104.96	118.78	113.00	52.25	171.08	100.00	82.19
Senegal	37.23	67.38	2.86	109.97	47.24	208.97	- 250.00	35.42
South Africa	98.94	78.01	24.08	88.95	39.64	-	- 50.00	40.33
Spain	97.87	107.09	163.27	96.31	59.45	218.75	50.00	85.33
Sri Lanka	70.21	72.34	9.39	87.39	40.10	190.29	- 250.00	35.07
Sweden	106.38	78.01	122.04	128.35	104.49	320.72	100.00	100.00
Switzerland	84.04	89.36	122.86	123.20	53.88	99.02	100.00	74.77
Thailand	62.77	78.01	9.80	49.92	65.06	25.98	- 200.00	23.83
Trinidad & Tobago	70.21	75.89	36.73	39.66	123.15	97.15	50.00	59.02
Tunisia	74.47	98.58	27.35	121.23	101.42	286.54	- 350.00	47.34
Turkey	64.89	96.45	42.04	30.80	21.96	209.51	- 300.00	30.33
United Kingdom	106.38	93.62	66.94	119.04	82.10	268.72	50.00	84.81
United States	100.00	100.00	100.00	100.00	99.95	100.00	100.00	77.19
Uruguay	81.91	73.05	126.12	90.39	202.84	286.97	-	91.34
Zambia	52.13	59.57	3.67	64.20	63.86	153.79	- 150.00	37.49
Zimbabwe	72.34	58.87	5.71	50.09	45.98	64.33	- 300.00	15.57

Human Security Outcome Indices version 4 Country	Economic Security Outcome Index	Food Security Outcome Index	Health Security Outcome Index	Environmental Security Outcome Index	Personal Security Outcome Index	Community Security Outcome Index	Political Security Outcome Index	Composite Outcome Index
Argentina	35.50	- 100.00	- 633.33	112.86	151.22	97.65	216.67	91.87
Australia	69.67	125.00	125.00	89.14	157.32	85.88	263.89	99.35
Austria	76.08	137.50	116.67	157.64	173.17	105.88	238.89	100.00
Bangladesh	3.62	- 1,162.50	- 6,883.33	130.09	173.17	70.59	205.56	38.82
Belgium	78.42	112.50	116.67	83.55	152.44	108.24	252.78	99.27
Botswana	26.51	- 412.50	- 1,883.33	166.57	9.76	52.94	213.89	79.54
Canada	77.49	112.50	150.00	101.05	137.80	88.24	191.67	98.94
Chile	43.88	37.50	- 341.67	155.56	152.44	82.35	238.89	95.40
China	10.79	- 387.50	- 591.67	119.22	176.83	84.71	0.10	88.49
Colombia	23.47	- 175.00	- 633.33	142.05	- 682.93	80.00	125.00	84.64
Costa Rica	22.92	25.00	- 258.33	137.21	97.56	109.41	194.44	95.10
Denmark	81.66	125.00	125.00	136.88	186.59	105.88	238.89	99.96
Egypt	10.51	- 712.50	- 1,216.67	120.03	184.15	76.47	133.33	82.59
Finland	69.46	150.00	108.33	84.58	190.24	111.76	188.89	99.26
France	75.94	137.50	75.00	117.43	146.34	94.12	197.22	98.83
Ghana	5.65	- 1,137.50	- 5,966.67	142.04	175.61	68.24	180.56	45.54
Greece	44.02	100.00	116.67	106.68	165.85	76.47	211.11	98.66
Guatemala	14.13	- 487.50	- 1,383.33	167.95	- 167.07	76.47	102.78	80.62
Hungary	24.82	62.50	83.33	93.66	151.22	88.24	155.56	97.50
India	5.76	- 1,150.00	- 3,466.67	137.17	108.54	64.71	172.22	62.91
Indonesia	12.03	- 650.00	- 3,050.00	142.14	190.24	58.82	247.22	70.70
Iraq	11.02	- 1,325.00	- 2,383.33	122.84	39.02	23.53	261.11	69.25
Ireland	71.39	112.50	116.67	86.64	179.27	100.00	183.33	98.87
Italy	69.94	125.00	100.00	117.94	140.24	100.00	230.56	99.12
Jamaica	11.86	62.50	- 800.00	102.19	- 180.49	100.00	180.56	88.95
Japan	82.97	125.00	50.00	94.03	187.80	70.59	163.89	98.33
Jordan	11.89	- 100.00	- 1,050.00	125.17	112.20	70.59	130.56	87.68
Kenya	4.10	- 887.50	- 5,216.67	142.04	148.78	76.47	180.56	52.62
Korea Republic	46.85	125.00	- 50.00	108.31	181.71	100.00	177.78	97.72
Kuwait	87.26	37.50	33.33	78.31	67.07	64.71	222.22	97.00
Malawi	2.45	- 2,487.50	- 4,966.67	158.11	168.29	76.47	222.22	43.42
Malaysia	28.06	62.50	- 83.33	108.04	175.61	94.12	200.00	96.96
Morocco	11.41	- 700.00	- 2,883.33	122.55	186.59	52.94	161.11	70.71
Nepal	3.76	- 1,100.00	-12,300.00	147.38	169.51	70.59	172.22	- 0.00
Netherlands	72.77	125.00	100.00	104.88	- 14.63	111.76	202.78	97.81
New Zealand	60.01	112.50	- 8.33	134.36	162.20	100.00	244.44	98.55
Norway	84.28	150.00	150.00	85.65	173.17	105.88	216.67	99.71
Panama	24.71	- 50.00	- 258.33	159.54	3.66	88.24	205.56	93.99
Paraguay	13.72	- 212.50	- 1,383.33	138.54	3.66	64.71	222.22	84.40
Philippines	12.13	- 312.50	- 1,550.00	134.92	- 167.07	76.47	219.44	81.27
Poland	22.48	62.50	158.33	108.24	162.20	94.12	133.33	98.09
Portugal	49.19	100.00	75.00	90.32	151.22	105.88	186.11	98.21
Senegal	5.96	- 1,350.00	- 4,050.00	157.20	187.80	89.41	113.89	57.73
South Africa	25.44	- 612.50	- 1,716.67	115.26	- 587.80	70.59	241.67	74.93
Spain	54.91	137.50	141.67	115.00	170.73	105.88	213.89	99.52
Sri Lanka	8.58	- 37.50	- 50.00	156.03	91.46	82.35	211.11	96.07
Sweden	68.22	150.00	141.67	109.39	90.24	117.65	225.00	99.25
Switzerland	87.00	137.50	150.00	104.19	171.95	105.88	116.67	99.04
Thailand	23.06	- 275.00	- 1,466.67	144.87	106.10	82.35	172.22	83.97
Trinidad & Tobago	23.58	- 12.50	- 550.00	80.17	117.07	82.35	175.00	92.12
Tunisia	18.27	- 212.50	- 1,216.67	114.18	191.46	88.24	263.89	87.29
Turkey	21.89	- 362.50	- 1,300.00	122.19	179.27	70.59	236.11	85.28
United Kingdom	71.46	112.50	125.00	127.51	171.95	100.00	200.00	99.30
United States	100.00	100.00	100.00	100.00	100.00	100.00	100.00	97.79
Uruguay	31.71	- 62.50	- 508.33	97.24	129.27	94.12	252.78	92.98
Zambia	3.31	- 2,325.00	- 5,216.67	149.87	67.07	88.24	111.11	41.28
Zimbabwe	8.10	- 800.00	- 2,133.33	140.44	114.63	100.00	158.33	75.31

Human Security Inefficiency Ratios version 4 Country	Economic Security Inefficiency Ratio	Food Security Inefficiency Ratio	Health Security Inefficiency Ratio	Environmental Security Inefficiency Ratio	Personal Security Inefficiency Ratio	Community Security Inefficiency Ratio	Political Security Inefficiency Ratio	Composite Inefficiency Ratio
Argentina	2.00	0.66	0.55	1.44	0.06	1.01	0.91	0.74
Australia	1.45	0.56	0.43	7.72	0.18	1.41	1.00	0.95
Austria	1.04	0.72	0.63	0.53	0.17	1.02	1.10	0.90
Bangladesh	0.00	0.22	0.07	0.71	0.02	0.40	0.86	0.74
Belgium	1.28	0.82	0.71	7.20	0.12	0.97	1.04	0.91
Botswana	2.18	0.33	0.04	0.24	0.12	1.00	0.93	0.52
Canada	1.28	0.51	0.42	3.25	0.00	1.25	1.38	0.85
Chile	1.52	0.38	0.21	0.93	0.17	1.29	0.92	0.76
China	6.12	0.63	0.23	0.94	0.05	0.89	-	0.16
Colombia	2.57	0.55	0.21	0.46	50,442.18	1.53	1.23	0.68
Costa Rica	2.27	0.71	0.25	0.77	0.18	0.87	1.24	0.78
Denmark	1.02	0.78	0.55	1.42	0.13	1.11	1.10	0.95
Egypt	6.89	1.08	0.44	1.78	0.13	1.37	0.33	0.49
Finland	1.43	0.43	0.52	11.67	0.12	0.83	1.40	0.88
France	1.16	0.88	0.54	1.78	0.13	1.25	1.23	0.90
Ghana	3.28	0.45	0.01	1.06	0.12	1.50	0.61	0.84
Greece	1.59	0.88	0.75	1.74	0.21	1.60	1.04	0.88
Guatemala	1.54	0.43	0.19	0.55	0.19	1.09	1.07	0.46
Hungary	2.62	0.75	0.65	4.30	0.11	1.33	1.56	0.89
India	9.08	0.77	0.13	1.28	0.10	1.37	0.77	0.68
Indonesia	4.54	0.93	0.03	0.46	0.05	0.26	0.09	- 0.00
Iraq	2.80	0.28	0.12	0.38	0.69	- 94,478.54	-	0.37
Ireland	1.15	1.01	0.32	4.57	0.25	0.60	1.32	0.74
Italy	1.05	0.85	1.00	2.06	0.12	1.09	1.05	0.97
Jamaica	4.47	0.52	0.12	0.41	0.31	0.93	1.10	0.64
Japan	0.93	0.61	0.34	3.03	0.16	0.51	1.34	0.59
Jordan	4.93	0.66	0.33	1.58	0.13	1.20	1.01	0.57
Kenya	13.63	0.22	0.04	0.49	0.05	0.74	0.24	0.19
Korea Republic	1.86	0.83	0.25	0.33	0.18	0.65	1.24	0.63
Kuwait	0.39	0.35	0.34	- 2.19	1.17	0.45	0.40	0.53
Malawi	- 23,377.60	- 0.03	- 0.00	0.44	0.04	0.23	0.89	0.78
Malaysia	1.76	0.71	0.08	1.18	0.10	0.00	0.55	0.19
Morocco	2.35	0.88	0.08	1.31	0.09	2.50	0.55	0.52
Nepal	27.56	0.26	5.80	0.67	0.07	0.81	0.89	- 570,183.04
Netherlands	1.34	0.56	0.49	2.11	0.19	0.81	1.30	0.88
New Zealand	1.56	0.82	0.41	0.89	0.12	1.06	1.08	0.87
Norway	1.10	0.57	0.65	12.21	0.09	1.14	1.22	0.97
Panama	2.56	0.26	0.23	0.76	0.56	1.19	0.96	0.82
Paraguay	3.86	0.58	0.14	0.47	0.32	1.29	0.69	0.57
Philippines	7.28	0.34	0.02	0.57	0.10	1.45	0.70	0.58
Poland	3.15	0.66	0.44	1.84	0.22	0.96	1.65	0.77
Portugal	1.80	0.95	0.56	6.09	0.12	0.60	1.42	0.84
Senegal	0.00	0.50	0.01	0.90	0.10	0.92	0.97	0.61
South Africa	3.79	0.59	0.13	1.53	0.77	-	0.82	0.54
Spain	1.63	0.98	0.77	1.68	0.13	0.77	1.13	0.86
Sri Lanka	7.59	0.33	0.04	0.71	0.10	0.94	0.52	0.37
Sweden	1.48	0.42	0.58	2.70	0.27	0.99	1.17	1.01
Switzerland	0.78	0.64	0.58	3.10	0.12	0.35	2.26	0.75
Thailand	1.75	0.50	0.05	0.44	0.16	0.13	0.77	0.28
Trinidad & Tobago	2.20	0.40	0.18	11.88	0.30	0.48	1.38	0.64
Tunisia	3.32	0.94	0.14	2.20	0.23	1.28	0.25	0.54
Turkey	2.01	0.96	0.22	0.36	0.04	1.29	0.37	0.36
United Kingdom	1.41	0.73	0.31	1.57	0.19	1.02	1.21	0.85
United States	0.91	0.85	0.47	2.96	0.25	0.38	2.64	0.79
Uruguay	2.15	0.35	0.63	3.03	0.50	1.18	0.87	0.98
Zambia	24.46	1.10	0.02	0.55	0.16	0.69	1.39	0.91
Zimbabwe	8.77	0.08	0.03	0.47	0.11	0.24	0.56	0.21

Index values: Calculations and notes

Version 1:

Index = (indicator value for country X - minimum indicator value) / (maximum indicator value - minimum indicator value) x 100

Version 2:

Index = [log (indicator value for country X) - log (minimum indicator value)] / [log (maximum indicator value) - log (minimum indicator value)] x 100

Version 3:

Z = (indicator value for country X - mean value for indicator) / standard deviation for indicator

Version 4:

Index = (indicator value for country X / indicator value for USA) x 100

Note: Due to rounding the minimum and maximum index values are not always equal to 0 or 100.

Data sources: Human Security Indices (HSIs) and Inefficiency Ratios

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Proxy of commitment to eight environmental treaties: Centre for International Earth Science Information Network, 1997. *Environmental Treaties and other Policy Instruments*. Available: http://sedac.ciesin.org/pidb/guides/sec2.html (26 January 1999).

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Real GDP per capita ($PPP): United Nations Development Programme, 1999. *Human Development Report (1999).* New York: Oxford University Press (Table 1).

Under-five mortality rate (per 1 000 live births): United Nations Development Programme, 1999. *Human Development Report (1999).* New York: Oxford University Press (Table 8).

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CO2 emissions tons per capita: United Nations Development Programme, 1999. *Human Development Report (1999).* New York: Oxford University Press (Table 18).

Emissions of water pollutants: World Bank, 1999a. *World Development Indicators (1999).* Available: http://www.worldbank.org/data/wdi/home.html (14 September 1999) (Table 3.6).

Homicides per 100 000 population: South African Police Service, 1998. *Quarterly Crime Report 2/98*. Pretoria: South African Police Service (Annexure F).

Nondiscrimination index: Ul Haq, M., 1995. *Reflections on Human Development*. New York: Oxford University Press (Annex 5.1).

Voter turnout: International Institute for Democracy and Electoral Assistance (IDEA), 1999. *Voter Turnout: A Global Survey*. Available: http://www.int-idea.se/Voter_turnout/index.html (18 February 2000) (country tables).

Data sources: External validators and other indicators

United Nations Development Programme, 1999. *Human Development Report (1999)*. New York: Oxford University Press:

Human Development Index (HDI) (Table 1)

Life expectancy at birth (Table 1)

Real GDP per capita ($PPP) (Table 1)

Gender-related Development Index (GDI) (Table 2)

Gender Empowerment Measure (GEM) (Table 3)

Human Poverty Index for developing countries (HPI-1) (Table 4)

Human Poverty Index for developed countries (HPI-2) (Table 5)

Average annual GDP growth (1975-95) (Table 11)

Average annual growth in GNP per capita (Table 11)

Percentage population urbanised (Table 16)

Population dependency ratio (Table 16)

Divorces as percentage of marriages (Table 24)

Number of refugees by country of asylum (Table 24)

Percentage births to mothers younger than 20 years (Table 24)

Suicides per 100 000 population (Table 24)

Kurian, G.T., 1997. *Illustrated Book of World Rankings*. New York: Sharpe:

Legal induced abortions per 100 live births (Table 27)

Ethnic homogeneity index (Table 38)

Human Suffering Index (Table 299)

Status of Women Index (Table 300)

Heritage Foundation, 1999. *Index of Economic Freedom Rankings (1995-1999)*. Available: http://www.heritage.org/index/countries/maps&charts/list1.gif (14 September 1999):

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World Bank, 1999a. *World Development Indicators (1999)*. Available: http://www.worldbank.org/data/wdi/home.html (14 September 1999):

Population density (Table 1.1)

Average annual population growth (1980-97) (Table 2.1)

Population size (Table 2.1)

Unemployment rate (Table 2.5)

Headcount poverty index based on national poverty line (Table 2.7)

Headcount poverty index based on $2 per capita per day poverty line (Table 2.7)

Poverty gap measures based on $2 per capita per day poverty line (Table 2.7)

Gini coefficient (Table 2.8)

Percentage share in income of highest and lowest decile (Table 2.8)

Percentage population with access to safe water (Table 2.14)

Percentage population with access to sanitation (Table 2.14)

Total fertility rate (Table 2.15)

Motor vehicles per 1000 population (Table 3.12)

Motor vehicles per kilometre of road (Table 3.12)

Average annual GDP growth (Table 4.1)

Telephone mainlines per 1000 population (Table 5.10)

Daily newspapers per 1000 population (Table 5.11)

Fax machines per 1000 population (Table 5.11)

Internet hosts per 100 000 population (Table 5.11)

Mobile phones per 1000 population (Table 5.11)

Personal computers per 1000 population (Table 5.11)

Radio receivers per 1000 population (Table 5.11)

TV sets per 1000 population (Table 5.11)

World Bank, 1999b. *World Development Report (1999/2000)*. Available: http://www.worldbank.org/wdr/2000/fullreport.html (14 September 1999):

Air passengers carried (Table 18)

Percentage roads paved (Table 18)

World Resources Institute, 1997. *World Resources (1996-97)*. New York: Oxford University Press:

Growth rate of urban population (1990-95) (Table A.1)

Growth rate of rural population (1990-95) (Table A.1)

Appendix B

Reconstruction and Development Indices (RDIs) for South Africa's Nine Provinces: Index Values and Data Sources

RDIs mark I version 1	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Mpuma-langa	North West	Northern Province	Northern Cape	Western Cape
Land reform	65.89	49.95	- 0.00	62.11	92.63	28.94	19.31	100.00	13.53
Housing	-	64.13	39.86	37.32	83.70	72.10	12.32	100.00	81.16
Water	15.38	32.31	76.92	35.38	24.62	20.00	-	100.00	100.00
Sanitation	26.98	26.98	92.06	31.75	26.98	26.98	-	66.67	100.00
Energy and electrification	6.90	17.24	98.28	39.66	17.24	13.79	-	100.00	100.00
Telecommunications	30.91	56.36	96.36	67.27	49.09	34.55	-	45.45	100.00
Transport	58.33	41.67	94.44	100.00	66.67	50.00	77.78	-	91.67
Clean and healthy environment	73.91	39.13	8.70	-	8.70	82.61	78.26	100.00	69.57
Nutrition	71.78	79.14	100.00	93.87	90.18	54.60	64.42	-	54.60
Health care	35.14	100.00	100.00	81.08	45.95	78.38	-	43.24	100.00
Social security and welfare	57.14	67.86	60.71	96.43	53.57	85.71	85.71	-	100.00
Personal safety	40.00	51.43	91.43	65.71	14.29	14.29	88.57	-	100.00
Education and training	93.22	42.37	35.59	100.00	28.81	91.53	86.44	-	32.20
Sport and recreation	-	77.50	80.00	35.00	37.50	17.50	-	40.00	100.00
Youth development	100.00	46.45	64.52	-	7.10	24.52	92.26	7.74	2.58
Economic growth	30.91	-	12.73	30.91	67.27	25.45	100.00	10.91	34.55
Employment	-	67.11	89.91	36.40	35.09	37.72	1.75	62.28	100.00
Distribution	13.89	23.15	100.00	38.58	24.69	38.58	-	70.99	99.85
Democratisation	50.64	40.27	15.69	0.15	36.33	-	3.37	100.00	73.07
Basic Needs RDI	40.20	52.18	71.56	59.21	47.80	46.83	35.53	54.61	84.21
Human Resource RDI	64.41	55.44	60.04	45.00	24.47	44.51	59.57	15.91	44.93
Economic RDI	14.93	30.08	67.55	35.30	42.35	33.92	33.92	48.06	78.13
Democratisation RDI	50.64	40.27	15.69	0.15	36.33	-	3.37	100.00	73.07
Composite RDI (4 components)	42.54	44.49	53.71	34.92	37.74	31.32	33.10	54.65	70.08
Composite RDI (19 components)	40.58	48.58	66.17	50.09	42.65	41.96	37.38	49.86	76.46

RDIs mark I version 2	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Mpuma-langa	North West	Northern Province	Northern Cape	Western Cape
Land reform	92.28	87.17	0.00	91.19	98.58	77.13	69.75	100.00	63.32
Housing	0.04	76.11	54.76	52.17	90.03	82.07	21.10	100.00	88.36
Water	35.49	57.17	89.27	60.23	48.52	42.45	0.03	100.00	100.00
Sanitation	49.98	49.98	96.47	55.29	49.98	49.98	-	82.97	100.00
Energy and electrification	13.99	30.75	99.21	57.25	30.75	25.60	0.04	100.00	99.97
Telecommunications	43.45	68.43	97.80	77.39	61.95	47.45	0.09	58.53	100.00
Transport	64.62	48.28	95.83	99.99	72.29	56.62	82.06	0.00	93.60
Clean and healthy environment	62.09	27.75	5.48	0.01	5.48	73.09	67.43	99.96	57.04
Nutrition	54.22	63.46	100.04	87.03	80.31	36.65	46.11	- 0.02	36.65
Health care	43.71	100.01	100.01	85.84	54.81	83.69	0.10	52.12	100.01
Social security and welfare	63.56	73.37	66.89	97.25	60.17	88.66	88.66	0.03	99.99
Personal safety	46.80	58.21	93.32	71.54	18.18	18.18	91.02	0.10	99.99
Education and training	95.74	54.89	47.91	100.00	40.41	94.62	91.17	0.11	44.23
Sport and recreation	0.09	83.36	85.34	44.13	46.78	23.91	0.09	49.38	99.94
Youth development	99.67	42.22	60.49	0.02	5.67	21.35	90.71	6.24	1.73
Economic growth	92.61	-	85.56	92.61	97.61	91.26	100.00	83.94	93.37
Employment	- 0.00	57.57	85.30	27.92	26.80	29.06	1.21	52.42	99.85
Distribution	6.69	11.70	99.96	21.25	12.58	21.25	0.00	49.33	99.51
Democratisation	55.45	45.06	18.77	0.77	41.02	0.59	4.60	100.20	76.68
Basic Needs RDI	47.52	61.72	74.92	69.60	55.92	56.80	38.87	57.81	86.58
Human Resource RDI	65.17	60.16	64.58	48.05	30.95	46.62	60.66	18.58	48.63
Economic RDI	33.10	23.09	90.27	47.26	45.66	47.19	33.74	61.90	97.58
Democratisation RDI	55.45	45.06	18.77	0.77	41.02	0.59	4.60	100.20	76.68
Composite RDI (4 components)	50.31	47.51	62.14	41.42	43.39	37.80	34.46	59.62	77.37
Composite RDI (19 components)	48.45	54.50	72.76	59.05	49.57	50.72	39.69	54.49	81.80

RDIs mark I version 3	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Mpuma-langa	North West	Northern Province	Northern Cape	Western Cape
Land reform	44.31	33.33	- 1.06	41.70	62.72	18.86	12.24	67.79	8.26
Housing	8.86	26.56	19.86	19.16	31.96	28.76	12.26	36.46	31.26
Water	17.43	28.43	57.43	30.43	23.43	20.43	7.43	72.43	72.43
Sanitation	25.23	25.23	66.23	28.23	25.23	25.23	8.23	50.23	71.23
Energy and electrification	20.27	26.27	73.27	39.27	26.27	24.27	16.27	74.27	74.27
Telecommunications	42.65	56.65	78.65	62.65	52.65	44.65	25.65	50.65	80.65
Transport	66.39	60.39	79.39	81.39	69.39	63.39	73.39	45.39	78.39
Clean and healthy environment	- 15.32	- 23.32	- 30.32	- 32.32	- 30.32	- 13.32	- 14.32	- 9.32	- 16.32
Nutrition	- 7.20	- 6.00	- 2.60	- 3.60	- 4.20	- 10.00	- 8.40	- 18.90	- 10.00
Health care	44.43	68.43	68.43	61.43	48.43	60.43	31.43	47.43	68.43
Social security and welfare	48.23	51.23	49.23	59.23	47.23	56.23	56.23	32.23	60.23
Personal safety	56.92	60.92	74.92	65.92	47.92	47.92	73.92	42.92	77.92
Education and training	85.85	55.85	51.85	89.85	47.85	84.85	81.85	30.85	49.85
Sport and recreation	32.28	63.28	64.28	46.28	47.28	39.28	32.28	48.28	72.28
Youth development	- 34.19	- 42.49	- 39.69	- 49.69	- 48.59	- 45.89	- 35.39	- 48.49	- 49.29
Economic growth	0.46	- 1.24	- 0.54	0.46	2.46	0.16	4.26	- 0.64	0.66
Employment	- 37.59	- 22.29	- 17.09	- 29.29	- 29.59	- 28.99	- 37.19	- 23.39	- 14.79
Distribution	- 65.99	- 59.99	- 10.19	- 49.99	- 58.99	- 49.99	- 74.99	- 28.99	- 10.29
Democratisation	47.73	45.70	40.89	37.85	44.93	37.82	38.48	57.39	52.12
Basic Needs RDI	29.35	34.01	44.45	37.79	33.39	30.57	24.53	40.97	49.73
Human Resource RDI	27.98	25.55	25.48	28.82	15.52	26.08	26.25	10.22	24.28
Economic RDI	- 34.38	- 27.84	- 9.28	- 26.28	- 28.71	- 26.28	- 35.98	- 17.68	- 8.14
Democratisation RDI	47.73	45.70	40.89	37.85	44.93	37.82	38.48	57.39	52.12
Composite RDI (4 components)	17.67	19.35	25.39	19.54	16.28	17.05	13.32	22.72	29.50
Composite RDI (19 components)	20.04	23.52	32.79	26.26	21.37	21.27	15.98	27.72	36.70

RDIs mark I version 4	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Mpuma-langa	North West	Northern Province	Northern Cape	Western Cape
Land reform	179.72	136.53	1.26	169.48	252.13	79.63	53.55	272.09	37.90
Housing	46.06	115.75	89.37	86.61	137.01	124.41	59.45	154.72	134.25
Water	51.35	81.08	159.46	86.49	67.57	59.46	24.32	200.00	200.00
Sanitation	67.50	67.50	170.00	75.00	67.50	67.50	25.00	130.00	182.50
Energy and electrification	46.81	59.57	159.57	87.23	59.57	55.32	38.30	161.70	161.70
Telecommunications	74.19	96.77	132.26	106.45	90.32	77.42	46.77	87.10	135.48
Transport	91.25	83.75	107.50	110.00	95.00	87.50	100.00	65.00	106.25
Clean and healthy environment	130.77	100.00	73.08	65.38	73.08	138.46	134.62	153.85	126.92
Nutrition	97.78	111.11	148.89	137.78	131.11	66.67	84.44	- 32.22	66.67
Health care	79.03	117.74	117.74	106.45	85.48	104.84	58.06	83.87	117.74
Social security and welfare	91.67	96.67	93.33	110.00	90.00	105.00	105.00	65.00	111.67
Personal safety	93.94	100.00	121.21	107.58	80.30	80.30	119.70	72.73	125.76
Education and training	125.35	83.10	77.46	130.99	71.83	123.94	119.72	47.89	74.65
Sport and recreation	67.92	126.42	128.30	94.34	96.23	81.13	67.92	98.11	143.40
Youth development	116.89	100.78	106.21	86.80	88.93	94.17	114.56	89.13	87.57
Economic growth	127.27	- 27.27	36.36	127.27	309.09	100.00	472.73	27.27	145.45
Employment	58.70	110.92	128.67	87.03	86.01	88.05	60.07	107.17	136.52
Distribution	52.17	65.22	173.48	86.96	67.39	86.96	32.61	132.61	173.26
Democratisation	113.55	109.39	99.53	93.30	107.81	93.24	94.59	133.35	122.55
Basic Needs RDI	87.51	97.21	114.47	104.04	102.42	87.21	70.77	117.82	125.57
Human Resource RDI	103.39	103.43	103.99	104.04	85.66	99.75	100.74	78.38	101.87
Economic RDI	79.38	49.62	112.84	100.42	154.16	91.67	188.47	89.02	151.74
Democratisation RDI	113.55	109.39	99.53	93.30	107.81	93.24	94.59	133.35	122.55
Composite RDI (4 components)	95.96	89.91	107.71	100.45	112.51	92.97	113.64	104.64	125.43
Composite RDI (19 components)	90.10	91.32	111.77	102.90	108.23	90.21	95.34	107.86	125.80

RDIs mark II version 1	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Mpuma-langa	North West	Northern Province	Northern Cape	Western Cape
Land reform	65.89	49.95	- 0.00	62.11	92.63	28.94	19.31	100.00	13.53
Housing	-	64.13	39.86	37.32	83.70	72.10	12.32	100.00	81.16
Water	11.77	38.91	85.15	37.54	33.28	21.84	-	54.95	100.00
Sanitation	-	76.32	100.00	52.26	76.69	85.34	29.70	69.17	89.10
Energy and electrification	-	50.00	90.00	28.00	44.00	18.00	4.00	82.00	100.00
Telecommunications	17.12	32.36	79.54	40.92	22.55	19.42	-	48.85	100.00
Transport	58.33	41.67	94.44	100.00	66.67	50.00	77.78	-	91.67
Clean and healthy environment	71.56	-	10.43	70.14	49.29	18.48	100.00	56.87	44.55
Nutrition	71.78	79.14	100.00	93.87	90.18	54.60	64.42	-	54.60
Health care	7.69	23.08	84.62	23.08	7.69	-	-	15.38	100.00
Social security and welfare	57.14	67.86	60.71	96.43	53.57	85.71	85.71	-	100.00
Personal safety	56.12	95.61	96.45	47.23	39.17	65.60	-	100.00	73.01
Education and training	86.88	84.60	-	65.21	57.22	42.97	73.19	100.00	34.41
Sport and recreation	-	77.50	80.00	35.00	37.50	17.50	-	40.00	100.00
Youth development	100.00	46.45	64.52	-	7.10	24.52	92.26	7.74	2.58
Economic growth	30.91	-	12.73	30.91	67.27	25.45	100.00	10.91	34.55
Employment	-	60.46	66.34	30.72	50.98	34.64	8.17	65.36	100.00
Distribution	37.55	10.31	54.47	43.19	47.08	93.77	-	41.44	100.00
Democratisation	50.64	40.27	15.69	0.15	36.33	-	3.37	100.00	73.07
Basic Needs RDI	34.78	51.58	70.10	57.41	54.95	43.34	32.77	52.27	78.97
Human Resource RDI	62.29	69.52	48.17	33.40	33.94	28.33	55.15	49.25	45.66
Economic RDI	22.82	23.59	44.51	34.94	55.11	51.29	36.06	39.24	78.18
Democratisation RDI	50.64	40.27	15.69	0.15	36.33	-	3.37	100.00	73.07
Composite RDI (4 components)	42.63	46.24	44.62	31.48	45.08	30.74	31.84	60.19	68.97
Composite RDI (19 components)	38.07	49.40	59.73	47.06	50.68	39.94	35.28	52.25	73.27

RDIs mark II version 2	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Mpuma-langa	North West	Northern Province	Northern Cape	Western Cape
Land reform	92.28	87.17	0.00	91.19	98.58	77.13	69.75	100.00	63.32
Housing	0.04	76.11	54.76	52.17	90.03	82.07	21.10	100.00	88.36
Water	22.54	56.64	91.72	55.27	50.82	37.24	0.07	70.93	100.00
Sanitation	0.01	48.74	100.01	26.47	49.20	61.71	12.91	40.77	68.63
Energy and electrification	0.13	61.20	93.29	38.43	55.45	26.25	6.50	87.59	99.99
Telecommunications	37.36	56.66	91.26	64.96	45.10	40.78	0.01	71.59	100.00
Transport	64.47	48.17	95.62	99.99	72.13	56.50	81.88	0.00	93.40
Clean and healthy environment	52.08	0.00	5.30	50.45	30.60	9.74	99.97	37.09	26.88
Nutrition	54.22	63.46	100.04	87.03	80.31	36.65	46.11	- 0.02	36.65
Health care	20.13	45.48	92.91	45.48	20.13	0.00	0.00	34.41	100.00
Social security and welfare	63.56	73.37	66.89	97.25	60.17	88.66	88.66	0.03	99.99
Personal safety	45.70	93.16	94.41	37.17	29.93	55.51	0.13	99.81	63.77
Education and training	78.69	75.46	0.02	51.83	43.63	30.61	60.83	99.87	23.61
Sport and recreation	0.09	83.36	85.34	44.13	46.78	23.91	0.09	49.38	100.00
Youth development	99.67	42.52	60.69	0.02	6.16	21.75	90.76	6.73	2.24
Economic growth	92.61	-	85.56	92.61	97.61	91.26	100.00	83.94	93.37
Employment	0.06	48.13	54.32	21.62	38.89	24.74	5.36	53.26	99.80
Distribution	23.98	5.75	38.10	28.40	31.60	87.71	0.05	27.00	99.85
Democratisation	55.17	44.71	18.24	0.13	40.64	0.01	3.98	100.01	76.53
Basic Needs RDI	37.71	59.18	73.85	62.16	56.87	47.69	35.59	53.52	78.42
Human Resource RDI	59.48	67.11	48.68	31.99	32.19	25.43	50.56	52.00	41.95
Economic RDI	38.89	17.96	59.33	47.54	56.04	67.90	35.13	54.74	97.67
Democratisation RDI	55.17	44.71	18.24	0.13	40.64	0.01	3.98	100.01	76.53
Composite RDI (4 components)	47.81	47.24	50.03	35.46	46.43	35.26	31.32	65.06	73.64
Composite RDI (19 components)	42.25	53.16	64.66	51.82	51.99	44.85	36.22	55.91	75.60

RDIs mark II version 3	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Mpuma-langa	North West	Northern Province	Northern Cape	Western Cape
Land reform	44.31	33.33	-1.06	41.70	62.72	18.86	12.24	67.79	8.26
Housing	8.86	26.56	19.86	19.16	31.96	28.76	12.26	36.46	31.26
Water	22.47	38.37	65.47	37.57	35.07	28.37	15.57	47.77	74.17
Sanitation	-27.68	-7.38	-1.08	-13.78	-7.28	-4.98	-19.78	-9.28	-3.98
Energy and electrification	29.99	54.99	74.99	43.99	51.99	38.99	31.99	70.99	70.99
Telecommunications	13.95	21.25	43.85	25.35	16.55	15.05	5.75	29.15	53.65
Transport	66.39	60.39	79.39	81.39	69.39	63.39	73.39	45.39	78.39
Clean and healthy environment	-8.54	-23.64	-21.44	-8.84	-13.24	-19.74	-2.54	-11.64	-14.24
Nutrition	-7.20	-6.00	-2.60	-3.60	-4.20	-10.00	-8.40	-18.90	-10.00
Health care	-0.90	-0.70	0.10	-0.70	-0.90	-1.00	-1.00	-0.80	0.30
Social security and welfare	48.23	51.23	49.23	59.23	47.23	56.23	56.23	32.23	60.23
Personal safety	-364.20	-244.60	-242.06	-391.14	-415.53	-335.48	-534.18	-231.30	-313.06
Education and training	-0.44	-0.56	-5.01	-1.58	-2.00	-2.75	-1.16	0.25	-3.20
Sport and recreation	32.28	63.28	64.28	46.28	47.28	39.28	32.28	48.28	72.28
Youth development	-34.19	-42.49	-39.69	-49.69	-48.59	-45.89	-35.39	-48.49	-49.29
Economic growth	0.46	-1.24	-0.54	0.46	2.46	0.16	4.26	-0.64	0.66
Employment	-44.92	-26.42	-24.62	-35.52	-29.32	-34.32	-42.42	-24.92	-14.32
Distribution	-47.36	-61.36	-38.66	-44.46	-42.46	-18.46	-66.66	-45.36	-15.26
Democratisation	47.73	45.70	40.89	37.85	44.93	37.82	38.48	57.39	52.12
Basic Needs RDI	-14.53	0.32	5.39	-9.14	-10.52	-10.13	-29.87	4.82	3.75
Human Resource RDI	-0.78	6.75	6.53	-1.66	-1.10	-3.12	-1.42	0.02	6.60
Economic RDI	-30.61	-29.67	-21.27	-26.51	-23.11	-17.54	-34.94	-23.64	-9.64
Democratisation RDI	47.73	45.70	40.89	37.85	44.93	37.82	38.48	57.39	52.12
Composite RDI (4 components)	0.45	5.77	7.88	0.14	2.55	1.76	-6.94	9.65	13.21
Composite RDI (19 components)	-11.62	-1.01	3.23	-8.23	-8.10	-7.67	-22.58	2.34	4.63

RDIs mark II version 4	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Mpuma-langa	North West	Northern Province	Northern Cape	Western Cape
Land reform	179.72	136.53	1.26	169.48	252.13	79.63	53.55	272.09	37.90
Housing	46.06	115.75	89.37	86.61	137.01	124.41	59.45	154.72	134.25
Water	55.26	90.83	151.45	89.04	83.45	68.46	39.82	111.86	170.92
Sanitation	- 34.68	129.03	179.84	77.42	129.84	148.39	29.03	113.71	156.45
Energy and electrification	60.00	105.45	141.82	85.45	100.00	76.36	63.64	134.55	150.91
Telecommunications	54.51	79.86	158.33	94.10	63.54	58.33	26.04	107.29	192.36
Transport	91.25	83.75	107.50	110.00	95.00	87.50	100.00	65.00	106.25
Clean and healthy environment	131.88	37.50	51.25	130.00	102.50	61.88	169.38	112.50	96.25
Nutrition	97.78	111.11	148.89	137.78	131.11	66.67	84.44	- 32.22	66.67
Health care	50.00	83.33	216.67	83.33	50.00	33.33	33.33	66.67	250.00
Social security and welfare	91.67	96.67	93.33	110.00	90.00	105.00	105.00	65.00	111.67
Personal safety	90.52	126.13	126.89	82.50	75.24	99.07	39.91	130.09	105.75
Education and training	126.49	123.84	25.61	101.32	92.05	75.50	110.60	141.72	65.56
Sport and recreation	67.92	126.42	128.30	94.34	96.23	81.13	67.92	98.11	143.40
Youth development	116.89	100.78	106.21	86.80	88.93	94.17	114.56	89.13	87.57
Economic growth	127.27	- 27.27	36.36	127.27	309.09	100.00	472.73	27.27	145.45
Employment	56.93	111.50	116.81	84.66	102.95	88.20	64.31	115.93	147.20
Distribution	90.59	59.96	109.63	96.94	101.31	153.83	48.36	94.97	160.83
Democratisation	113.55	109.39	99.53	93.30	107.81	93.24	94.59	133.35	122.55
Basic Needs RDI	76.16	99.66	122.22	104.64	109.15	84.09	66.97	108.44	131.61
Human Resource RDI	103.77	117.01	86.71	94.15	92.40	83.60	97.69	109.65	98.84
Economic RDI	91.60	48.06	87.60	102.96	171.12	114.01	195.13	79.39	151.16
Democratisation RDI	113.55	109.39	99.53	93.30	107.81	93.24	94.59	133.35	122.55
Composite RDI (4 components)	96.27	93.53	99.01	98.76	120.12	93.73	113.60	107.71	126.04
Composite RDI (19 components)	84.93	94.77	109.95	102.12	116.22	89.22	93.51	105.35	129.05

Index values: Calculations and notes

Version 1:

Index = (indicator value for province X - minimum indicator value) / (maximum indicator value - minimum indicator value) x 100

Version 2:

Index = [log (indicator value for province X) - log (minimum indicator value)] / [log (maximum indicator value) - log (minimum indicator value)] x 100

Version 3:

Z = (indicator value for province X - mean value for indicator) / standard deviation for indicator

Version 4:

Index = (indicator value for province X / national indicator value) x 100

Note: Due to rounding the minimum and maximum index values are not always equal to 0 or 100.

Data sources: Reconstruction and Development Indices (RDIs)

Land reform:

Mark I and II indices: Actual transfers of land as percentage of approved land claims (1994-98), South African Institute of Race Relations (SAIRR), 1998b. *South Africa Survey 1997/98*. Pretoria: South African Institute of Race Relations (page 325-326).

Housing:

Mark I and II indices: Percentage of 1994 housing programme targets achieved (1994-98), Development Bank of Southern Africa, 1998. *Development Report 1998. Infrastructure: A Foundation for Development*. Midrand: Development Bank of Southern Africa (Table 4.2).

Water:

Mark I indices: Percentage of households with access to running water in dwelling, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H10).

Mark II indices: Percentage of households with tap water in dwelling, Statistics South Africa, 1998. *1996 Census in Brief*. Pretoria: Statistics South Africa (Figure 3-9).

Sanitation:

Mark I indices: Percentage of households with access to full waterborne sanitation in dwelling, South African Advertising Research Foundation, 1996. *SAtoZ: The*

Decision Maker's Encyclopaedia of the South African Consumer Market. Rivonia: South African Advertising Research Foundation (Table H10).

Mark II indices: Percentage of household without access to any sanitation facilities, Statistics South Africa, 1998. *1996 Census in Brief*. Pretoria: Statistics South Africa (Figure 3-13).

Energy and electrification:

Mark I indices: Percentage of households with access to Eskom or local municipality electricity grid, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H10).

Mark II indices: Percentage houses with electricity, Development Bank of Southern Africa, 1998. *Development Report 1998. Infrastructure: A Foundation for Development*. Midrand: Development Bank of Southern Africa (Table 4.2).

Telecommunications:

Mark I indices: Percentage of households with access to a public phone, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H16).

Mark II indices: Percentage of households with telephone in dwelling or in possession of cellular phone, Statistics South Africa, 1998. *1996 Census in Brief*. Pretoria: Statistics South Africa (Figure 3-11).

Transport:

Mark I and II indices: Percentage of households with access to a taxi rank or bus stop, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H16).

Clean and healthy environment:

Mark I indices: Percentage of households living in shacks or backyard rooms, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H7).

Mark II indices: Percentage of households living in informal dwellings, Statistics South Africa, 1998. *1996 Census in Brief*. Pretoria: Statistics South Africa (Figure 3.2).

Nutrition:

Mark I and II indices: Percentage underweight children in grades 3 and 4, Health Systems Trust, 1999. *South African Health Review (1999)*. Available: http://www.hst.org.za (2 June 2000) (page 402).

Health care:

Mark I indices: Percentage of households with access to a clinic or hospital, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H16).

Mark II indices: Medical officials per 1000 population, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Tables G2 to G10).

Social security and welfare:

Mark I and II indices: Percentage of households with access to a pension pay point, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H16).

Personal safety:

Mark I indices: Percentage of households with access to a police station, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H16).

Mark II indices: Population per police officer, South African Institute of Race Relations (SAIRR), 1998b. *South Africa Survey 1997/98*. Pretoria: South African Institute of Race Relations (page 60).

Education and training:

Mark I indices: Percentage of households with access to a high school, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H16).

Mark II indices: Percentage of schools platooning, South African Institute of Race Relations (SAIRR), 1998b. *South Africa Survey 1997/98*. Pretoria: South African Institute of Race Relations (page 145-146).

Sport and recreation:

Mark I and II indices: Percentage of households with access to a sportsfield or facilities, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation (Table H16).

Youth development:

Mark I and II indices: Youth unemployment as percentage of total unemployment, Development Bank of Southern Africa, 1998. *Development Report 1998. Infrastructure: A Foundation for Development*. Midrand: Development Bank of Southern Africa (Table 5.2).

Economic growth:

Mark I and II indices: Average annual growth in real GGP (1980-94), Development Bank of Southern Africa, 1998. *Development Report 1998. Infrastructure: A Foundation for Development*. Midrand: Development Bank of Southern Africa (Table 2.2).

Employment:

Mark I indices: Unemployment rate (1995), Development Bank of Southern Africa, 1998. *Development Report 1998. Infrastructure: A Foundation for Development.* Midrand: Development Bank of Southern Africa (Table 5.2).

Mark II indices: Unemployment rate (1996), Statistics South Africa, 1998. *1996 Census in Brief.* Pretoria: Statistics South Africa (Figure 2.30).

Distribution:

Mark I indices: Percentage of population falling into Living Standard Measure (LSM) categories 1-3, South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market.* Rivonia: South African Advertising Research Foundation (Tables G2 to G10).

Mark II indices: Percentage of individuals living in poverty, Development Bank of Southern Africa, 1998. *Development Report 1998. Infrastructure: A Foundation for Development.* Midrand: Development Bank of Southern Africa (Table 5.2).

Democratisation:

Mark I and II indices: Election Task Group, 1996. *Local Government Elections in South Africa.* Cape Town: ABC Press (Appendix 2).

Data sources: External validators and other indicators

Development Bank of Southern Africa, 1998. *Development Report 1998. Infrastructure: A Foundation for Development.* Midrand: Development Bank of Southern Africa:

Age dependency ratio (1995) (Table 5.2)

Average annual household income by head of household (1996) (Table 5.2)

Gini coefficient (1993) (Table 5.2)

Human Development Index (HDI) (1991) (Table 5.2)

Functional level of urbanisation (1994) (Table 5.2)

Life expectancy (1994) (Table 5.2)

Percentage population urbanised (1995) (Table 5.2)

Personal income per capita (1994) (pages 254-271)

Poverty gap measure (1993) (Table 5.2)

Real GGP per capita (1994) (pages 254-271)

Total fertility rate (1994-96) (Table 5.2)

Election Task Group, 1996. *Local Government Elections in South Africa.* Cape Town: ABC Press:

Highest percentage vote to a single party in local government elections (1995/96) (Appendix 2)

South African Advertising Research Foundation, 1996. *SAtoZ: The Decision Maker's Encyclopaedia of the South African Consumer Market*. Rivonia: South African Advertising Research Foundation:

Average annual per capita income (1995) (Tables G2 to G10)

Average monthly household income (1995) (Tables G2 to G10)

Average rating of quality of life (1995) (Tables G2 to G10)

Highest percentage vote to a single party in national elections (1994) (Tables G2 to G10)

Percentage single parent households with children (Table H3)

Highest percentage of population that shares same language (Table H4)

South African Institute of Race Relations (SAIRR), 1998a. Selected Provincial Crime Ratings. *Fast Facts* 9/98: 9:

Life expectancy (1991-96)

Total fertility rate (1991-96)

South African Institute of Race Relations (SAIRR), 1998b. *South Africa Survey 1997/98*. Pretoria: South African Institute of Race Relations:

Average percentage passrate in senior certificate exam (1994-97) (page 125)

Percentage women attending antenatal clinics who are HIV+ (1994-97) (page 189)

Population dependency burden (1996) (page 101)

South African Police Service, 1998. *Quarterly Crime Report 2/98*. Pretoria: South African Police Service:

Reported murders per 100 000 population (1995 and 1996) (Annexure A)

Reported rapes per 100 000 population (1995 and 1996) (Annexure A)

Reported drug related crimes per 100 000 population (1995 and 1996) (Annexure A)

Statistics South Africa, 1998. *1996 Census in Brief*. Pretoria: Statistics South Africa:

Percentage population aged twenty years and older with at least matric (Figure 2.25)

Percentage population urbanised (1996) (Figure 2.4)

Population dependency burden (1996) (Figure 2.6)

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