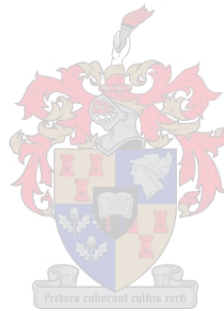# Saving and wealth in the context of extreme inequality

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Dissertation presented for the degree of Doctor of Philosophy
in the Faculty of Economics and Management Sciences
at Stellenbosch University

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Stellenbosch, South Africa
December 2017

Declaration:

By submitting this dissertation electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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Abstract

Saving and wealth are important determinants for the wellbeing of individual households and the development of whole economies. Unlike flow variables like income and consumption, however, balance sheet data on wealth have been collected only recently. Among the developing countries, South Africa has been the first to publish official household sector balance sheets, one of the first to conduct large-scale household wealth surveys, and one of the first to give researchers access to anonymised tax records. In this dissertation, I use these new data to study saving and wealth in the context of a developing country with extreme inequality.

The first chapter focuses on saving and studies how the balance sheet concept of saving (the change in wealth between two periods of time) differs from the flow concept (the residual between income and expenditure). It finds that household wealth has grown much more strongly over the last decades than would have been implied by the flow measure of saving alone, owing to sizeable capital gains on existing asset holdings. The second chapter puts this finding into an international perspective, tying it to the literature that developed from Thomas Piketty's influential *Capital in the Twenty-First Century* (2014). While Piketty finds that capital gains contributed to a strong increase in rich-world wealth-income ratios between 1970 and 2010, I find that a similar trend started only in the late 1990s in South Africa. I also find that this trend was generated almost entirely through corporate savings and the strong performance of the stock market, which contrasts with the importance of household savings and house price developments in Piketty's sample of advanced economies.

Since a large share of stocks are held through domestic pension and retirement funds, the appreciation of financial assets has benefited millions of South Africans. Yet, it is very likely that the boom has enriched a small

number of individual shareholders disproportionately. The third chapter thus takes a distributional perspective on wealth, using two distinct data sources to estimate the degree of inequality in the country. I compare a survey with 18,820 respondents in 6,450 households to a novel dataset of almost 1.2 million personal income tax records. Despite the differences in the coverage of each source, I find robust evidence that wealth is much more unequally distributed than income. Ten percent of the population own more than 50–95 percent of all wealth, compared to a top labour income share of "only" 45 percent. While an income or consumption perspective thus allows us to speak of a South African middle class, the balance sheet data suggest that a propertied middle class is still largely non-existent.

Keywords: Saving; wealth; asset accumulation; income and wealth distribution; inequality; data and measurement; South Africa

Opsomming

Besparing en rykdom is belangrike bepalers van die welstand van individuele huishoudings sowel as die ontwikkeling van ekonomieë in die geheel. Tog, in teenstelling met vloeiveranderlikes soos inkomste en verbruik, word balansstaatdata oor rykdom eers sedert betreklik onlangs ingesamel. Suid-Afrika was een van die eerste ontwikkelende lande wat amptelike balansstate vir die huishoudelike sektor gepubliseer, grootskaalse huishoudelike welvaartopnames gedoen, en navorsers toegang tot naamlose belastingrekords gegee het.

In hierdie tesis gebruik ek hierdie nuwe data om besparing en rykdom in die konteks van 'n ontwikkelende land met uiterste ongelykheid te bestudeer.

Die eerste hoofstuk konsentreer op besparing, en bestudeer die verskille tussen die balansstaatkonsep van besparing (die verandering in rykdom van een tydperk tot 'n volgende) en die vloeikonsep (die verskil tussen inkomste en uitgawes). Dit bring aan die lig dat huishoudelike rykdom oor die afgelope dekades veel sterker gegroei het as wat die vloeimaatstaf van besparing op sy eie sou aandui, as gevolg van beduidende kapitaalwinste op bestaande bates.

Die tweede hoofstuk beskou hierdie bevinding uit 'n internasionale hoek deur dit te koppel aan die literatuur wat uit Thomas Piketty se gesaghebbende *Capital in the Twenty-First Century* (2014) ontwikkel het. Terwyl Piketty vasgestel het dat kapitaalwinste tussen 1970 en 2010 tot 'n sterk toename in rykdom-inkomsteverhoudings in die welvarende wreld gelei het, bevind ek dat 'n soortgelyke tendens eers laat in die 1990's in Suid-Afrika posgevat het. Ek bevind ook dat hierdie tendens byna geheel en al deur korporatiewe besparing en die sterk prestasie van die aandelemark tot stand gekom het, in teenstelling met die belang van huishoudelike besparing en huisprysontwikkelings in Piketty se steekproef van gevorderde ekonomieë.

Aangesien binnelandse pensioen- en aftreefondse oor 'n groot aandeelhouding beskik, het miljoene Suid-Afrikaners baat gevind by die waardevermeerdering van finansiële bates. Tog het di voorspoedgolf heel waarskynlik 'n klein getal individuele aandeelhouers buite verhouding verryk. Die derde hoofstuk beskou rykdom dus uit 'n verdelingsoogpunt deur van twee verskillende databronne gebruik te maak om die mate van ongelykheid in die land te bepaal. Ek vergelyk 'n opname van ongeveer 18 820 respondente in 6 450 huishoudings met 'n nuwe datastel van bykans 1,2 miljoen persoonlike inkomstebelastingrekords. Hoewel die omvang en dekking van die databronne verskil, kom ek af op robuuste bewyse dat rykdom ongelyker verdeel is as inkomste. Tien persent van die bevolking besit meer as 90-95 persent van alle rykdom, vergeleke met 'n topinkomste-aandeel van "slegs" 45 persent. Hoewel 'n mens dus volgens 'n inkomste- of verbruiksperspektief van 'n Suid-Afrikaanse middelklas kan praat, dui die balansstaatdata daarop dat 'n middelklas van eiendomsbesitters steeds grotendeels ontbreek.

Acknowledgements

Working on this thesis has been an enriching and often enjoyable experience, and I owe my gratitude to the people who accompanied and supported me along the way.

Stan du Plessis, Dieter von Fintel and Monique Reid guided me through the research process. Stan taught me that the most complicated questions were not always the most relevant ones, and challenged me to communicate my answers in a way that they would be understood. Dieter passed on to me the economist's toolkit, and listened to my occasional frustrations with exceptional patience and empathy. Our joint meetings were intellectually stimulating and fun, and I always came out a little bit wiser and a lot more motivated than before.

Besides my supervisors, a number of South African economists contributed to my work. Philippe Burger and Gavin Keeton gave thoughtful feedback on my first two chapters; Elizabeth Gavin, Ingrid Woolard, Murray Leibbrandt and Rulof Burger gave valuable advice on the third. The research groups that Philippe, Murray and Ingrid lead—*Economic Research Southern Africa (ERSA)* and the *Research Project on Employment, Income Distribution and Inclusive Growth (REDI3x3)*—also helped me with research grants, data access and opportunities to publish my chapters as working papers, for which I am grateful.

Stellenbosch is a wonderful place to live and study, but can at times feel somewhat isolated from the wider academic community. I am therefore grateful to Thomas Piketty, Gabriel Zucman and Facundo Alvaredo, who lead the research agenda on wealth and inequality on a global level and have nevertheless been open to engage with me on my research. Their interest in my work was immensely motivating, and I am proud to have contributed a small piece to the *World Wealth and Income Database* project.

I would not have embarked on this adventure without the encouragement of my colleagues at McKinsey & Company (and the Firm's support of my rather unorthodox educational leave) or the assistance from the *Graduate School of Economics and Management Sciences* at Stellenbosch University. I am also grateful to Jaco Franken for his guidance through the bureaucratic jungle, and to Abel, Chris, Izel, Laurie, Kholekhile, Mike, Nicola and Spencer for making my days in the lab much more fun.

To not yield to undue emotionalism, I keep my personal acknowledgements short. My parents passed on their intellectual curiosity and industriousness to their daughters, and my sister Clara—soon a PhD herself—has become my staunchest ally and closest friend. Andro not only made me uncountable cups of tea when the thesis wasn't going too well, but also made these two years in South Africa some of the best of my life.

Thank you.

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Introduction

When I started to investigate potential research topics at the beginning of 2015, the issue of household saving caught my attention. I had just moved to South Africa from central Europe, where economists were growing increasingly worried about the high savings rates of the household sector. Even after central banks had lowered interest rates to near zero, household spending remained insufficient to support the recovery after the financial crisis, and concerns about a secular stagnation became more prominent (see, e.g. Baldwin and Teulings, 2014).

In South Africa, the tables are turned: concerns about saving exist for the opposite reason. Household savings rates had just reached historic lows of close to zero, raising fears that citizens would be vulnerable to unexpected losses or expenses and would struggle to maintain their living standards during retirement. The low propensity to save was also thought to increase South Africa's reliance on foreign capital inflows, increasing the vulnerability of the economy to large current account deficits and skewing the market structure in favour of larger companies (National Planning Commission, 2012). Savings-enhancing policy initiatives such as the introduction of tax-free saving and investment accounts in March 2015 were motivated largely by these concerns.

Given the prominence of the savings debate in South Africa and abroad, it surprised me how little attention was being paid to the specific measure of saving under consideration. Saving is by no means an unequivocally defined concept, and has been subject to vivid academic discussions since the work of Henry Simons (1938), John Hicks (1939), Raymond Goldsmith (1955) and Milton Friedman (1957). The most important distinction made in this literature has been that between the stock and the flow concept of saving: The former views saving as the accumulation of wealth between the beginning

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and end of a period of time and is often considered the theoretically "pure" concept; the latter views saving as the proportion of income that is not spent on consumption within that same period and has come to dominate the empirical work in post-war, pre-crisis macroeconomics.

The two concepts of saving are closely related, of course: In accordance with the logic of double-entry bookkeeping, savings "supplied" through restraint on consumption must be "used" to build up one's assets or pay one's debts. Given that capital gains on existing assets are generally not counted as income, however, the two corresponding empirical measures can still deviate from each other. Such discrepancies are particularly pronounced during prolonged asset price booms, when the flow measure will understate saving and wealth formation relative to the stock perspective (Peach and Steindel, 2000, Perozek and Reinsdorf, 2002).

The discrepancies between stocks and flows are, implicitly, also at the heart of Thomas Piketty's influential work on wealth and income. In *Capital in the Twenty-First Century*, Piketty (2014) shows how prolonged asset price gains in rich countries caused a disproportionate growth in private wealth, from 200–300 percent of national income in 1970 to 400–700 percent in 2010. The observed divergence between wealth and income highlights the importance of considering balance sheet variables in macroeconomic analyses (see also Piketty and Zucman, 2014, 2015).

The fact that flow variables nevertheless remain the dominant source of information on macroeconomic developments is primarily due to the scarcity of reliable stock data for empirical analyses. Whereas flow data have been recorded in the national accounts since the 1940s, stock variables are only gradually being included in official statistics. And even where balance sheet data have been collected, they are not yet commonly used by economists in research and government. Even in South Africa, for instance, recent proposals for higher wealth taxation made more references to Piketty's findings on the major advanced economies than to an analysis of domestic data (Davis Tax Committee, 2015). This is despite the fact that South Africa was the first developing country to compile its own household sector

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balance sheets in 2006, and also despite the fact that Piketty's concern about the growing importance of wealth contrasts at least outwardly with South Africa's original concerns about low saving and scarce capital – the concerns that motivated this dissertation in the first place. By analysing South Africa's balance sheet data, I attempt to weigh these two perspectives against each other and study how the dynamics of saving and wealth formation differ in a country that is characterised by a lower level of development and much higher levels of inequality than the advanced economies, for which Piketty had found that capital had made a comeback.

In the first chapter of this dissertation I explore the topic of saving. Drawing on a large body of literature, I synthesise the main considerations in selecting appropriate measures of saving and apply them to the context of the South African household sector. These analyses confirm that the balance sheet perspective yields a significantly higher and historically much more stable savings rate than the conventional flow concept would imply, owing to a steady increase in the value of existing assets in household portfolios. In the second chapter, I put these findings into an international perspective, replicating Piketty's analyses on wealth-income ratios for South Africa. While Chapter 1 shows that households have (on aggregate) become much wealthier than their saving behaviour would have predicted, Chapter 2 shows that this discrepancy was nevertheless much less pronounced than in the advanced economies. Using Piketty and Zucman's (2014) decomposition methodology, I also investigate which factors contributed to this gap.

Although both chapters take a macroeconomic perspective on saving and wealth, they also raise important distributional questions. Wealth is always more concentrated than incomes, such that any asset revaluations (which explain the difference between the stock and flow measure of saving in Chapter 1 and contribute to the divergence between wealth and incomes in Chapter 2) are likely to benefit a relatively small share of wealthy households disproportionately. Indeed, one reason for the concern about wealth-income ratios is its potential distributional implications. If wealth gains importance over incomes, wealth inequality is likely to play an

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increasing role in shaping overall inequality (Piketty and Zucman, 2014, 2015). To investigate the consequences of the macroeconomic factors on the microeconomic distribution, I focus the third chapter of this dissertation on the distribution of wealth relative to the distribution of incomes.

As with macroeconomic statistics, microeconomic surveys have until recently been limited to measuring flow variables. Even South Africa's relatively large literature on inequality has historically focused on income and consumption only (see, e.g., Alvaredo and Atkinson, 2010, Leibbrandt et al., 2010, Van der Berg, 2010). The second wave of the biannual National Income Dynamics Study (NIDS), conducted in 2010–2011, was the first large-scale household survey to contain a module on wealth. Compared to the income and consumption modules, however, these data were given much less attention – the analyses of Daniels et al. (2014) being the only exception to date.

Wealth surveys indeed suffer from more limitations than income or consumption surveys. A sensitive and complex subject, wealth is often understated considerably in voluntary surveys. Since richer households are generally least likely to reveal their wealth, this understatement is particularly pronounced in the top of the distribution (ECB2013a; Vermeulen, 2014). Seeking more accurate data on top wealth, some researchers have suggested using information from tax records on investment incomes instead (see, e.g., Bricker et al., 2016, Saez and Zucman, 2014). Following their lead, I re-evaluate the NIDS wealth data by comparing them to a previously unpublished dataset of almost 1.2 million personal income tax (PIT) records for the 2010–2011 tax year.[1]

To compare the information from both data sources, I need to make several adjustments. The PIT provides no information on forms of wealth

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[1]Researchers in other countries have estimated the underlying asset holdings by capitalising incomes using average investment returns for each asset class (Saez and Zucman, 2014, Wolff, 1987). Given the low granularity of the PIT records (split into *interest income* and *other investment income* only) and given the additional sensitivity that would be introduced by making assumptions on the returns of the *other financial assets* category, I used investment incomes directly. This simplification equates to the assumption that all asset classes generate the same average returns.

that do not generate taxable investment incomes and does not capture individuals with incomes below the filing thresholds – almost 80 percent of the South African adult population. To match the survey population with the tax filing population, I "scale" PIT by simulating the wealth of non-filers from a bottom-censored lognormal distribution, and "resample" the NIDS by dropping and re-drawing the richest one percent from a top-censored Pareto distribution. I then combine the estimates using the PIT as a measure of inequality for financial assets, the NIDS as a measure of inequality for non-financial assets, and the portfolio distribution in the national accounts to weigh the two. Despite the large differences in the data sources, this procedure yields surprisingly robust and comparable results for the South African wealth and income distribution, and shows that the former is indeed much more unequally distributed than the latter.

Saving and wealth are important determinants for the wellbeing of individual households and the development of whole economies. To assess the level and distribution of these variables we need reliable macro- and micro-level balance sheet data, the collection of which has only recently started. To date, most of our knowledge on household sector balance sheets stems from a small number of advanced economies, studied by Thomas Piketty, Gabriel Zucman and Emmanuel Saez and other researchers in the *World Wealth and Income Database* project (2016). South Africa is the first developing country to include detailed sectoral balance sheets in its national accounts, one of a few countries with a large-scale household wealth survey, and one of only a handful that gives researchers access to anonymised records from tax authorities. The fact that South Africa is a pioneer among middle-income and lower-income countries with regard to collecting such data allows me to add a new perspective to this research – that of a country that is considerably poorer and much more unequal than the countries studied previously in the international literature.

Chapter 1

Concepts and measures of saving: Selected issues for South Africa

South African household savings rates have been declining steadily over the last five decades, raising concerns that the population structurally under-saves. Against the background of new saving-promoting policy initiatives, this thesis chapter asks to what extent the concern is founded, and whether the measurement of saving is really appropriate to guide economic policy. Comparing different macroeconomic concepts and measurements of saving, I show that the measure of saving in the national accounts (the residual between income and expenditure) understates the household savings rate compared to other measures. Specifically, an alternative measure from the balance sheets (the change in wealth) yields a significantly higher and non-declining figure. While households haven't been 'putting aside' their incomes, they have nevertheless grown richer, driven largely by the appreciation of asset valuations. I also examine the impact of taking non-financial saving and wealth into account, and conclude that household sector saving on the aggregate is higher than the national accounts suggest. However, these adjusted measures are most relevant for the upper tail of the income and wealth distribution, raising important distributional concerns.

Keywords: Saving, wealth, measurement and data, national income accounting

1.1 INTRODUCTION

According to the South African national accounts, South African households save worryingly little. Over the last 50 years household savings rates have been on a steady decline, falling from about 10 percent of GDP to almost nothing today. In net terms, household savings rates have been in negative territory for almost a decade, meaning that they are insufficient to replace even depreciating capital, let alone fund new investment (see Figure 1.1). While low levels of saving are widespread across sub-Saharan Africa, the South African situation is in stark contrast to that of the fast-growing Asian economies, where household savings rates in excess of 20 or 30 percent of GDP have often been associated with the successful transition to more dynamic economies (Commission on Growth and Development, 2008).

In response to these trends, the South African government has launched a number of initiatives to enhance the country's savings culture, most recently through the introduction of tax-free savings accounts in March 2015. The government's concern about saving is founded on both micro- and macro-level considerations. At the household level, the low savings rate means that households are vulnerable to unexpected losses or expenses and will face challenges to maintain their living standards during retirement. At the aggregate level, it increases the reliance on foreign capital inflows to finance domestic investments. This is thought to increase the vulnerability to balance of payments shocks and lead to a less competitive market structure, as larger companies have better access to foreign capital than smaller ones (National Planning Commission, 2012).

Given the prominence of the savings debate in South Africa, it is surprising how little attention is currently being paid to understanding what exactly we are measuring as saving in the national accounts. Saving is by no means an unequivocally defined concept, and different measures yield vastly different results. The most commonly used metric (according to which household saving is nil or negative) stems from the national income statements, where saving is calculated as the residual between disposable income and consumption expenditures. If, instead, we look at the balance

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sheet side of the national accounts, we find that real household wealth increased by 5–10 percent of GDP per year over the last decades. Our assessment of the level of household saving also changes when we consider investments in physical, human and environmental capital in addition to pure financial saving and wealth; an adjustment that would add another three to seven percentage points to the conventionally measured savings rate.

Although one specific measure of saving dominates contemporary empirical analyses, it is not clear that it is the one measure that corresponds most closely to the theoretical concepts we try to investigate. Nor would that be true for the alternative measures of savings. Instead, the variety of questions asked by economists and economic policymakers—whether low levels of household savings cause a reliance on foreign capital, to what extent households are prepared to absorb unexpected losses and expenses in the short run or retire in the long run, and whether their savings behaviour corresponds to our models, to name but a few—calls for different concepts and measures of savings.

The insight that there is no universal or correct measure of saving is not new. The literature on concepts and measurement of savings dates back to Henry Simons (1938), John Hicks (1939), Raymond Goldsmith (1955) and Milton Friedman (1957), and was revived in the 1980s and 1990s through a large number of empirical studies on the decline in the American household savings rate (see, for instance, Blades and Sturm, 1982, Boskin, 1991, Browning and Lusardi, 1996, Gale et al., 1999, Perozek and Reinsdorf, 2002). A number of recent studies on different measures of savings have also been conducted by the National Treasury of New Zealand (most recently by Gorman et al., 2013), one of the countries with the lowest household savings rates among the high-income economies.

In this chapter, I attempt to synthesise the main considerations in selecting such appropriate concepts and measures of saving on the basis of the existing literature and to apply them to the South African household sector. In contrast to the contemporary empirical literature on saving in South Africa, I do not seek to answer whether households save too little or

why they do not save more, but try to take a step back and question whether our current measures of saving allow us to adequately address such questions in the first place.

1.2 Two perspectives on saving

1.2.1 *Flow and stock concepts of saving*

There are two conceptual approaches to defining household saving. The first concept views saving as the proportion of resources that accrue to a household over any given period of time, but are not spent on consumption within that same period. This notion of saving corresponds to the common usage of the word *saving* as a verb; such as in "saving money on groceries" or in "saving for retirement". The second concept views saving as the accumulation of wealth—the value of all assets net of all debts—between the beginning and the end of a specific period. In common language, the use of the word *savings* as a noun—such as in "retirement savings" or in "savings for a rainy day"—expresses this view of saving as the accumulation of wealth. The two concepts are of course closely related: In accordance with the logic of double-entry bookkeeping, saving 'supplied' through restraint on consumption must be 'used' to build up one's assets or pay down one's debts.[1] To highlight this relationship, the literature often refers to the two concepts as 'flow' and 'stock' or 'source' and 'use' concepts of saving. Abbreviating them as S_F and S_S, respectively, and letting Y_t denote available resources, C_t consumption expenditure, and W_t wealth in period t, the two concepts can be written as:

$$S_{F,t} = Y_t - C_t \qquad\qquad s_{f,t} = S_{F,t}/GDP_t \qquad (1.1)$$

$$S_{S,t} = W_t - W_{t-1} = \Delta W_{t-1} \qquad\qquad s_{s,t} = S_{S,t}/GDP_t \qquad (1.2)$$

Whilst the stock concept of saving is generally considered to represent the pure theoretical view of saving as defined by Classical economists (see

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[1]Provided, of course, that they are not destroyed or transferred to others instead. Both possible alternative 'uses' for household sector saving—unreciprocated capital transfers to foreigners or other institutional sectors, or the destruction of these funds—are, however, generally small.

Hicks, 1939, Thuronyi, 1990), the flow concept has come to dominate the empirical work in post-war, pre-crisis macroeconomics. This is due not only to the optimistic belief that stocks and flows should be consistent over the long term, but largely also to the fact that balance sheet data have only recently become available in most countries.[2]

If the two concepts of saving yielded similar empirical results, the predominance of the flow concept in empirical analyses would be of little interest. However, it tends to be the case that the accumulation of household wealth exceeds the flow measure of household saving significantly (see, for example, Peach and Steindel (2000), Perozek and Reinsdorf (2002) or Piketty and Zucman (2014)). As Figure 1.2 shows, this is also the case in South Africa: While the flow measure of saving has been declining for five decades towards levels around zero today, the stock measure of saving is much higher and—although much more volatile—exhibits no clear downward trend. While South Africans thus spend almost their entire incomes on the consumption of goods and services, they nevertheless get collectively wealthier – by 6.5 percent of GDP per year on average in real terms. Real household saving as defined in the flow view accounts for less than a quarter of the increase in real household wealth between 1975 and 2014. This discrepancy points to the importance of household wealth dynamics that are not reflected in current-period household saving figures.

1.2.2   Explaining the discrepancy

The discrepancy between the flow and stock measures of saving can be traced to the rules of national accounting (the System of National Accounts, SNA). The flow measure of household saving is calculated from the National Income and Production Accounts (NIPA) as the residual between disposable income and final consumption expenditure. The stock measure can be calculated

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[2]In South Africa, retrospective household balance sheets were first released in 2006. Being based on the work of Aron and Muellbauer (2006), these household sector balance sheets are the first of their kind for a developing country (Aron et al., 2008). Although select sectoral balance sheets statistics have since become available in Korea, Mexico and Turkey, South Africa remains one of at most a few emerging economies with complete household sector balance sheet data today (Stierli et al., 2014).

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Figure 1.1: Savings rates
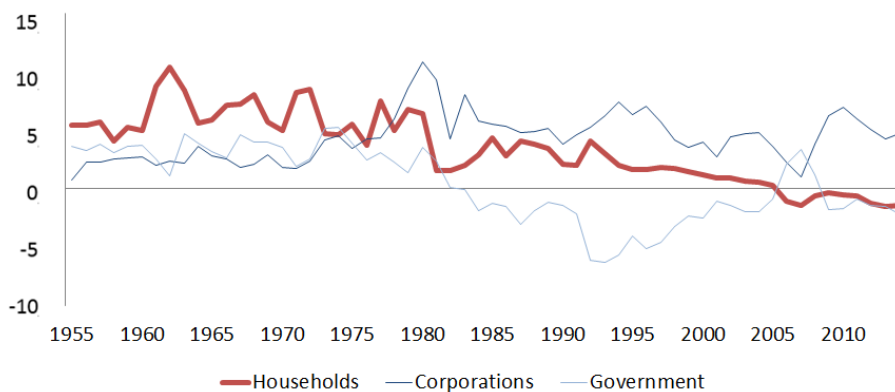
Note: Savings rates by institutional sector, 1955–2014, net, in percent of GDP.

Figure 1.2: Flow and stock measures of saving
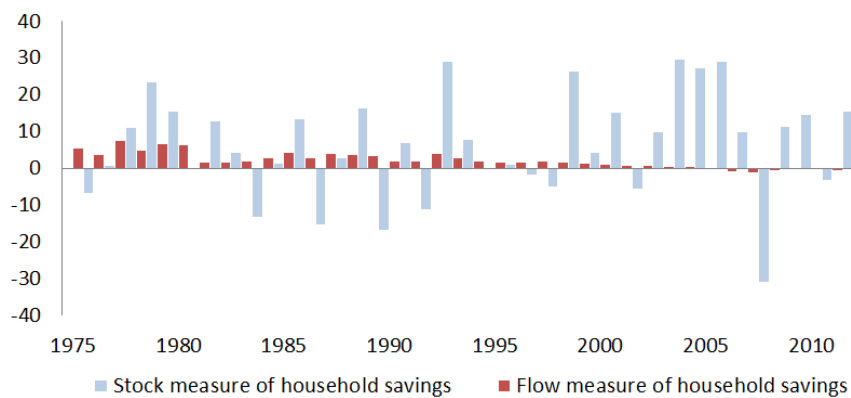
Note: Household sector savings rates, 1975–2014, net, in percent of GDP.

from the balance sheets as the change in wealth from one period to the next. This measure not only includes the 'saving-induced' increase in wealth, but also the change in the value of the existing stock of assets as well as the change in the quantity of assets due to capital transfers (K_t) or other factors such as destruction or discovery (O_t):

$$S_{S,t}^{BS} = S_{F,t}^{NIPA} + \frac{\Delta P_t}{P_{t-1}} \times W_{t-1} + K_t + O_t \qquad (1.3)$$

In a fully integrated system of national accounts, the latter three elements are recorded in the accumulation accounts, which link the NIPA to the balance sheet. While these accumulation accounts are still under construction for South Africa, the figures from other countries suggest that asset revaluations are by far the most important of the three.

Asset revaluations—also referred to as unrealised capital gains or holding gains (or losses)—occur when asset prices increase or decrease over time. In contrast to interest, dividends and rents (which are recorded as incomes in the NIPA and are thus reflected in S_F and S_S alike), asset revaluations are 'paper profits' that affect the balance sheet but not the income statement, thus driving S_S away from S_F. Even when gains materialise as assets are sold at a higher price, they remain unaccounted for in the income statement and excluded from S_F. Since asset revaluations affect primarily real estate and stocks, the importance of the 'revaluation effect' in household wealth dynamics depends on the importance of these asset classes in household portfolios as well as on the development of house and stock prices over time: In periods of booming asset prices, in particular, the wealth dynamics of households with real estate assets and stock portfolios can become largely disconnected from their saving as measured in the NIPA.

1.2.3 Which concept is more relevant?

The large and persistent discrepancy between the flow and the stock measures of saving raises the question which of the two concepts is more relevant. When studying saving in the context of investment volumes and current account

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CHAPTER 1. CONCEPTS AND MEASURES OF SAVING

imbalances—flow variables themselves—the flow measure is generally the appropriate counterpart. When asking to what extent households can weather unemployment or retirement, in contrast, their wealth position (and composition) presumably plays an important role. In studies on household saving behaviour, again, it is important to take an approach that reflects what households themselves have in mind when making spending decisions. The question what households consider as their available resources is, however, by no means unequivocal.

It is clear from equations (1.1) – (1.3) that the two concepts of saving would be equivalent if household resources, Y_t, were defined to include all capital gains or losses, net capital transfers and other changes in the volume of assets in addition to what the SNA currently defines as adjusted disposable income.[3] This would be equivalent to defining income as the sum of an individual's consumption expenditure on the one hand and the change in their wealth on the other – a widely accepted theoretical concept referred to as 'Haig-Simons income' in reference to the work of Robert Haig and Henry Simons (Thuronyi, 1990). It would also reflect John Hicks' idea that *"the purpose of income calculations in practical affairs is to give people an indication of the amount which they can consume without impoverishing themselves"* (Hicks, 1946, p.172), i.e. the amount that they can spend without reducing their wealth position.

The Haig-Simons view of income (and thus the stock concept of saving) is consistent with a world in which households are acutely aware of their net worth and adjust their spending accordingly. If the value of their retirement fund rises significantly due to a prolonged stock market boom, for instance, they might find it less pressing to add to these funds by continuing to forgo current consumption. The definition of income in the

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[3]The definition of disposable income in the NIPA consists of labour incomes (wages, salaries and social security contributions) and capital incomes (interest, dividends, rents, and investment income attributable to insurance policyholders) net of all current transfers (taxes, net social contributions/benefits, other current transfers), with an adjustment made for the change in household pension entitlements. This adjustment in the 'use of disposable income account' reflects the fact that current contributions can deviate from current benefits and translate into future claims or liabilities of the household sector on the financial sector.

SNA (and thus the flow measure of saving), in contrast, reflects a view in which households are somewhat more myopic or conservative – taking their spending decisions solely on accounts of their regular cash receipts. This may either be because they are unaware of other changes in their net worth or because they are sceptical about the permanent nature of these 'windfalls'. It may also be due to financing constraints, particularly when the majority of capital gains occur on housing assets or interests in long-term saving products. The wealth effect thus also depends on the liquidity profile of the portfolio (Aron and Muellbauer, 2000). In terms of Milton Friedman's (1957) Permanent Income Hypothesis, which underpins most macroeconomic models of household consumption and saving behaviour, the definition of income in the SNA is consistent with a view in which asset revaluations (including realised gains from buying low and selling high) are seen as purely transient components of income, while the Haig-Simons income is consistent with a situation in which households view these gains at least partly as permanent sources of wealth.

Empirical studies on this matter suggest that the truth lies somewhere in the middle. In terms of stock market wealth, rising share prices indeed contribute to rising consumer spending, even though the marginal propensity to spend out of wealth is smaller than the propensity to spend out of labour or capital incomes (Poterba, 2000). In the case of housing, too, it is generally found that households do take the market value of their houses into account when making their spending decisions, although the propensity to spend out of illiquid assets is only about half as high as the propensity to spend out of liquid forms of wealth (Aron and Muellbauer, 2000, 2013).

This discussion supports a cautionary observation: When households have a different perception of their available resources than we assume in our models, our conclusions from these models can be seriously misleading. If, specifically, households take prolonged periods of asset price increases into account when making their spending decisions, analyses focusing only on the flow measure of saving will understate to what extent households are actually making future-oriented decisions. Note, however, that the importance of

this effect probably varies across different subsets of the population, as wealth tends to be highly unevenly distributed. While the discrepancy between wealth accumulation and saving, as conventionally measured, is considerable for the wealthiest households, the two measures of saving are likely roughly equivalent for households in the lower end of the income and wealth distribution.

1.3 Towards a concept of genuine saving

The previous section showed that the conceptual discrepancy between the stock and the flow concept and measure of saving can be boiled down to the definition of *income*. Regardless of which definition of income is chosen—whether the flow or the stock approach to saving is taken—, however, additional definitional issues arise regarding the definition of *consumption* and *wealth*.

From a stock perspective, it has often been argued that the assets accounted for in the national accounts (tangible non-financial and financial assets) cover only a portion of 'true' household wealth. On the one hand, households own tangible assets other than those reported, notably in the form of durable consumer goods. On the other hand, a large part of 'true' household wealth is intangible, particularly when it comes to human or intellectual capital (Becker, 1975) or to natural or environmental capital (Arrow et al., 2012, Atkinson and Hamilton, 2007, Hamilton and Clemens, 1999).

If these forms of capital form part of household wealth, it follows that the expenditures inccurred on building them should be treated as investment or saving rather than as consumption. From a broadened definition of what constitutes wealth thus follows a broadened definition of what constitutes saving. Savings measures adjusted in this vein are sometimes referred to as measures of "genuine saving" (Hamilton and Clemens, 1999), and are closely linked to the literature on sustainable development: Using the concept of genuine saving, economic development can be said to be economically or

environmentally sustainable when the appropriately adjusted savings rates are non-negative, and unsustainable otherwise (Arrow et al., 2012).

1.3.1   Physical capital

The measure of final consumption expenditure in the NIPA includes expenditures on durable consumer goods; a category that includes items such as household furniture and appliances, personal vehicles, computer equipment and certain recreational goods. While depreciating assets such as cars or computers are certainly not advisable saving vehicles, they do differ from other goods and services in that they provide a flow of "consumption services" for several years beyond the time of purchase and therefore preclude certain future expenditures.

A range of authors—beginning with John Hicks (1939, Chapter XIV), Raymond Goldsmith (1955) and Milton Friedman (1957, Chapter V)—have thus suggested reclassifying durable goods expenditures as investments, by treating only the current depreciation but not the original outlays as current consumption. Indeed, the reclassification of durable goods as investments is probably the most common adjustment to the household saving rate in the literature (see, for example, Blades and Sturm, 1982, Boskin, 1991, Gale et al., 1999, Gorman et al., 2013, Perozek and Reinsdorf, 2002).

1.3.2   Human capital

The reason we considered excluding durable goods from the measure of final consumption expenditure was that they provided consumption services over longer periods of time. Strictly speaking, education and healthcare services are consumed immediately, such that this justification is not applicable here. However, these expenditures have a distinct forward-looking character as they increase the stock of human capital, which in turn is among the most important determinants of future prosperity: While the stock of health impacts the amount of time each individual can spend on income- or commodity-generating activities, the level of the education affects the productivity of these activities (Becker, 1975). From this it follows that

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education and health should be treated as investments rather than as consumption expenditures.

The main difference with respect to the reclassification of durable goods as investments in physical capital is that the stock of human capital and its depreciation are unobservable and difficult to approximate. In contrast to tangible assets that wear and tear over a number of years after their acquisition, the overall economic value of human capital tends to first increase with time before decreasing later in life (Becker, 1975). There are likely also differences between the depreciation of education—which humans acquire during their youth—, training—which they receive during their working life and which helps to prevent the depreciation of their education—, and that of health—with which humans are endowed at birth, and which depreciates at an accelerating speed with age unless investments in healthcare are made to postpone some of this depreciation. Despite the difficulties in measuring the stock and depreciation of human capital, a number of authors have attempted to make appropriate adjustments for human capital investments (see, for example, Arrow et al., 2012, Blades and Sturm, 1982).

1.3.3   Natural capital

A somewhat more recent major addition to the literature on saving is the inclusion of natural capital in an economy's wealth, and thus the formation or consumption of natural capital in measures of saving or dissaving (Arrow et al., 2012, Atkinson and Hamilton, 2007, Hamilton and Clemens, 1999, Pearce and Atkinson, 1993).

The consumption of natural capital includes the depletion of natural resources on the one hand and the degradation of the environment on the other. The ownership of natural resources is generally clearly determined and thus at least partly accounted for as assets in the balance sheet, unless in the cases in which no ownership rights can be exercised or in which mineral or fuel deposits have not been discovered or are not workable. Changes in the volume of these natural assets are then recorded in the 'other changes in the volume of assets account' in the accumulation accounts, which are

currently under construction in South Africa (2008 SNA, Sections 1.46-1.47). In general, the vast majority of these resources are owned and depleted by the corporate and public sector rather than the household sector.

The quality of the environment, in contrast, is a public good, which can neither be easily valued in monetary terms nor attributed to individual institutional sectors. It seems reasonable to assume that households are the main beneficiaries of a clean environment, while all three institutional sectors are jointly responsible for polluting and degrading it. An adjustment for environmental degradation is thus likely more meaningful on a national level than for the household sector alone. The World Bank provides estimates for such economy-wide adjusted savings rates for a large number of countries. For all major economies, these adjustments lower the conventionally measured savings rate.

1.4 Aggregation and disaggregation

After having discussed the definition of household income in section 1.2 and the definition of household consumption in section 1.3, this section discusses the challenges of delineating the household sector itself. Indeed, the boundaries between the household, the corporate and the public sector are not clear cut, and household saving is not independent of how much other sectors save. This is reflected in the frequent observation that total national saving is more stable over time than either private saving (the sum of household and corporate saving) or public saving, and that private saving in turn exhibit greater stability than household or corporate saving considered separately (Blades and Sturm, 1982, David and Scadding, 1974).[4]

1.4.1 Household claims on corporate saving

The definition of the household sector in the System of National Accounts (SNA) comprises not only private households, but also unincorporated business enterprises of households, non-profit institutions serving households,

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[4]In South Africa, the correlation coefficient between household and corporate sector savings rates is -0.2 and between private and public sector saving $+0.1$ (1946-2014).

as well as private trusts and friendly societies. The main justification for including unincorporated businesses in the household sector lies with the unlimited liability of the owners of these businesses, which means that all household assets are at risk in the case the enterprise declares bankruptcy. Similarly, non-profit institutions, private trusts and friendly societies are included because the boundary to private households is not always clear. Usually, their overall share is relatively small compared to private households.

Incorporated businesses, on the other hand, constitute a separate institutional sector – although ultimately also owned by private households via direct shareholdings or indirect interests in pension- or long-term insurance funds. As a major shareholder, the household sector has claims on corporate profits. At any point in time, corporations can choose between paying these profits out as dividends (or through share repurchases) or holding on to them internally, thus increasing shareholders' claims on future payouts instead. The Modigliani-Miller invariance proposition predicts that shareholders are indifferent between these two options (they "pierce the corporate veil"), such that dividend payouts always translate into an equivalent drop in shareholder value (Miller and Modigliani, 1961). As shown in section 1.2, however, only the stock concept of saving reflects this theoretical invariance by taking into account price changes in the valuation of household wealth. For the flow measure of saving in the NIPA, in contrast, retained profits are entirely accounted as corporate saving until they are paid out as dividends to households.

In light of the substitutability between corporate and household saving, although imperfect, it has been suggested that total private saving may be a more meaningful measure than household saving when flow measures are used (Blades and Sturm, 1982, Boskin, 1991, David and Scadding, 1974, Gale et al., 1999). Given the interest in household saving from a theoretical perspective, and the importance of household saving in most countries in practice, aggregating over household and corporate saving could stretch the point. Yet, this discussion certainly suggests that changes in corporate saving

should be taken into consideration when interpreting changes in the saving figures as provided by the NIPA.

1.4.2 Household claims on pension and social security funds

A large share of saving of most working-age individuals is not discretionary but contractual, particularly in the form of contributions to pension schemes. For the household sector as a whole, the share of contractual saving is closer to zero, since pension schemes are largely a redistributive process between working-age and retired individuals. When there is a discrepancy between current contributions and current benefits, however, it seems straightforward that these savings should be attributed to households. This is largely the case under the current SNA.

For all claims that accrue 'in a predictable fashion or for predictable reasons', an adjustment is made in the national accounts to reflect any deviations between current contributions and current benefits. In the NIPA, household disposable income is adjusted for the change in the household sector's pension entitlements before the flow measure of saving is calculated. This change in the household sector's pension entitlements should be consistent with the change in the interests of households in pension funds and long-term insurers that are included in the balance sheet. Note, however, that the qualification of predictability excludes claims under social security and social assistance schemes. Given the market-based nature of the South African pension system, this distorts the South African estimates less than those of the advanced economies in extensive social security systems.

1.5 OTHER MEASUREMENT CONCERNS

Since national accounts data are constructed under a number of assumptions from a variety of sources, they are prone to errors and omissions in the source data as well as in the aggregation process.[5] Measurement errors can be classified in two groups: systematic errors, whose magnitude can be predicted

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[5]An overview over sources and methods in the South African household sector accounts is provided in Appendix A.1.

based on other variables, and non-systematic errors, where this is not the case. One systematic error in the measurement of saving is the treatment of inflation, which overstates the saving of net creditors and understates that of net debtors as will be shown in section 1.5.1 (Jump, 1980). A second systematic error concerns the discrepancy between excluding capital gains but including the corresponding taxes in the calculation of disposable income, which effectively understates saving (Peach and Steindel, 2000). The effects of other measurement errors are, per their nature, hard to estimate, but will be discussed in the subsequent section 1.5.3.

1.5.1 Treatment of inflation

One specific measurement error in the national accounts is related to inflation expectations. Jump (1980) shows that measures of income and saving contain a spurious element whenever inflation expectations are non-zero. This bias is related to the inclusion of nominal net interest payments or receipts in the calculation of sectoral income. Nominal interest rates consist of two components: a real interest component, and a premium intended to compensate the creditor for the expected inflation-induced reduction in the value of the principal. Since both components are included as 'net interest receipts' in the calculation of sectoral income (without deducting losses on the principal accordingly), a positive inflation premium will overstate the income of net creditors and understate that of net debtors. Since the household sector is generally a net creditor to the public and corporate sector, this spurious element in the measurement of income leads to an overstatement of household savings rates – particularly in times in which inflation expectations are high. It also introduces an element spurious correlation between inflation and savings rates when inflation expectations change over time (Jump, 1980).

To achieve inflation-invariant savings rates, the measured savings figure can be adjusted by subtracting the product of the (expected) inflation rate and the net creditor $(+)$ or debtor $(-)$ position of the household sector towards other sectors and the rest of the world. For the United States, Jump (1980) finds that inflation-adjusted household savings rates are between one

and two percentage points lower than the measured rates in the NIPA. In a more recent estimate, the discrepancy was only one half percentage points, owing to the decline in American inflation rates since the 1980s (Perozek and Reinsdorf, 2002).

1.5.2 Treatment of capital gains taxes

Another systematic 'measurement error' in the national accounts concerns the treatment of capital gains taxes. As Peach and Steindel (2000) point out, realised capital gains from the disposal of assets are excluded from the calculation of income in the NIPA, on the basis of the principle that gains and losses from non-produced assets should not enter the current accounts. On the other hand, taxes on these capital gains are considered as current transfers when calculating disposable income.[6] This asymmetry thus understates disposable income, and increases the wedge between the flow and the stock measure of saving. Peach and Steindel (2000) and Perozek and Reinsdorf (2002) find that excluding these taxes or including realised capital gains raises the United States household savings rate between less than one percent (subtracting capital gains taxes) and more than five percentage points (adding realised capital gains). Again, the stock measure of saving is not subject to this measurement issue.

1.5.3 The non-observed economy

The most obvious candidate for measurement errors in the national accounts is the non-observed economy, which ranges from non-monetary transactions (such as the production of goods and services for own consumption or for provision free-of-charge to others) to hidden monetary transactions (such as black-market or underground transactions). The fact that these activities are missing from administrative sources, however, does not mean that they are entirely excluded from the national accounts. Since the national accounts are partly based on survey data, targeted questions can be included in household

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[6]In South Africa, capital gains taxes apply when assets are disposed of (e.g., sold or bequeathed) at a value that exceeds the base cost. Due to significant tax exemptions on capital gains, only one third of capital gains were liable to taxation in 2014.

or enterprise surveys to estimate the size of the informal sector. Alternatively, statistical estimation and triangulation approaches can be used. When appropriate imputations are made, only some proportion of non-observed transactions will be missed in the national accounts (OECD, 2002).

To what extent do these non-observed transactions affect the savings figures in the national accounts? Since saving is calculated as the residual between income and consumption expenditure, a bias arises only when some transactions are reflected in one but not the other measure. In principle, the internal consistency requirement of the system of national accounts will prevent such a discrepancy: If reported cigarette consumption exceeds reported cigarette sales due to smuggling, for instance, an appropriate imputation is made to the income side of the accounts (2008 SNA, Section 25.28-25.35). However, the existence of non-observed transactions can contribute to the discrepancy between the flow and stock measures of saving. This happens when unrecorded production goes towards the formation of fixed capital rather than towards consumption, such as in the case of do-it-yourself or black-market construction, maintenance or repair activities that increase the market value of the housing stock. In countries where construction activity is largely informal, this could lead to a significant understatement of the flow measure of saving relative to the stock measure of wealth accumulation (Gorman et al., 2013).

1.5.4   Is survey data better?

The weaknesses of the 'macroeconomic' national accounts data could point us towards using 'microeconomic' survey data instead. Although household surveys are an important input for the construction of the national household sector accounts, the two data sources tend to differ systematically (Deaton, 2005, Pinkovskiy and Sala-i Martin, 2014, Ravallion, 2003). This discrepancy results, in part, from different definitions between both frameworks. For instance, national accounts define the household sector more broadly than surveys do, and apply different accounting practices regarding imputations for non-monetary transactions. However,

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the discrepancy also results from differing errors and omissions within each dataset (Deaton, 2005, Ravallion, 2003).

Both income and consumption expenditure are generally lower when constructed from surveys than when taken from the national accounts (Deaton, 2005, Ravallion, 2003). In South Africa (as in many other developing countries), this discrepancy is particularly pronounced: Some South African household surveys capture less than 60 percent of national accounts income (Van der Berg et al., 2007), compared to a median of 68 percent in a sample of 88 developing countries (Ravallion, 2003). Since income is usually understated even more substantially than consumption (Ravallion, 2003), survey data thus understates saving relative to national accounts data. The downward-bias in income and consumption is partly due to under-sampling and under-reporting, since wealthier households are less likely to respond to surveys than poorer households (Deaton, 2005). It can also result from flaws in the survey design and execution, or from low-quality responses that respondents give to the numerous survey questions from which income and consumption figures are constructed (Deaton, 2005). Overall, Pinkovskiy and Sala-i Martin (2014) suggest that national accounts give more accurate estimates of the variation in average per-capita income— and hence saving—than surveys do – although they cannot provide any insight on the distribution of savings on the level of households.

When taking the stock rather than the flow approach, survey data are even less likely to yield accurate information. Non-response is frequent in wealth-related surveys because wealth is considered a socially sensitive issue. When households do choose to respond, they generally find it difficult to estimate the value of their assets. Because survey data on wealth is so noisy, "differencing an already noisy series (wealth) can lead to very high (and spurious) variability in the saving level" (Browning and Lusardi, 1996, p. 1814). Despite all their shortcomings, national accounts data might thus still be our best source for empirical analyses on income, consumption, wealth and saving of the household sector on the aggregate level.

1.6 South African household saving

1.6.1 Data

I use the household sector NIPA and balance sheet data for the household sector provided by the South African Reserve Bank (SARB). While the institutional sector accounts of the NIPA date to 1946, the balance sheet data—first compiled in 2006—only go back to 1975. The full integration between the balance sheet and the NIPA via the accumulation accounts is still ongoing at the time of this writing.

I express all savings rates in net terms and as a percentage of GDP. The choice between gross and net data is based on the economic logic that depreciation cannot be consumed: From a microeconomic perspective, households presumably seek to save and accumulate assets beyond what is needed to offset the wear and tear of their existing assets; from a macroeconomic angle, it is net rather than gross savings that constitute the resources for new investments in the economy (Boskin, 1991). Moreover, only the net measure of saving in the NIPA is directly comparable to the change in wealth in the balance sheet: Since the balance sheet values household assets at fair value, depreciation is implicitly taken into account in the wealth figures. The choice of the denominator is simply based on the the greater transparency of using of GDP over other measures, such as disposable income.

Because depreciation expenses are fairly stable over time, the choice between gross and net measures does not affect the measured trend. This is, however, not the case for the choice of the denominator. The disposable income share of South African households bounced around quite significantly, from highs of around 70 percent of GDP in the 1990s to lows of less than 60 percent in the 1980s and 2000s. It should thus be kept in mind that the choice of this denominator could overstate the measured decline in households' propensity to save over the past two decades.

1.6.2   Adjustments: Flow and stock measures of saving

Figure 1.2 shows that the flow and stock measures of saving differ both in level and in trend. While the flow measure is low and steadily downward trending (from more than 10 percent of GDP in the 1960s to negative levels today), the stock measure is much higher and—although much more volatile—without any long-term trend. Between 1975 and 2014, South African households saw their wealth increase by 6.5 percent per year on average in real terms; significantly higher than the flow measure of saving would suggest.[7] Overall, real household wealth quadrupled between 1975 and 2014, whereby only fifteen percent of the increase can be explained through compound household savings over that period.

As discussed in section 1.2, the discrepancy between the flow and the stock measure of saving stems from revaluations on the existing stock of assets on the one hand and from capital transfers and other changes in the volume of assets on the other. In a fully integrated set of national accounts, these three elements could be easily read from the accumulation accounts, which consist of the revaluations account, the capital account, and the 'other changes in the volume of assets account'. At the time of this writing, however, only the capital account has been published by the SARB. Assuming that the 'other changes in the volume of assets account' is roughly zero as it is in other countries, the residual between S_S (9.0 percent), S_F (-1.4 percent) and the capital account (0.5 percent) is then primarily due to asset revaluations (9.9 percent in 2014).

The revaluations component can also be estimated from a bottom-up approach. Formally speaking, the value of household assets equals the sum-product of the quantity and the current price of each asset, such that the change in the value of assets—and hence in wealth—between two points in time can be decomposed into a quantity effect (a change in the quantity of

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[7]The stock measure of saving is calculated as the increase in wealth between the beginning and the end of a period over current-period GDP, $s_s = \frac{(W_t - W_{t-1})}{GDP_t}$. Over the same period of time (1975–2014), the average annual increase in wealth, $S_s = \frac{(W_t - W_{t-1})}{W_{t-1}}$ was 13.3 percent per year in nominal terms and 3.5 percent per year in real terms, as inflation averaged 9.8 percent over the 40-year period.

assets relative to liabilities at constant prices) and a revaluation effect (a price-induced increase in the value of assets over inflation) by applying a standard growth accounting procedure (described in Appendix A.2). Since real estate and equities are the main asset classes that generate holding gains and losses, we can calculate the revaluation effects as long as we know the value of housing and stocks in household portfolios and the development of their prices relative to consumer price inflation.

Consider real estate first. In 2014, housing constituted 24 percent of assets of the South African household sector, while mortgage advances constituted 48 percent of liabilities. Since mortgage advances are not only used to finance new housing but are taken out by existing homeowners to finance other purchases, the true 'housing wealth' lies somewhere between the value of housing assets and the residual between housing assets and mortgage liabilities (Scobie and Henderson, 2009).[8] Between 1975 and 2014, residential house prices increased by 10.8 percent per year while consumer price inflation averaged 9.8 percent.[9] Over the 40-year period, this small gap between house- and consumer price inflation resulted in a roughly 50 percent increase of house prices relative to consumer prices. Using the growth accounting procedure, we find that 58 percent of the increase in real house prices can be attributed to real additions to the housing stock, while the remaining 42 percent are due to real revaluations. The revaluation effect was particularly pronounced between 2000 and 2008, where house prices grew strongly while inflation remained low (see Figure 1.3). In 2014, the increase in household wealth driven by real revaluations of housing assets amounted to 1.3 percent of GDP; if mortgages are subtracted, the figure is 0.9 percent. While these figures are substantial when compared to the unadjusted flow measure of saving, they explain only a very small proportion (roughly 10 percent) of the discrepancy from the stock measure. They are also very small compared to

[8]The relative importance of real estate assets in South African household portfolios is low compared to other countries, since pension assets constitute the single largest category of assets. In the OECD, housing accounts for almost 70% of total household assets, as pensions are organised through pay-as-you-go schemes.

[9]Calculations on the basis of the middle-segment house price index provided by ABSA.

many advanced economies, in which real house price increases were the main driver of private wealth accumulation over the last decades.

Turn, thus, to equities. While the SARB records the financial assets of the household sector not by asset class but by the financial institution through which they are held ("assets with monetary institutions", "interest in pension funds and long-term insurers" and "other financial assets"), the amount of equities held by households can be estimated from the balance sheets of the relevant counterparties (public and private pension funds and long-term insurers on the one hand and unit trusts on the other). Using this procedure, we arrive at a substantial equity share in household portfolios, at almost 60 percent of financial assets or over 40 percent of total assets.[10] Comprehensive counterparty balance sheet data are only available since 1990. Since this point in time, stock prices increased by 12.4 percent per year in nominal terms, or 4.7 percent per year in real terms at an average inflation rate of 7.8 percent. Using the growth accounting procedure again, we find that 93 percent of the real increase in the value of household equity portfolios were due to revaluation. Most recently, the revaluation effect amounted to 8.6 percent of GDP per year, thus roughly explaining the remaining 90 percent of the discrepancy between the stock and the flow measure.

Is such a high revaluation effect on stocks plausible? The South African equity market has indeed performed remarkably well since the inception of the Johannesburg Stock Exchange (JSE) in 1887. According to the Crédit Suisse *Global Investment Returns Yearbook* (Dimson et al., 2015), the JSE generated real returns of 7.4 percent per year on average since 1900 – the highest among the 23 countries covered in the Yearbook. Over the same time, the real exchange rate depreciated by only 0.9 percent per year against the US dollar. The annualised real returns on equities were even higher in more recent decades than in the earlier years of the JSE. Since 1965, South African shares generated real returns of 8.0 percent per year, the equivalent

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[10]To estimate the composition of the financial assets of households, I apply the aggregate portfolio composition of official pension and provident funds, private self-administered pension funds and long-term insurers to the household sector's 'interest in pension funds and long-term insurers', and the portfolio composition of unit trusts to the 'other financial assets' bucket. Household 'assets with monetary institutions' are simply cash equivalents.

Figure 1.3: WEALTH DECOMPOSITION
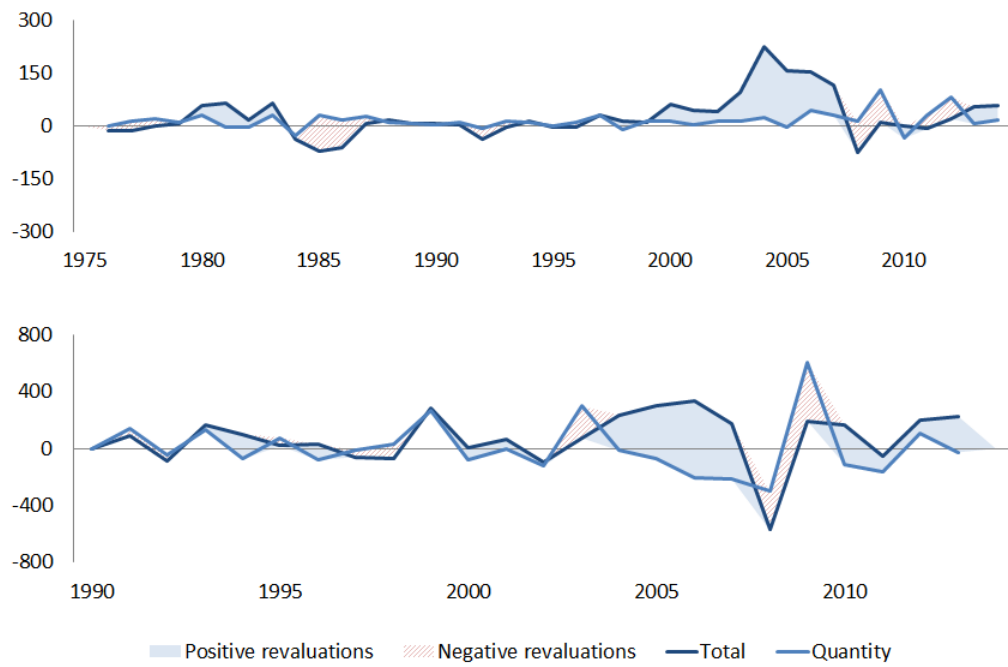
Note: Decomposition of the annual real increase in real estate (top panel) and equities holdings (bottom panel) into quantity and price effects, in ZAR billions (2000 CPI = 100).

figure since 2000 is 9.6 percent. Due to the strong home bias of South African investors, it is likely that South African households benefited sizably from these gains.[11]

1.6.3 Adjustments: Towards a measure of genuine saving

Physical capital

The vast majority of household final consumption expenditure in South Africa goes towards non-durable goods and services. In 2014, the share of durables stood at only 8.7 percent of household final consumption expenditure or at 5.3 percent of GDP, 1.3 percentage points above the estimated depreciation of these durables (3.0 percent of GDP). Adding this number back to the flow savings rate raises s_f from -1.4 to -0.2 percent of GDP.[12] Since net investment in durables has been relatively stable, however, this adjustment does not reverse the downward trend of the household savings rate over the last decades. For the two decades between 1995 and 2014, average net investment in durable goods amounted to 1.4 percent of GDP, raising the average savings rate from 0.2 percent to 1.6 percent of GDP.[13]

This adjustment is broadly in line with that for the advanced economies: According to a survey by Gorman et al. (2013), the capitalisation of durable

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[11]The majority of equities is generally held indirectly, through pension or long-term insurance funds or other collective investment schemes. These 'interests in pension funds and long-term insurers' and 'other financial assets' constitute more than half of all household assets. Owing to the history of controls regarding capital and exchange outflows, the large majority of equities held through such schemes is likely domestic. Under the current prudential rules of the SARB the foreign exposure of pension funds is restricted to 25% of retail assets; in the case of collective investment funds, long-term insurance funds and other institutional investors, this share cannot exceed 35% of assets under management; although an additional allowance in the order of five percent of assets exists for African assets in both cases (see Section O – F.6 in the SARB Exchange Control Manual).

[12]See Appendix A.3 for an overview over the calculation of depreciation expenses.

[13]Since the household balance sheets in the national accounts report "net wealth including consumer durable goods" as a memo-item, the same adjustment can also be made from a stock perspective. Using this figure for the calculation of the savings rate increases s_s by 1.3 percentage points (22.2 compared to 20.8 percent) in 2014 and by 1.6 percentage points (20.8 compared to 19.2 percent) for the 20-year period between 1995 and 2014. The 0.2 percentage point difference in the longer-term adjustment is presumably due to differences in the methodology used to estimate depreciation.

goods has an impact of up to three percentage points in the United States, between 1.0 and 1.8 percentage points in Europe and between 0.4 and 1.0 percentage points in New Zealand and Australia.

Human capital

In principle, net investments in human capital can be reclassified analogously to the way we just reclassified net investments in physical capital. In practice, this adjustment is harder to make; both because of limited data on actual expenditures on human capital formation and because of the conceptual and methodological difficulties in estimating the associated depreciation expenses.

Household expenditures on education are grouped together with expenditures on recreational and entertainment services in the NIPA, forming a category that jointly amounts to 3.3 percent of GDP. Survey data suggests that educational services contribute roughly half to this bucket, amounting to 1.6 percent of GDP.[14] Household expenditures on healthcare (medical services, medical insurance and medical or pharmaceutical products) are significantly higher, amounting to 4.6 percent of GDP in 2014. However, only a part of these expenditures actually contribute to future productive activity and are thus 'investments' in the economic sense. If the productive share of healthcare expenditures were only half, the gross investment in health capital would fall 2.3 percent of GDP, more similar to the estimate for education.

Taken together, at least 6.5–10.2 percent of South African household consumption expenditure or 3.9–6.2 percent of GDP goes towards the formation of human capital. As discussed in section 1.3.2, the depreciation of human capital investments is unobservable and hard to estimate. In the absence of depreciation, the South African household savings rate could be adjusted upwards by the full 3.9–6.2 percentage points. The zero depreciation assumption is plausible for healthcare: In contrast to education,

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[14]The Income and Expenditure Survey is conducted every five years since 1995 by Statistics South Africa (StatsSA), and reports the share of education in total household expenditure as 1.8% in 1995, 2.8% in 2000 and 2005, and 2.7% in 2010. The National Income Dynamics Survey (NIDS) is conducted biannually since 2008 by the University of Cape Town, and reports a share of 3.1% in 2008, 2.8% in 2010 and 2.7% in 2012.

humans inherit their stock of health at birth rather than building it up through investments — expenditures on medical services and pharmaceutical products thus only serve to mitigate the inevitable depreciation, and don't in themselves depreciate. In the case of education, however, some depreciation is likely. Under a depreciation rate of 8.5 percent (based on an adjusted estimate from the literature), the reclassification of expenditures on education would increase the savings rate by only 0.9 percentage points, bringing the total adjustment for human capital down to +3.2–5.5 percentage points.[15]

While comparable figures are not available for a broad range of countries, a comparison with New Zealand (+0.5 percentage points) suggests that the adjustment to the South African savings rate is relatively high (Gorman et al., 2013). This is likely due to the fact that households bear a larger share of healthcare and education expenditures in South Africa than in the advanced economies, where these items are largely funded through social security systems.

Natural capital

For natural or environmental capital, we can resort to estimates provided by the World Bank. These estimates, available only on the national level, consider carbon dioxide damage and particulate emission damage (environmental degradation) as well as for energy, minerals and net forest depletion (natural resources depletion). For South Africa, the estimated adjustments to the national savings rate amounted to −1.8 percent of GDP from the former, and −4.8 percent from the latter.[16]

As discussed previously, the depletion of natural resources can likely be attributed to the corporate and public sectors in cause and consequence. While environmental degradation is also caused by all sectors, it affects households first and foremost. From that perspective, the 'dissaving' in terms

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[15]The extent to which education depreciates in different phases of life is a debated topic, and I made several assumptions to arrive at the above estimate of a non-zero depreciation rate. Appendix A.3 provides an overview over these assumptions.

[16]Latest available data for 2013. Source: World Bank Development Indicators database

of environmental quality in the order of −1.8 percent of GDP constitutes an upper bound for an adjustment to the South African household savings rate.

1.7   Conclusion

The comparison of different concepts and measures of saving stresses one main point: Since there is no single 'correct' measure of saving, a careful choice of the most relevant concept and measure is an important step in any analysis of the level of saving or the saving behaviour of households.

Table 1.1 summarises the adjustments to the conventionally measured savings rate for South Africa: While the flow measure of saving stood at −1.4 percent and the stock measure of saving at 9.0 percent in 2014, the measure of genuine saving is estimated at up to 16.5 percent of GDP – a considerably higher number.

The most important distinction is that between the balance sheet and the income statement view of saving: While households haven't been "putting aside" their incomes according to the latter concept, they have nevertheless grown richer, driven largely by favourable asset price developments that are not reflected in conventional measures of income. Although detailed revaluation accounts are still under construction in South Africa, the available data suggest that this owes primarily to the exceptional appreciation of domestic corporate equities over the last decades. Chapter 2 of this thesis will investigate the sources of this appreciation, and compare the results for South Africa to those in the advanced world.

While the growth in aggregate household wealth paints a less worrisome picture than the low conventionally measured saving rates, it raises important distributional questions. Since wealth tends to be highly concentrated, it is highly probable that asset revaluations have disproportionately benefited a small share of the South African population. As a result, true savings inequality is likely even more pronounced than conventional forms of measurement suggest. Chapter 3 of this thesis will attempt to shed more light on the distribution of wealth (and therefore saving) among the South African population.

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Table 1.1: Overview of adjustments

Measure/Adjustment	Impact	Savings rate
Gross saving		**0.1%**
Consumption of fixed capital	-1.5	
Net saving (s_f)		**-1.4%**
Capital transfers	$+0.5$	
Real revaluations: Real estate	$+0.9 - 1.3$	
Real revaluations: Equities*	$+8.6 - 9.0$	
Change in real net wealth (s_s)		**9.0%**
Physical capital: Durable goods	$+1.3$	
Human capital: Education	$+0.9 - 1.6$	
Human capital: Healthcare	$+2.3 - 4.6$	
Natural capital: Environment	$-1.8 - 0.0$	
Genuine saving (s_f')		**$11.7 - 16.5\%$**

Note: Adjustments to the South African headline savings rate, 2014, in percentage points (impact) and in percent of GDP (savings rate).
*Real equity valuations calculated as a residual since stock holdings for 2014 not available.

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Chapter 2

Private wealth in a developing country: Evidence from South Africa

The point of departure of Thomas Piketty's influential *Capital in the Twenty-First Century* (2014) was the strong growth of private wealth-income ratios in the advanced economies between 1970 and 2010. Using official household-sector balance sheet data for South Africa—the first country in the developing world to publish such data—, this chapter examines to what extent this re-emergence of private wealth was also experienced in the developing-country context. First, we find that the South African current wealth-income ratio is very close to its level in 1975 (255 and 240 percent), and thus much lower than those of Piketty's sample of advanced economies (where it increased from 200–300 to 400–700 percent). Second, I show that the discrepancy is explained not only by South Africa's relatively low savings rates, but also by the reduction of wealth before and during the transition to democracy in the 1990s. Since the late 1990s, however, private wealth recovered significantly, indicating that South Africa might resemble the advanced economies more closely in the future.

Keywords: Saving; wealth; asset accumulation

2.1 Introduction

Until recently (and as shown in Chapter 1), the macroeconomic literature on developing countries was primarily concerned with the flows of income and expenditure rather than with the stocks of assets and liabilities. This owes not only to the theoretical notion that flows and stocks are consistent over the long term, but also to the scarcity of reliable balance sheet data for empirical analyses: While flow variables have been recorded in the national accounts since the 1940s, stock variables are only gradually being included in official statistics.

When Thomas Piketty used these novel balance sheet data for a sweeping account of the accumulation and distribution of wealth in the major advanced economies, it nevertheless attracted considerable attention. *Capital in the Twenty-First Century* (2014) showed how private wealth re-emerged in the second half of the twentieth century following the great contraction during and after the world wars, approaching levels last seen in the rentier-societies of nineteenth-century Europe in several countries. As wealth gains importance over incomes, wealth inequality—which typically exceeds income inequality significantly—is likely to play an increasing role in shaping overall inequality, therefore raising the redistributive potential of capital relative to labour-related taxes: In an environment where national income is dwarfed by private wealth, the redistribution of income alone is likely insufficient to effectively reduce overall inequality (see also Piketty and Zucman, 2014, 2015).

Although Piketty's analyses were confined to the largest advanced economies, his work has been highly influential even in the developing world, and particularly South Africa (as seen, for example, in the 2015 report of the Davis Tax Committee on estate tax reform). But to what extent are his conclusions really applicable to emerging economies, in which persisting capital scarcity tends to cause at least as much concern as increasing wealth concentration?

In this chapter, I use the South African household sector balance sheets (which were introduced in Chapter 1) to compare the South African situation

to that in the advanced economies. With retrospective estimates dating back to 1975, private wealth can be traced over the same period in which the wealth-income ratios of rich countries expanded from their historic low-point of about 200–300 percent to their current levels of 400–700 percent.

First, I compare the wealth-income ratios of South Africa and the eight major advanced economies over the 1975–2010 horizon, and use Piketty and Zucman's methodology to decompose their development into quantity (saving-induced) and price (revaluation-induced) effects. While I find that South Africa was still comparable to the rich countries at the beginning of this period (with a wealth-income ratio of 240 percent in 1975), the developments diverged thereafter: Rather than experiencing an emergence of private wealth, South Africa's wealth-income ratio of 255 percent today is very close to its level in 1975. While South Africa's structurally lower savings rate contributed to this divergence, the relatively less pronounced asset price boom also played a role.

Second, I study the South African wealth-income ratio over time, as the long-term view masks important shorter-term dynamics. Rather than remaining stable as the comparison between 1975 and 2014 suggests, wealth-income ratios actually trended downward from the mid-1980s to the mid-1990s, reflecting dwindling asset prices in a period of economic sanctions against the apartheid regime and political uncertainty over the transfer of power. From the late 1990s onwards, private wealth recovered, as asset price increases more than compensated for steadily falling savings rates. While South Africa's wealth-income ratio is thus still substantially lower than those of the advanced economies, it appears to be on a trajectory to resemble them more closely in the future.

The fact that aggregate private wealth is still lower than in the advanced economies could also be misleading with regard to its importance in shaping the structure of inequality. Although higher wealth-income ratios have been associated with higher capital shares in the functional distribution of income, capital receives a much higher share of total income in South Africa than in any of the countries in Piketty's sample (40 percent compared to 25–30

percent). Private wealth in South Africa generates thus disproportionately high returns for their owners, which tend to constitute a much smaller group than the recipients of other incomes. This indicates that the distributional concerns raised by Piketty's observations for the advanced economies could nevertheless be shared in South Africa.

2.2   Data and methodology

2.2.1   Data

The reason the empirical literature on wealth is still young is that reliable balance sheet data are much newer than flow data on incomes and expenditures. While the System of National Accounts (SNA)—the international standard for national accounting—was first published in 1953, recommendations on the compilation of sectoral balance sheets were only included in 1993. Since the 2000s, these recommendations have gradually been implemented in most advanced economies, whereby official balance sheet data were released as early as 1970 in France and as late as 2010 in Germany (Piketty, 2011, Piketty and Zucman, 2014).

In South Africa, the first retrospective household sector balance sheets were included in the national accounts in 2006, and now span over four decades (1975–2014). Although some data have since become available in Korea, Mexico, Taiwan and Turkey, South Africa remains one of at most a few emerging economies (and even fewer lower- and middle income economies) with complete household sector balance sheet data today (Alvaredo et al., 2016, Stierli et al., 2014).[1]

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[1]There is no authoritative overview to what extent different countries have implemented sectoral balance sheets. According to an IMF conference paper on this subject (Shreshta et al., 2011, p.10), Korea had complete sectoral financial and non-financial balance sheets in 2011 while Mexico had sectoral financial balance sheets compiled through the OECD. According to the Credit Suisse *Global Wealth Report*, in contrast, Korea and Mexico both provide only financial balance sheets for the household sector, and South Africa is the only developing country with sectoral balance sheets today. The World Income and Wealth Database contains information on wealth-income ratios in Mexico, Korea and Taiwan (Alvaredo et al., 2016).

To ensure comparability with Piketty's data and analyses, this chapter uses the same standard concepts of saving and wealth. The fact that South Africa's balance sheet data was modeled by Aron and Muellbauer (2006) after the United Kingdom should ensure the comparability of the resulting estimates.

Private wealth-income ratios are calculated by dividing *household sector wealth* ("wealth") through *net national income* ("income"), and are decomposed into savings- and revaluations-induced components using *net savings rates* ("saving") calculated straight from the national income and production accounts (as saving net of depreciation over net national income). The reason for using *household sector* balance sheets to measure *private* wealth is that all assets and liabilities of the corporate sector are ultimately owned by their shareholders – households, government entities or foreigners. Household sector balance sheets thus capture the wealth of the corporate sector to the extent that these businesses are owned by South African private residents (as opposed to public sector or the rest of the world). The reason for considering only the flow measure of saving in this chapter is not only that it ensures consistency with Piketty's work on the advanced economies, but also because it would be somewhat circular to explain the change in wealth through a savings rate that is calculated as the change in wealth. Appendix A.1 provides more details on the concepts and measures used in this chapter.

2.2.2   Decomposition methodology

The change in the value of assets between two points in time depends on the change in the quantity of assets at constant prices and the change in their respective market prices. As shown in Chapter 1, the quantity effect corresponds broadly with what is measured as saving in the national accounts, allowing us to talk about a saving-induced and a revaluation-induced component of any change in wealth.

I follow the multiplicative decomposition methodology of the change in the value of assets that was proposed by Piketty and Zucman (2014). Denoting real wealth and real asset prices (asset prices relative to consumer

prices) at the end of period t as W_t and P_t, and denoting real income and the savings rate during period t as Y_t and s_t, real wealth at the end of period $t + 1$ can be expressed as

$$W_{t+1} = (W_t + s_{t+1}Y_{t+1})(1 + \frac{P_{t+1}}{P_t}) \tag{2.1}$$

Denoting the total growth rate of wealth between period t and $t + 1$ as g_{t+1}^w, the saving-induced growth rate of wealth as $g_{t+1}^{w,s}$ and the revaluation-induced growth rate of wealth as $g_{t+1}^{w,r}$, this equation can be rewritten as

$$W_{t+1} = (1 + g_{t+1}^{w,s})(1 + g_{t+1}^{w,r})W_t \tag{2.1'}$$

where $g_{t+1}^{w,s} = s_{t+1}\frac{Y_{t+1}}{W_t}$ and $g_{t+1}^{w,r} = \frac{P_{t+1}}{P_t}$. Finally, denoting the growth rate of income as g_t^y, the change in the wealth-income ratio β between two years becomes

$$\beta_{t+1} = \frac{(1 + g_{t+1}^{w,s})(1 + g_{t+1}^{w,r})}{1 + g_{t+1}^y}\beta_t \tag{2.2}$$

The dynamics of the wealth-income ratio thus depend on the growth in wealth relative to the growth in incomes. Letting growth rates without subscripts denote compound annual growth rates over a period spanning n years, the decomposition of a change in wealth and the wealth-income ratio over time can be generalised through equations (2.3) and (2.4):

$$W_{t+n} = (1 + g^{w,s})^n(1 + g^{w,r})^n W_t \tag{2.3}$$

$$\beta_{t+n} = \frac{(1 + g^{w,s})^n(1 + g^{w,r})^n}{(1 + g^y)^n}\beta_t \tag{2.4}$$

Over the long term, asset price should not diverge systematically from the prices of goods and services, and the valuation effect should ultimately even out ($g_t^{w,r} = 0$). In the steady-state—characterised by stable savings and growth rates—the wealth-income ratio converges toward the ratio between

the savings rate and the growth rate of income:

$$\beta_{t+n} \rightarrow \beta = \frac{s}{g^y} \tag{2.5}$$

This equation is the steady-state result of standard neoclassical growth models and a mathematical identity as long as s and g^y are constant and $g_t^{w,r}$ is zero (Piketty and Zucman, 2014).

In their joint paper on wealth-income ratios in rich countries, Piketty and Zucman (2014) find that this steady-state prediction indeed describes wealth dynamics reasonably well over the very long run and at highly aggregated levels. Over shorter horizons in individual countries, however, valuation effects remain important, causing the wealth-to-income ratio to deviate from the saving-induced level. The shorter the horizon, the more the wealth-income ratio is also determined by the initial wealth-income ratio at the beginning of the period under analysis, requiring a different explanation for finite horizons.

First, the growth rate of wealth is decomposed into a saving-induced and a price-induced component. For this purpose, equation (2.3) is rewritten as:

$$(1 + g^w)^n = (1 + g^{w,s})^n (1 + g^{w,r})^n \tag{2.3'}$$

The cumulative growth of wealth, $(1 + g^w)^n = (1 + g_{t+1}^w) \times ... \times (1 + g_{t+n}^w)$ can be calculated from annual balance sheet data on wealth, $W_t, ..., W_{t+n}$. Analogously, the cumulative saving-induced growth rate of wealth $(1 + g^{w,s})^n = (1 + g_{t+1}^{w,s}) \times ... \times (1 + g_{t+n}^{w,s})$ can be calculated from data on $s_t, ..., s_{t+n}$ and $\beta_t, ..., \beta_{t+n}$, using the definition that $g_{t+1}^{w,s} = s_{t+1} \times Y_{t+1}/W_t$. Taking the n-th root yields the uniform-growth-weighted average annual rates g^w and $g^{w,s}$. The revaluation-induced component is the residual.

These rates can then be used to decompose the wealth-income ratio into three components: the impact of the initial wealth-income ratio, β_{ini}, a

saving-induced component β_{sav} and a revaluation-induced component, β_{rev}:

$$\beta_{t+n} = \beta_{ini} + \beta_{sav} + \beta_{rev} \tag{2.6}$$

$$\beta_{ini} = \beta_t \times \frac{1}{(1 + g^w)^n} \tag{2.6a}$$

$$\beta_{sav} = (\beta_{t+n} - \beta_{ini}) \times \frac{g^{w,s}}{g^w} \tag{2.6b}$$

$$\beta_{rev} = (\beta_{t+n} - \beta_{ini}) \times \frac{g^{w,r}}{g^w} \tag{2.6c}$$

2.2.3 Which savings rate?

I have argued that the *household sector* balance sheets are a good measure for the wealth of the entire *private sector*, because they include the assets and liabilities of the South African corporate sector to the extent that these businesses are owned by South African private residents (as opposed to public sector or the rest of the world). Saving, in contrast, is recorded separately for the household and the corporate sector, regardless of the fact that the household sector can ultimately claim corporate savings as the major shareholder of domestic corporations. In light of the substitutability of corporate and household saving (which was also discussed in Chapter 1), Piketty and Zucman use the private rather than the household savings rate in decomposing private wealth.

However, this approach is not without limitations either. While the household sector is generally the largest shareholder of a country's corporate sector, it is not the only one – most corporations are at least partially owned by foreigners and/or the government. Similarly, households typically own at least some shares in foreign companies, despite the home bias in equity portfolios. Piketty and Zucman argue that their approach remains a good approximation because government ownership has become fairly small across countries, while net foreign asset positions are largely balanced (implying that each country gives and receives a comparable share of corporate savings). However, the approximation might be less valid in the context of developing countries, where state-owned enterprises constitute a substantial share of the

corporate sector. Moreover, it seems that large discrepancies in the corporate savings rates across countries would also render the approximation less valid, even where net foreign asset positions are relatively small.

As Piketty and Zucman point out in their Data Appendix, the national accounts do not systematically report bilateral flows between the resident institutional sectors and the rest of the world, such that there is no straightforward way to improve the matching between private wealth and saving. For consistency with these authors I therefore still use the private savings rate, but complement all analyses with estimates using the household savings rate as well.

2.3 PRIVATE WEALTH AND ITS COMPOSITION

2.3.1 Wealth-income ratios

In 2014 South Africa's private wealth stood at 255 percent of national income; in 2010—the end of Piketty's horizon—just above 230 percent. How does this compare with the eight advanced economies?

As Table 2.1 shows, South Africa's 2010 wealth-income ratio was about 40 percent lower than that of Germany, Canada and the United States, and 60 percent lower than that of Italy or France. While this is in line with the prediction that developing countries are less capital-abundant and capital-intensive than advanced economies, a higher wealth-income ratio would not have been surprising for a middle-income country that is known for its extraordinary riches – platinum mines, industrial farms, globally operating corporations and the luxury real estate of the Western Cape.

Table 2.1 and Figure 2.1 also show that the discrepancy between South Africa and the advanced economies was considerably less pronounced back in the 1970s. In 1975, South Africa's wealth-income ratio was on par with Canada's, and even exceeded Germany's. This suggests that today's discrepancy between South Africa and these countries is not explained by a structurally lower wealth-income ratio of South Africa as a developing

country, but by the specific developments that drove the rise of the wealth-income ratios of the rich countries over the past four decades.

Yet, the comparison between 1975 and today masks the dynamics within the last decades. While the advanced economies experienced a pronounced increase of the wealth-income ratio over the entire period, the South African development was U-shaped: Between the late 1970s and the late 1990s, the wealth-income ratio declined from over 260 percent to about 190 percent, only to return to earlier levels in the subsequent decade and a half (see Figure 2.2). While still more moderate, the increase of 60 percentage points over the last 15 years thus has started to resemble the trend of the advanced economies over the last four decades.

2.3.2   Wealth composition

Before proceeding to the drivers of wealth accumulation, it is useful to consider the composition of wealth. In most countries and for most individuals, housing assets constitute the bulk of their wealth (OECD, 2015). It is thus remarkable that housing constitutes merely one quarter of total private assets in South Africa, compared to an average share of 40 percent in Piketty's sample. Given the low asset-to-income ratio, the discrepancy is even bigger: As shown in table 2.2, housing assets amount to 75 percent of national income in South Africa, compared to 180–380 percent in the advanced economies.

The low housing share implies that three quarters of assets in South Africa are financial, with interests in pension funds and long-term insurers constituting the single largest category. The importance of pension assets for South African households is less surprising when considering that the domestic pension system is almost entirely capitalised and privately administered. This characteristic of the retirement fund landscape dates back to the 1980s and 1990s, when the industry experienced a sweeping transition from partially funded defined benefit to fully funded defined contribution

Table 2.1: PRIVATE WEALTH-INCOME RATIOS, 1975 AND 2010

	β in 1975	β in 2010	Δ 1975–2010
South Africa	240	231	−9
United States	320	410	90
Canada	242	416	174
Japan	386	601	215
Australia	349	518	169
Germany	229	412	183
United Kingdom	301	522	221
France	317	575	258
Italy	321	676	355

Note: Private wealth-income ratios, 1975 and 2010, % of national income. Data for advanced economies from Piketty and Zucman (2014).

Table 2.2: PORTFOLIO COMPOSITION, 2010

Asset class	South Africa	Piketty-8
Residential buildings	26	40
Other non-financial assets	6	5
Total non-financial assets	32	45
Pension funds and life insurance	36	19
Equities and fund shares	21	16
Currency, deposits, bonds and loans	12	20
Total financial assets	68	55
Total assets	100	100

Note: Household sector portfolio composition, 2010, in percent of total assets. Piketty-8 denotes national-income weighted averages for Piketty's sample of eight advanced economies, calculated based on Piketty and Zucman (2014).

Figure 2.1: Private wealth-income ratios, 1900–2010
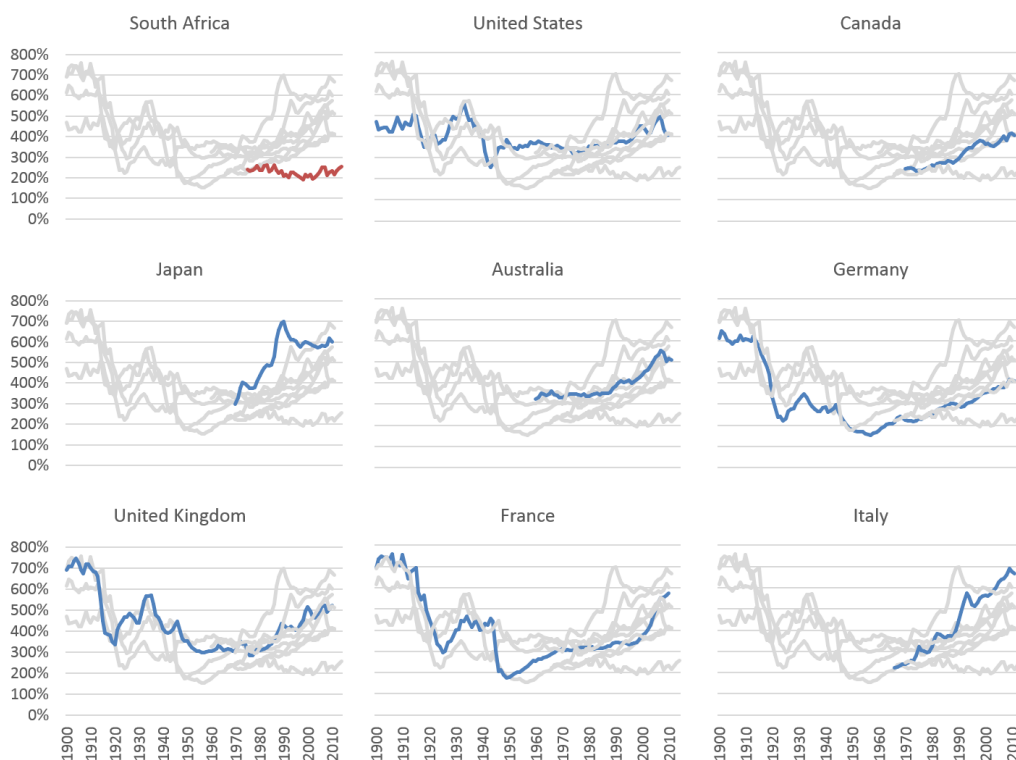
Note: Private wealth-income ratios, 1900–2010, in percent of national income. Data for advanced economies from Piketty and Zucman (2014).

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Figure 2.2: PRIVATE WEALTH-INCOME RATIO, 1975–2014
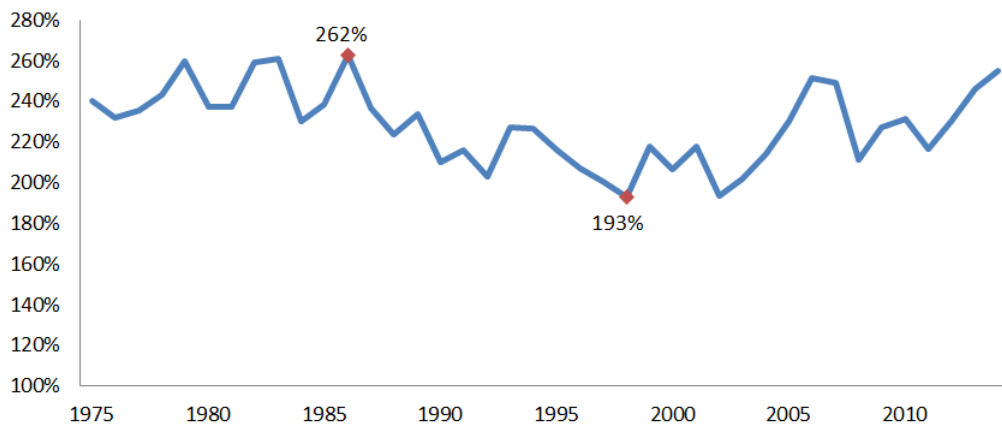
Note: South African private wealth-income ratio, 1975–2014, in percent of national income. Maximum, minimum, 1975, 2010 and 2014 marked.

Figure 2.3: PORTFOLIO COMPOSITION, 1975–2014
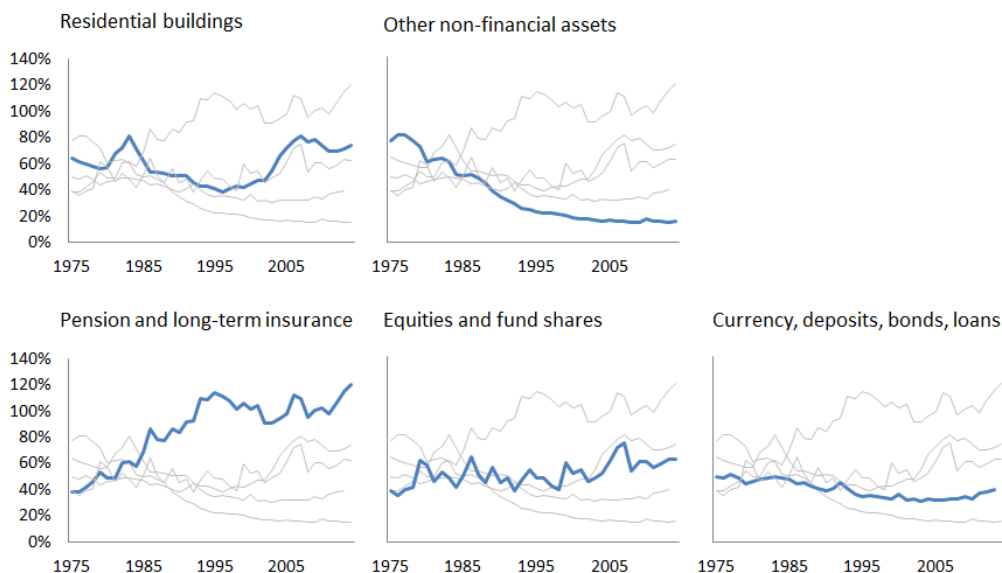
Note: Portfolio composition, 1975–2014, in percent of national income.

arrangements – a transition that is reflected in the stark increase of financial assets between 1975 and 1995 (see Figure 2.3).[2]

In most advanced economies, in contrast, pension liabilities are generally not fully funded. Particularly in Continental Europe, most pension schemes are administered by the social security system, and function on a pay-as-you-go basis. Under the accounting rules of the SNA, such pension entitlements are not recorded on households' balance sheets, which explains the comparatively low share of pension assets in Piketty's sample. Even in countries like the United Kingdom and the United States, where the retirement landscape is more diverse, pension wealth constitutes at most a quarter of total assets; in Continental Europe the share is less than 15 percent.[3]

2.4   Decomposing the wealth-income ratio

2.4.1   International comparison

Steady state decomposition

Table 2.3 shows the average savings and growth rates for South Africa and Piketty's eight rich countries between 1970 and 2010. Over this period, real national incomes in South Africa grew at $g^y = 2.5$ percent per year, while the

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[2]Although many public sector employees are still covered by defined benefit schemes, the majority of private sector employees are now covered by defined contribution arrangements, sponsored by employers, employer groups or trade unions. Under both models, the occupational pensions are currently at least partially funded. Only the government old-age grant, intended to prevent old-age poverty irrespective of previous employment, is funded from current government revenue rather than through funds. For more than three quarters of South Africans in retirement age, the means-tested old-age grant of at most 1,410 ZAR per month in 2014 (ca. 100 USD) constitutes the main source of income (National Treasury, 2004, 2012).

[3]Whether the structure of the pension system also impacts on overall wealth is unclear. Under privately administered pension schemes, the corresponding assets (of households) and liabilities (of financial corporations) are recorded on the sectoral balance sheets. Under social security schemes, in contrast, both assets (of households) and liabilities (of the general government) are unrecorded. From an accounting perspective, the measures of wealth should thus not be distorted. From a behavioural perspective, however, the presence of social security pensions might reduce the accumulation of private wealth *ceteris paribus*.

private savings rate s averaged less than eight percent of national income. In terms of the growth rate, South Africa ranks in the middle of the sample, owing largely to much higher-than-average population growth. In terms of saving, in contrast, South Africa ranks close to the bottom. In that context, it is worth noting the composition of saving: While the importance of household saving relative to corporate saving varies widely even across the advanced economies, South Africa stands out in that households contribute merely a quarter of total private saving – much less than anywhere else. While South Africa's corporate savings rate is among the highest in the sample, it is thus the low household savings rate that brings South Africa's private savings rate down in comparison.

Per equation (2.2): $\beta = s/g^y$, the saving and growth figures suggest that South Africa's wealth-income ratio is structurally lower than those of the advanced economies because the country's savings rate has been low relative to its rate of income growth – regardless of whether the private or household savings rate is considered. Especially when using total private saving, however, the steady-state equation does not provide a satisfactory explanation of the divergence between South Africa and the advanced economies. Although all three countries had fairly similar savings and growth rates, the wealth-income ratio decreased in South Africa, increased by 90 percentage points in the United States and increased by 220 percentage points in the United Kingdom. This indicates that valuation effects played a substantial role in the accumulation of wealth over the past four decades.

Finite horizon decomposition

Table 2.4 displays the results of the multiplicative decomposition proposed by Piketty and Zucman (2014). In South Africa, national income grew at $g^y = 2.5$ percent per year between 1975 and 2010, while private wealth grew at a rate of $g^w = 2.4$ percent. The small discrepancy in the growth rates of income and wealth explains the slight decline in the wealth-income ratio from $\beta_{1975} = 240$ percent to $\beta_{2010} = 231$ percent.

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Plugging the average private savings rate of $s^{priv} = 7.7$ into formula (2.3'), we find that we would have predicted wealth to grow by $g^{w,s} = 4.1$ percent per year in the absence of valuation effects, implying an increase rather than a decrease in the wealth-income ratio. The fact that wealth grew substantially less pronounced than suggested by the savings rate indicates that valuation effects were negative, amounting to $g^{w,r} = -1.7$ percent per year. This finding contrasts starkly with the advanced economies: Only Germany and Canada experienced slightly negative valuation effects between 1975 and 2010; in the United Kingdom, Australia and the United States, in contrast, asset price increases explained up to half of the total growth in private wealth.

If only the household savings rate of $s^{hh} = 2.2$ is considered instead of the total private savings rate, the saving-induced growth in wealth amounts to only $g^{w,s} = 1.2$ percent per year. In this case, the situation in South Africa is more in line with the advanced economies, where the total valuation effect explains up to three quarters of the increase in wealth. Figure 2.4 illustrates the bridge between the total revaluation effect from the household perspective and the residual revaluation effect with corporate saving taken into consideration.

The stark discrepancy between the 'total' and 'residual' revaluation effect in South Africa is due to the disproportionate importance of corporate saving relative to household saving. The specific composition of private saving in the wealth accumulation equation also stands out in Figure 2.5, which displays the results of equation (2.6). The low contribution of household saving to the increase in private wealth is visible both in absolute (top panel) and relative (bottom panel) terms. Conversely, the contribution of corporate saving exceeds that of almost all other countries in both panels.

Savings, revaluations and the portfolio composition

The discrepancy between South Africa and the advanced economies is likely also determined by differences in the asset composition. One of the main contributors of the growth of private wealth observed for Piketty's

Table 2.3: Savings and growth rates, 1975–2010

	Real income growth			Net savings rate		
	Total	*Productivity*	*Population*	*Private*	*Households*	*Corporates*
South Africa	2.5	0.5	2.0	7.7	2.2	5.5
United States	2.8	1.8	1.0	8.0	4.7	3.3
Canada	2.6	1.5	1.1	12.5	7.4	5.1
Australia	3.1	1.7	1.3	9.2	5.3	3.9
Japan	2.3	1.9	0.4	16.1	7.2	8.9
Germany	2.2	1.4	0.8	12.8	9.8	3.0
France	2.0	1.5	0.5	11.4	9.2	2.2
United Kingdom	2.3	2.0	0.3	7.5	2.8	4.8
Italy	1.8	1.5	0.2	16.7	16.4	0.3

Note: Private savings rate (households and corporations, net of depreciation, in percent of national income) and growth rate of real national income, 1975–2010, uniform-growth-weighted averages, in percent. Data for advanced economies from Piketty and Zucman (2014).

Figure 2.4: Decomposition of β, South Africa, 2014
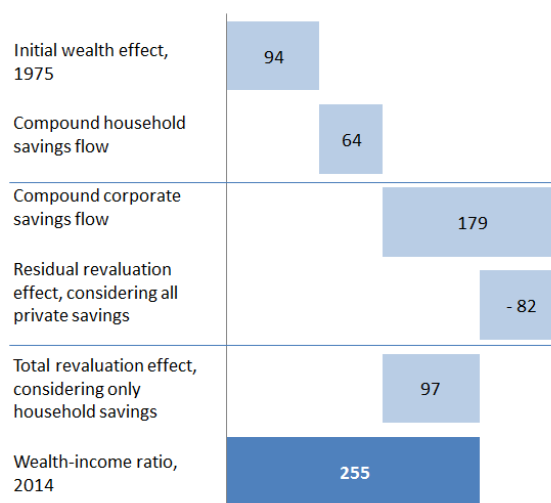
Note: Decomposition of the South African private wealth-income ratio of 2014 on the basis of 1975, in percent of national income.

Table 2.4: Decomposition of β, Cross-section, 1975–2010

	Growth rate of income	Growth rate of wealth	Private savings rate	Saving-induced component	Revaluation-induced component
	g^y	g^w	s^{priv}	$g^{w,s}$	$g^{w,r}$
Decomposition using the private savings rate					
South Africa	2.5	2.4	7.7	4.1	−1.7
United States	2.9	3.6	8.0	2.2	1.4
Australia	3.1	4.2	9.2	2.8	1.5
United Kingdom	2.3	4.0	7.5	2.0	2.0
Canada	2.6	4.2	12.5	4.3	−0.1
France	2.0	3.7	11.4	3.0	0.7
Japan	2.3	3.6	16.1	2.8	0.8
Germany	2.2	3.9	12.8	4.0	−0.2
Italy	1.8	4.0	16.7	3.8	0.2
Decomposition using the household savings rate					
South Africa	2.5	2.4	2.2	1.2	1.2
United States	2.9	3.6	4.7	1.5	2.1
Australia	3.1	4.2	5.3	1.8	2.4
United Kingdom	2.3	4.0	2.8	0.9	3.0
Canada	2.6	4.2	7.4	2.8	1.3
France	2.0	3.7	9.2	2.5	1.2
Japan	2.3	3.6	7.2	1.4	2.2
Germany	2.2	3.9	9.8	3.2	0.7
Italy	1.8	4.0	16.4	3.8	0.2

Note: Decomposition of the drivers of the wealth-income ratio between 1975 and 2010; multiplicative methodology (Piketty, 2014). β_t and β_{t+n} are given in percent of nominal income, growth rates and savings rates in percent per year. Data for advanced economies from Piketty and Zucman (2014).

Figure 2.5: Decomposition of β, Cross Section, 2010
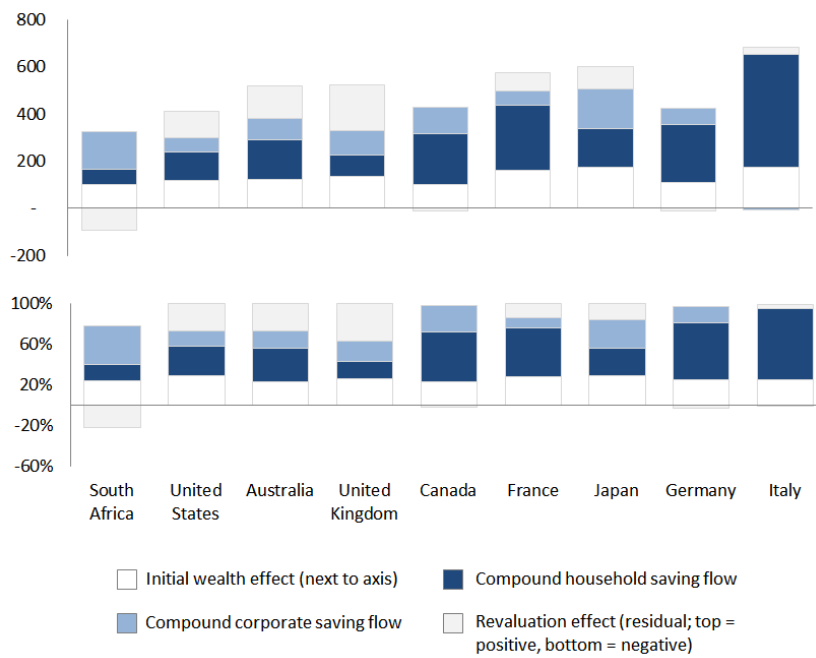
Note: Comparison of the drivers of the private wealth-income ratios of 2010 on the basis of 1975, in percent of national income (top panel) and in percent of total (bottom panel). Data for advanced economies from Piketty and Zucman (2014).

rich countries was the prolonged increases in house prices over the last four decades (Piketty, 2014, Rognlie, 2015). Rising house prices manifest themselves in higher household saving (for instance, in the form of residential mortgages) as well as in the form of real revaluations, the two components of wealth accumulation that were much less pronounced in South Africa than anywhere else.

In Section 2.3.2, we saw that housing assets are much less important than financial assets in the composition of household portfolios, while equities play a disproportionately larger role. Owing in part to the long history of controls regarding capital and exchange outflows, the large majority of these equities are likely tied to domestic companies.[4] This suggests a reason why it is corporate saving rather than household saving or revaluations that explain the largest part of private wealth accumulation in South Africa.

2.4.2 Inter-temporal analysis

In a discussion of Piketty's *Capital*, Acemoglu and Robinson (2015) stress the importance of taking into account the institutions and politics prevalent in specific countries at specific points in time. For South Africa, the most important institutional and political shift over the period 1975–2014 is certainly the transition from the apartheid regime to a new democratic government in 1992-1996.

As shown in Figure 2.2, these transition years are indeed those with the lowest wealth-income ratios in the 40-year history: Between the mid-1980s and the late 1990s, β decreased from 260 to 190 percent, as private wealth grew significantly less than what would have been predicted from the relatively high level of saving (see Table 2.5). The negative valuation effects likely reflect the capital outflows and disinvestment associated with the economic and political struggles during the final years of the apartheid

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[4]Under the current prudential rules of the SARB the foreign exposure of pension funds is restricted to 25 percent of retail assets; in the case of collective investment funds, long-term insurance funds and other institutional investors, this share cannot exceed 35 percent of assets under management; although an additional allowance in the order of five percent of assets exists for African assets in both cases (see Section O - F.6 Capital transactions in the Exchange Control Manual, available online from the SARB).

government (which included the imposition of economic sanctions in 1986-1991), as well as the political uncertainty over the transition of power and the course of economic policy and property rights in the mid-1990s.

But private wealth recovered from the late 1990s onwards, as asset price increases more than compensated for the falling savings rates. While South Africa thus still does not look like the advanced economies today, it currently seems to be on a trajectory to resemble them more closely.

Table 2.5: Decomposition of β, Decade split, 1975–2014

	Initital ratio	Final ratio	Growth rate of income	Growth rate of wealth	Private savings rate	Savings-induced comp.	Reval.-induced comp.
	β_t	β_{t+n}	g^y	g^w	s^{priv}	$g^{w,s}$	$g^{w,r}$
Decomposition using the private savings rate							
1975–1985	240	238	1.6	1.6	13.6	5.7	−4.1
1985–1995	238	216	1.6	0.6	10.5	4.6	−3.9
1995–2005	216	231	3.6	4.4	6.8	3.3	1.0
2005–2014	231	255	2.9	4.1	4.5	1.9	2.2
1975–2010	240	231	2.5	2.4	7.7	4.1	−1.7
1975–2014	240	255	2.4	2.6	7.5	3.9	−1.3
Decomposition using the household savings rate							
1975–1985	240	238	1.6	1.6	5.3	2.2	−0.7
1985–1995	238	216	1.6	0.6	3.9	1.6	−1.0
1995–2005	216	231	3.6	4.4	1.4	0.7	3.7
2005–2014	231	255	2.9	4.1	−1.0	−0.5	4.6
1975–2010	240	231	2.5	2.4	2.2	1.2	1.2
1975–2014	240	255	2.4	2.6	1.7	1.0	1.6

Note: Decomposition of the drivers of the wealth-income ratio between 1975 and 2014. Multiplicative methodology (Piketty, 2014). β_t and β_{t+n} are given in percent of nominal income, growth rates and savings rates in percent per year.

2.5   Wealth-income ratios and capital flows

In a closed economy, the wealth of a country's (private) residents would be equivalent to the domestic (private) capital stock, i.e., the capital stock available for (private) production within the country's boundaries. In South Africa—as in all major advanced economies—however, wealth is relatively mobile, with residents holding assets abroad and foreigners holding assets in South Africa. This raises the question whether the low South African wealth-income ratio can be explained by the fact that foreigners might own a significant proportion of the South African capital stock.

Over the last 60 years, South Africa has indeed consistently had a negative international investment position, meaning that the total value of foreign liabilities exceeded the total value of foreign assets held by South African residents abroad. However, the net debtor position is relatively small nowadays, amounting to -14 percent of national income in 2014 (up from -40 percent in the 1970s). It implies a private capital-income ratio of $\beta_k = 269$ percent (compared with the private wealth-income ratio of $\beta = 255$ percent), which is still significantly lower than in the sample of advanced economies (where the international investment position ranges from approximately -70 to $+70$ percent).[5]

This is in contrast to the predictions of standard models in international macroeconomics, according to which capital tends to flow from capital-abundant rich countries to capital-scarcer poor countries, in which the marginal productivity of capital and hence the returns on capital are higher. The fact that international capital flows are insufficient to balance capital-income ratios and returns to capital are, however, a well-documented puzzle in economics (see Feldstein and Horioka, 1980, Lucas, 1990).

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[5]Since I include housing capital in private capital for consistency with Piketty's work, "productive capital" includes includes capital used for the production of housing services. In 2014, fixed capital of private enterprises amounted to 190 percent of national income. Adding the fixed capital of households of 90 percent yields the private capital-income ratio of approximately 270 percent. It is interesting to note that the increase in the private wealth-income ratio since the late 1990s contrasts with a significant decline in the fixed capital of private corporations over the same time period, 215 percent at the end of the 1990s to 190 percent in 2014.

2.6 Wealth-income ratios and inequality

The main reason for the growing interest in wealth-income ratios is their potential distributional implications. As wealth gains importance over incomes, wealth inequality—which typically exceeds income inequality significantly—is likely to play an increasing role in shaping overall inequality (Piketty and Zucman, 2014, 2015).

The traditional economic view on inequality and economic outcomes is that of a "big trade-off" between equity and efficiency (Okun, 1975). In this view, inequality is a symptom of a well-functioning market economy, which provides incentives for investments, innovativeness and productive work. Particularly in poor countries, income and wealth inequality can be a sign that at least some people had (and will have) the opportunities to get an education and invest in enterprises (Barro, 2000).

Over the last two decades, however, a growing number of empirical studies suggested that high inequality could be associated with lower growth rates and shorter growth spells than in more egalitarian societies (Aghion et al., 1999, Berg and Ostry, 2011, Ostry et al., 2014). There is, however, little evidence on the channels through which inequality impacts economic growth and stability.

One channel through which inequality might impact the economy is through investment in human and physical capital. While inequality can indeed offer some people the incentives and opportunities to invest, it can also deprive a large share of the population from such opportunities. In the presence of credit constraints, poor households are not able to make optimal investments in their education, health, or enterprises, thus reducing the productive potential of the overall economy (Aghion et al., 1999, Barro, 2000). And even without credit constraints, poor households may not be willing to make such investments in the presence of uninsurable or uninsured risks (Collier and Gunning, 1999). This link is likely to be particularly relevant in countries like South Africa, where high inequality is associated with a higher poverty headcount than the aggregate middle-income status would suggest (Van der Berg, 2010).

Another channel through which income and wealth inequality could impact the economy is through its social and political consequences. On the one hand, poverty and inequality can encourage the poor to engage in criminal and disruptive behaviour. This not only constitutes a direct waste of resources that could be more productively used, but can also increase political instability and discourage investment in the economy (Alesina and Perotti, 1996, Barro, 2000). On the other hand, high inequality can lead to suboptimal policy choices. In democratic societies, it can increase the political pressure in favour of protectionist or redistributive policies, which may not be optimal for economic growth or fiscal sustainability (Alesina and Perotti, 1994, Meltzer and Richard, 1981, Ostry et al., 2014). In less democratic societies, it can instead allow wealthy elites to gain a disproportionate influence on political process, which might ultimately also be harmful for sustainable economic growth (Deaton, 2013, Stiglitz, 2012).

A third channel that has been proposed to link inequality (particularly wealth inequality) to adverse economic outcomes is that of domestic and international financial markets. High inequality has been linked to higher household debt and lower financial stability (Kumhof and Rancière, 2010, Rajan, 2010), as well as to a greater vulnerability to external imbalances (Kumhof et al., 2012).

For some of these channels, wealth inequality might be more relevant than income inequality. The investment channel depends on the extent to which credit constraints are binding, which is, in turn, a function of the household's balance sheet (the amount of savings or the value of assets for down-payments and collateral). One of the political economy channels also works through the wealth distribution, namely the distribution of assets that can be used to gain political influence. For the third channel, the role of wealth inequality is immediate: At any level of household assets and debt, higher wealth inequality is associated with a higher headcount of indebted households. To some extent, the scant evidence on the links between inequality and economic performance could also be related to the fact that most existing studies rely on measures for income inequality only.

Better measures of wealth inequality can therefore help to better understand why and how inequality affects the economy and society, and how inequality can best be addressed.

2.6.1 From wealth-income ratios to the factor distribution

The relative importance of wealth and incomes does not, by itself, determine which share of output goes to capital and labour. This is due to the decreasing marginal productivity of capital: as the capital intensity of an economy increases, the return on capital tends to decrease accordingly.

Under the assumption that all assets are real assets and that revaluation effects wash out in the long run (such that real capital gains or losses on the principal can be ignored), the private wealth-income ratio and the capital share of output α can be related through the formula

$$\alpha = r(\underset{(-)}{\beta}) \times \beta, \tag{2.7}$$

where the rate of return on capital r is a decreasing function of the wealth-income ratio β (Piketty, 2014). The distributional effect of an increase in the wealth-income ratio thus depends on the responsiveness of the rate of return, which in turn depends on the elasticity of substitution σ between capital and labour in the aggregate production function. If $\sigma < 1$, capital cannot effectively be substituted for labour (the two factors of production are complements), such that the marginal productivity of additional capital falls disproportionately. With $\sigma > 1$, additional capital can be employed more productively, allowing its owners to capture a larger share of total output. Only in the case that $\sigma = 1$ does an increase in the wealth-income ratio have no impact on the factor distribution (Arrow et al., 1961, Bronfenbrenner, 1960, Piketty, 2014).[6]

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[6]While the explanation for the responsiveness of r to changes in β assumes that capital is remunerated according to its marginal productivity, the same result can be obtained in models in which the remuneration of capital is instead determined by the bargaining power of capital owners relative to workers.

Most economic models assume a unitary elasticity of substitution; many empirical papers even suggest that the elasticity is lower (Rognlie, 2015). In *Capital*, Piketty contests both views by observing that capital shares across countries followed a similar—albeit less pronounced—trend as the wealth-income ratio, which indicates that the returns on capital have not fallen as much as the increase in capital intensity would have suggested. Since 1970, capital owners in the major advanced economies have thus been able to expand their incomes (net of depreciation) from 15–25 to 25–30 percent of total output. For Piketty, this points to an increasingly high elasticity of substitution.[7]

One reason for the disagreement on the elasticity of substitution between capital and labour and the factor shares of income is that these concepts are hard to measure. The most common methodology to measure the latter is to calculate the labour share by dividing the aggregate compensation of employees through GDP at factor cost, and to derive the capital share as the residual (Gollin, 2002). The SARB provides such estimates for South Africa, which put the gross capital share just below 50 percent. Netting out depreciation yields a net capital share just below 40 percent – significantly higher than the 25–30 percent reported in Piketty's sample of advanced economies.[8]

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[7]Piketty's view has been supported by Karabarbounis and Neiman (2014), who estimate that $\sigma = 1.25$. It has been contested by Rognlie (2015), who argues that the increase in the capital share was driven primarily by housing capital, and thus allows no inference on the shape of the aggregate production function. Instead of being a consequence of a high elasticity of substitution, the parallel increase in α and β were driven by a third factor, notably the increase in house prices.

[8]In the presence of a substantial informal sector, the methodology of dividing the aggregate compensation of employees through GDP tends to understate the labour share, since incomes of those *not* formally employed in the corporate sector are included in the denominator but not the numerator (Gollin, 2002). An alternative methodology is to divide the *corporate* compensation of employees through *corporate* value added only (Karabarbounis and Neiman, 2014). For South Africa, the corporate sector shares are very similar to the total economy estimates, indicating that there is no major distortion. Using SARB data, the corporate and total capital shares for 2010 are 51 and 50 percent; in Karabarbounis and Neiman' database they are 48 and 46 percent. To obtain net shares, depreciation is subtracted from the denominator (Karabarbounis and Neiman, 2014).

Combined with the relatively low wealth-income ratio, the high capital share points to a disproportionately high return on capital in South Africa. Per Equation 2.7, the implied average annual pre-tax return on private capital has been 15 percent on average in real terms over the last four decades – significantly higher than the 4-8 percent Piketty and Zucman estimate for the eight advanced economies, and also significantly higher than the real rate of income growth of two percent per year on average.[9]

Figure 2.6 shows α, β and r since 1975. As in the case of Piketty's sample, the capital share increased over the last decades. Yet unlike in Piketty's sample of advanced economies, this increase did not correlate with an increase in the wealth-income ratio. If anything, α and β seem to have moved inversely. The capital share of output grew substantially while the wealth-income ratio decreased in the 1980s and 1990s, peaking shortly after β reached its low. Conversely, the recent increase in the wealth-income ratio was not accompanied by a further expansion of the capital share, but rather by a small contraction. While it would be imprudent to conclude from this alone that $\sigma < 1$ in South Africa, these series do suggest that an increase in the wealth-income ratio does not automatically increase capital's share in the factor distribution. An elasticity of substitution less than unity is also consistent with the industry-level work of Kreuser et al. (2015), who estimate the elasticity of substitution for South Africa between 0.6 and 0.9.

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[9]Based on Piketty and Zucman (2014), I derive r as follows: The net capital share α is defined as the ratio between capital incomes and net domestic product at factor cost, $\alpha \equiv Y_K/(NDP-T)$, where T denotes production taxes. β is defined as the ratio between private wealth and national income, $\beta \equiv W/Y$. With r defined as the ratio between capital incomes and private wealth, we can write $r \equiv Y_K/W = \alpha/\beta \times (NDP-T)/Y$, where all figures are net of depreciation. For South Africa, the results for the period spanning 1975–2014 are $\alpha = 37$ percent, $\beta = 228$ percent, $(NDP-T)/Y = 92$ percent, yielding $r = 15$ percent on average. Note that Piketty and Zucman (2014) do not multiply α/β by $(NDP-T)/Y$. Note also that the rate of return is derived under the assumption that all assets are real assets and that valuation effects even out in the long run. For Piketty, these assumptions provide a reasonably good approximation, as real assets constitute the majority of household assets in the advanced economies. For us, however, the calculated return might be overstated, as about 30 percent of assets are nominal (while the inflation rate averaged 10 percent).

Figure 2.6: CAPITAL-INCOME RATIOS, CAPITAL SHARES AND RETURNS
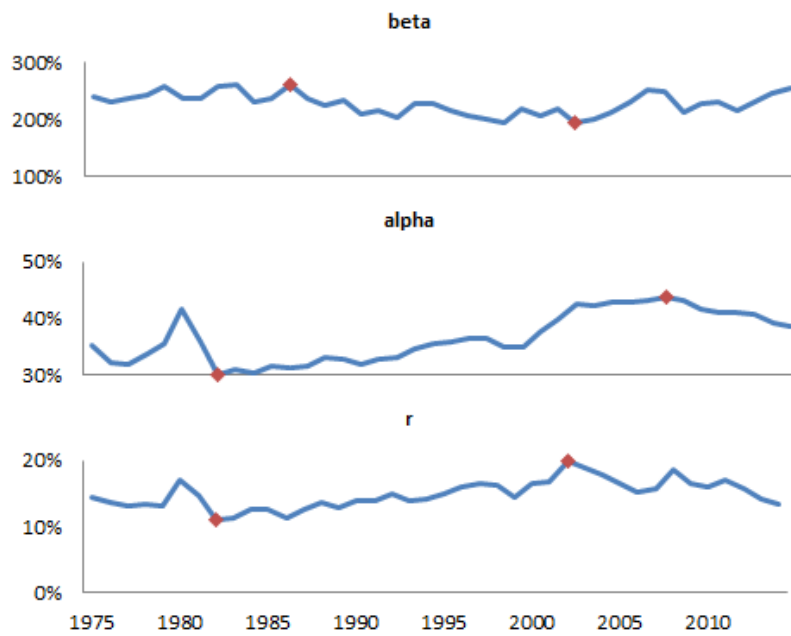
Note: Capital-income ratios β_k, capital shares α and implied rates of return $r = \frac{\alpha}{\beta_k}$, 1975–2014, in percent. Minimum and maximum marked.

2.6.2   *From wealth-income ratios to the structure of inequality*

Since wealth (and therefore capital incomes) tends to be more concentrated than labour incomes, a high capital share tends to be associated with higher overall inequality (Piketty and Zucman, 2014).

While there is little reliable data on the distribution of wealth in South Africa, it is likely that the degree of wealth inequality is extreme in a country that consistently ranks among the world's most unequal economies with regard to incomes. According to Daniels et al. (2014), 10 percent of South African households earn half of all incomes but own 80–90 percent of all wealth. The equivalent numbers for the OECD are 'only' about 30 and 50 percent (OECD, 2015). Even within the wealthiest decile, the distribution tends to be highly uneven. Data from the Forbes billionaires list suggest that the wealthiest 10 individuals owned about four percent of the country's private wealth in 2015, while the market research company New World Wealth estimates that 46,800 individuals owned assets that together amount to over a quarter of the combined wealth of all 54 million South Africans.[10]

Together with the high capital share, these figures suggest that wealth inequality should play an important role in shaping overall inequality in South Africa. This contrasts with the emphasis that South African researchers and policymakers currently place on labour market inequality: According to Van der Berg (2010) and Leibbrandt et al. (2010), for instance, wage inequality explains up to 80–85 percent of overall income inequality. One potential explanation is that wealth is too concentrated to shape the distribution anywhere but at the very top: Most South Africans have no income-generating assets at all, such that their position in the income distribution is determined by their wages alone.[11] Chapter 3 of this thesis will follow this line of thought.

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[10]Data available from *Forbes* (`www.forbes.com/africa-billionaires/list/`) and the New World Wealth South Africa Wealth Report 2015 description (`www.nw-wealth.com`) (full report not accessed).

[11]Note that the findings of Leibbrandt et al. are based on the National Income Dynamics Survey, which—being a survey with focus on incomes, expenditures, living conditions and poverty—tends to under-sample the wealthiest households and under-report assets (particularly pension assets). It might therefore understate the importance of capital

2.7 Conclusion

The intention of this chapter was to test the applicability of Piketty's work in the context of a developing country. By describing and analysing the discrepancy in the private wealth-income ratio between South Africa and the advanced economies, it made one step towards this objective. Unlike the rich countries, South Africa did not experience a prolonged increase in private wealth; a trend that reflects structural differences between developing and advanced economies (lower savings and higher growth rates) as well as specific factors surrounding South Africa's political transition in the 1980s and 1990s. Even in South Africa, however, wealth has grown much more quickly than incomes over the last 15 years. This raises the question to what extent South Africa might be starting to share more of the structural and behavioural characteristics with some of the major advanced economies.

It is important to note that this chapter did not replicate all aspects of Piketty's research. First, it focused on private wealth only, as the sectoral balance sheets for the public sector are still under construction. Once these data become available, they will allow comparing national rather than private wealth- and capital-income ratios, a concept of greater relevance from the perspective of economic growth. Second, and perhaps more importantly, this chapter does not allow for drawing conclusions about the distribution of wealth on the personal level. The analyses presented in this chapter showed that capital receives a much higher share of income in South Africa than in other countries, which points to a disproportionately high return on private wealth. If the following chapter confirms the suspicion that capital incomes are more concentrated than labour incomes, this would imply that the distributional concerns raised by Piketty's observations could be shared in South Africa even though the overall wealth-income ratio is still substantially lower.

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incomes significantly. In the advanced economies, the labour share in inequality is between two thirds and three quarters (Piketty and Zucman, 2015).

Chapter 3

Wealth inequality in South Africa: Insights from survey and tax data

This chapter assesses two sources of information on the South African wealth distribution: a large-scale household survey with 18,820 respondents in 2010–2011, and a novel sample of almost 1.2 million personal income tax records for the 2010–2011 tax year. Since both sources cover different sub-populations, I propose an approach to scale the results by fitting and drawing from censored distributions. Despite the differences in the coverage of each dataset, I find that both sources yield similar results for overall inequality once appropriate censoring rules and parametrizations are defined. In particular, I find robust evidence that wealth is much more unequally distributed than income: 10 percent of the population own at least 90–95 percent of all private wealth, compared to roughly 45 percent of all labour income. With a Gini coefficient of about 0.95 (compared to 0.60 for labour income), the South African wealth distribution is as unequal as that of the world as a whole.

3.1 Introduction

The Global Financial Crisis, the Great Recession and the increase in economic inequality have brought considerable attention to the issues of wealth distribution and redistribution (see, e.g. Piketty, 2014; IMF 2014; OECD, 2015). In many countries, however, the debates are ahead of the evidence. One such country is South Africa.

Despite the concern about the persisting economic disparities since the end of apartheid, existing research has focused almost exclusively on income inequality (see, e.g., Alvaredo and Atkinson, 2010, Leibbrandt et al., 2010, Van der Berg, 2010).[1] Even though South Africa was one of the first countries to publish a large-scale wealth survey in 2012, this data was given much less attention than the income data collected in the same survey.[2] This is particularly surprising given that capital receives almost 40 percent of total output in South Africa, suggesting that wealth inequality plays an important role in shaping overall inequality (see Chapter 2).

Without trusted domestic data, recent proposals on tax reform have been based on findings from other countries, primarily Thomas Piketty's work on the major advanced economies (Davis Tax Committee, 2015). In this chapter I re-evaluate the available survey data by combining it with novel tax records and the official household sector balance sheets. I not only want to shed more light on the distribution of income and wealth in South Africa, but also seek to propose a way in which researchers can integrate multiple data sources to study inequality even in countries in which each individual source is subject to various biases and inaccuracies.

The survey data presented in this chapter stem from the second wave of the National Income Dynamics Study (NIDS), which was conducted in

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[1]The two early exceptions are McGrath's (1982) analysis of the wealth distribution in the Natal Province of the 1970s and van Heerden's (1997) thesis on the wealth distribution of the Transvaal in 1985. Both studies use the estate multiplier method to estimate the wealth distribution from estate accounts, and focus on the extreme inequality between racial groups during the apartheid system.

[2]Daniels et al.'s (2014) analysis of the quality of the wealth data in the second wave of the National Income Dynamics Study (NIDS) constitutes the only exception. The fourth wave of the NIDS, published in June 2016, also contains a wealth module.

2010–2011 and included a special module on wealth. Surveys are a common source of information on personal wealth, but tend to understate both assets and liabilities due to the social sensitivity and cognitive complexity of the topic. Since rich households are often found to have the lowest response rates, surveys are particularly prone to understating the wealth at the top of the distribution (ECB2013a; Daniels et al., 2014, Vermeulen, 2014). And since the NIDS was not specifically designed as a wealth survey when it was launched in 2008, it is exceedingly unlikely that its sample includes any of the few high net worth individuals that typically capture a significant share of private wealth.

Tax filing is mandatory for people with incomes above certain thresholds, such that personal tax records are not subject to the same biases as voluntary surveys. In South Africa, however, wealth itself is not liable to taxation, such that taxable investment income must hold as a proxy for wealth. In this chapter I use a previously unpublished dataset of almost 1.2 million personal income tax (PIT) records for the 2010–2011 tax year. Although the PIT dataset should provide better information on the top of the distribution than the NIDS, the data have other limitations. First, the PIT dataset provides no information on forms of wealth that do not generate taxable investment income to the tax filer, such as owner-occupied housing, pension assets or assets held in trusts. Second, the PIT dataset excludes all individuals whose incomes are below the filing thresholds. While non-filers are not of much concern to researchers in advanced economies, they constitute the majority of the population in developing countries. Less than 20 percent of the South African adult population are liable to file income tax returns, and less than a tenth of these filers—about one percent of the total adult population— declared any investment income at all.

To compare the information from both data sources I treat the PIT dataset as a proxy for the wealth of the tax-filing top tail of the distribution, and "scale" the results by simulating the wealth of non-filers from a bottom-censored lognormal distribution.[3] I also test the NIDS for potential

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[3]Researchers in other countries have estimated the underlying asset holdings by capitalising investment incomes using average investment returns for each asset class

misreporting of top wealth by dropping and re-drawing the richest one percent from a top-censored Pareto distribution. This approach is validated by the finding that the resulting measures of income inequality coincide closely between the two sources: according to the NIDS, one percent of the employed population earns 11 of all labour income whilst ten percent earn 46 percent; in the PIT dataset, the equivalent figures are 12 and 43 percent.

With regards to wealth inequality, the results coincide less neatly. Tail wealth remains particularly hard to pinpoint, with top one percent shares ranging from 60 percent in the NIDS to almost 90 percent in the PIT dataset, where important forms of middle-class wealth (such as housing and pensions) are excluded. Nevertheless, both sources agree that ten percent of the population own 90–95 percent of all wealth.

Since neither the NIDS nor the PIT dataset reflects the asset composition in the national accounts, I also combine the estimates using the PIT dataset to measure the concentration of financial assets, the NIDS to measure the concentration of non-financial assets, and the national accounts to define appropriate weights. The resulting top wealth shares of 67 percent for the top centile and 93 percent for the top decile should provide the most reliable first estimates for wealth inequality in South Africa. With a combined Gini coefficient of 0.95 (compared to 0.60 for labour income), they suggest that the country itself is as unequal as the world at large.

Age and race can play a role in explaining the high degree of wealth inequality in South Africa. Younger people have had less time to accumulate savings than older ones; black citizens were denied access to most forms of capital during the apartheid system (see, e.g., McGrath, 1982).[4] Yet, neither of these factors is found to contribute more than five percent to total wealth inequality. While the age-wealth profiles lend some support for the life-cycle hypothesis among middle class households, inequality *within* generations

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(Saez and Zucman, 2014, Wolff, 1987). Given the low granularity of the PIT records (split into *interest income* and *other investment income* only) and given the additional sensitivity that would be introduced by making assumptions on the returns of the *other financial assets* category, I use investment income directly. This equates to the assumption that all asset classes generate the same average returns.

[4]In this thesis, "black" refers to all South African citizens not of European descent.

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remains much more important than inter-generational inequality. And while black households are still much poorer on average than white households, it stands out that the inequality *within* the African majority population far exceeds the inequality of all other groups. Paradoxical as it sounds, the presence of (disproportionately wealthy) white households *lowers* overall wealth inequality in South Africa. This finding supports existing research on income, according to which South Africas highly unequal income distribution is increasingly shaped by growing within-group inequality (Leibbrandt et al., 2010).

To my knowledge, this is the first study that systematically examines private wealth, its distribution and composition in South Africa. It draws on a growing literature on wealth inequality using household wealth surveys (e.g., ECB 2013a,b; Vermeulen 2014) and income tax records (e.g., Bricker et al., 2016, Saez and Zucman, 2014), and extends it to a context in which both surveys and tax records are less reliable. My initial hypothesis was that an integrated view of the two sources would be necessary in a country in which each individual data source is highly incomplete and inaccurate. I was thus surprised to find that the two data sets led to surprisingly similar conclusions on the overall income and wealth distribution (outside the top one percent). Although this chapter suggests that more accurate data is necessary for designing concrete policies on wealth redistribution, it should provide some encouragement to practitioners who wish to study the degree of inequality in countries with even scarcer data than South Africa.

3.2 HOUSEHOLD WEALTH: THE AGGREGATE VIEW

Although this chapter is primarily concerned with the distribution of wealth between households, aggregate household sector balance sheets are relevant to contextualize and compare the household-level data. This section briefly recaps the main results from Chapter 2 on the size and composition of wealth in South Africa.

CHAPTER 3. WEALTH INEQUALITY IN SOUTH AFRICA

The concept and measure of wealth in this chapter follows directly from the household sector balance sheets in the South African national accounts. Based on the work of Aron and Muellbauer (2006) and Aron et al. (2008) the definition is consistent with those in the major advanced economies. Wealth is calculated as the residual between the market value of all assets and liabilities – a quantity also known as "net worth". Assets include financial assets (such as cash, stocks, bonds, unit trusts, pension and long-term insurance assets) and non-financial assets (real estate, land and other fixed assets), but exclude durable consumer goods (such as cars). Although the combined assets of the household sector typically exceed its liabilities on the aggregate level, the net worth of individual households can therefore also be negative.

At 255 percent of national income, private wealth plays a much smaller role in South Africa than in the major advanced economies (where it ranged from 400 to 700 percent in 2010; see Piketty, 2014). Two thirds of this wealth is in the form of financial assets, with pension and life-insurance assets being the single most important form of private wealth (36 percent of total assets in 2010).

Despite the relatively low level of private wealth, capital receives an even larger share of output in South Africa than elsewhere. The net capital share of output is just below 40 percent – significantly higher than the 25–30 percent reported in Piketty's sample of advanced economies. In combination, these figures point to a disproportionately high return on capital in South Africa (Piketty, 2014).

A high capital share of total output means that wealth inequality plays an important role in determining the structure of overall inequality: almost 40 percent of total income accrues to capital owners, which tend to form a much smaller group than the recipients of labour income. To what extent the factor distribution shapes the overall personal income distribution depends on the size of this group as well as on the concentration of investment income and wealth relative to labour income and employment. The remainder of this chapter will attempt to address this question.

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3.3 Wealth distribution: Data sources

There are two main sources for microeconomic data on wealth: large-scale household surveys and administrative records from tax authorities. The main advantage of surveys is that they allow researchers to pose a large number of questions to a large number of people. The second wave of the biannual National Income Dynamics Study (NIDS)—conducted by the Southern Africa Labour and Development Research Unit (SALDRU) in 2010–2011—included a special module on wealth, and asked almost 9,000 households with 24,000 adult members about the value of all their assets and debts. The main disadvantage is related to the sample selection: given that wealth tends to be highly concentrated among a small number of high net worth individuals, a random sample is very unlikely to include any one of these households. Another disadvantage of surveys is that the participation is voluntary: surveyed households can refuse to answer certain questions or decline participation altogether. In the case that the willingness to participate differs between poorer and richer people, this introduces a bias in the survey results (Ravallion, 2003, Vermeulen, 2014, Wolff, 1987). Thirdly, the accuracy of wealth survey data also suffers from the social sensitivity and cognitive complexity of the topic, which tends to lead people across the distribution to understate the value of their assets vis-à-vis the interviewer (ECB 2013a; Daniels et al. 2014).

Since taxation is mandatory for people with income above certain thresholds, tax records can provide better information on the top of the wealth distribution. In South Africa, however, wealth itself is not liable to taxation, such that taxable investment income must hold as a proxy. For this study, the South African Revenue Service (SARS) provided a previously unpublished 20 percent sample of the 2010–2011 personal income tax (PIT) assessment, which consists of almost 1.2 million individual records.[5] Since not all assets produce income streams and since not all income streams can be

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[5]The 2011 assessment covers the tax year from March 2010 to February 2011. SARS also provided a 20% sample of the 2014 assessment for the 2013–2014 tax year, which is briefly discussed in Appendix C.4.

tracked at the level of the individual, however, the wealth coverage of the PIT dataset is much narrower than can be achieved by household surveys.[6] The following sections discuss the South African survey and tax data in greater detail.

3.3.1 Wealth concepts in the NIDS and the PIT dataset

What is included in the NIDS?

In theory, the wealth concept of the NIDS is closely comparable to the national accounts. A household questionnaire asks the oldest woman or other knowledgeable adult in the household about the value of the household's non-financial assets and mortgages, while an adult questionnaire asks each household member about their financial and business assets and liabilities.[7] Both questionnaires also contain a "one-shot" question on wealth. This question asks whether the respondent would be in debt, break even or have something left over if they would sell all assets and repay all debts, and asks them to quantify this amount. From these four sources one can (in theory) construct comprehensive estimates of household and individual wealth.

To generate such a wealth variable, I first aggregate all asset-level data from the adult and household questionnaires into pension and life-insurance assets, other financial assets/liabilities, business assets/liabilities, real estate assets/liabilities, and livestock assets. I do not impute missing values, unless the answer is given in preceding or subsequent questions. I then aggregate the individual-level assets and liabilities across household members to arrive at the bottom-up estimate for household-level wealth. Analogous to this,

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[6]A third type of data, also administrative, comes from estate tax records. When combined with mortality tables, these can be used to estimate the underlying wealth distribution (Piketty and Saez, 2006, Wolff, 1987). The first analyses on the South African wealth distribution were based on estate tax records from Natal (McGrath, 1982).

[7]Non-financial assets include real estate, land and livestock; financial assets include cash, banking assets, stocks, bonds, unit trusts, life insurance and pension assets; liabilities include mortgages, bank and non-bank loans, credit card and store card debt as well as outstanding hire purchase agreements. Appendix B.1 provides details on the NIDS wealth data.

I break down household-level assets and liabilities to arrive at individual wealth estimates.[8]

In certain cases, the answer to the one-shot wealth question might provide a more reliable indicator than the bottom-up estimates. I substitute valid, non-zero one-shot results for the bottom-up estimate if these estimates are missing or zero. I also substitute one-shot results in cases in which these exceed the bottom-up estimate in absolute terms due to item non responses on the category level (i.e., the household does not have valid responses for all classes of assets and liabilities), or due to unit non-responses within households.[9]

If all questions are answered accurately, this procedure should provide a comprehensive estimate of private wealth. In practice, however, it is unlikely that survey respondents disclose their entire wealth. Although half of all formal-sector employees are covered by occupational pension schemes, for instance (National Treasury, 2012), only five percent of adults reported owning a pension or retirement annuity, and only a third of these were able or willing to provide a quantification. While pension and long-term insurance assets thus constitute more than 30 percent of assets in the national accounts, they only account for 10 percent of assets in the NIDS. For non-pension financial assets, the under-statement is even more pronounced.[10] If financial assets are more concentrated than non-financial assets (see, e.g. ECB, 2013b; OECD, 2015, Saez and Zucman, 2014), the under-statement of

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[8]Real estate and livestock are measured on the household level. For real estate, the NIDS asks to specify up to three home owners. Where available, I use this information to allocate real estate assets and mortgages to household members; otherwise, I allocate these items evenly to all adult household members. For livestock, the NIDS provides no information on ownership, so I allocate livestock assets evenly to all members.

[9]Appendix B.1 and B.2.2 provide detail on the treatment of missing values and the construction of our wealth aggregates.

[10]Note that the national accounts and the NIDS are not perfectly comparable: The national accounts include non-profit institutions in the household sector, while the NIDS does not survey such institutions. National accounts and surveys also differ in the treatment of business assets and the coverage of land (ECB 2013b). However, the discrepancies seem too large to be explained by conceptual differences. See Appendix B.5 for a Table with the portfolio composition, and Appendix B.6 for a detailed discussion of pension wealth in the NIDS.

financial wealth is likely to introduce a downward-bias to our estimates on wealth inequality.[11]

What is included in the PIT dataset?

Whereas the concept of wealth in the NIDS is at least theoretically comprehensive, the coverage of the PIT dataset is from the outset limited to those assets that generate taxable incomes in the name of the individual tax filer (see also Table 3.1). It therefore provides no information whatsoever on assets that do not generate investment incomes (such as owner-occupied housing or livestock), assets whose incomes are exempt from taxation, or assets whose incomes accrue to a different entity (such as in the case of pension funds or trusts).

In countries with more comprehensive (or better integrated) wealth-related tax systems, researchers usually estimate underlying asset holdings before analyzing the wealth distribution (Bricker et al., 2016, Saez and Zucman, 2014, Wolff, 1987). This capitalization technique makes assumptions on the average investment returns for each asset class, and uses these returns to convert flows into stocks. Given the low granularity of the PIT records provided by SARS (split into *interest income* and *other investment income* only in order to protect anonymity) and given the additional sensitivity that would be introduced by making assumptions on the average return of the *other financial assets* category, the analyses presented in this chapter are based on investment income directly. Compared to the income capitalization methodology, this simplification equates to the assumption that all asset classes generate the same average returns.

The following provides an overview about all forms of wealth that are missing in the PIT dataset:

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[11]Financial assets have also been found to be understated in other countries (see, for example, Andreasch and Lindner, 2014, Sierminska et al., 2008). Apart from general under-reporting, the high concentration of financial assets among very wealthy households (who tend to be under-represented in surveys) can also play a role in explaining the discrepancy.

Tax exemptions: Local interest up to R22,300 is exempt from taxation, and local dividends are liable to the dividend withholding tax rather than the PIT. While these incomes are reported for informational purposes in the PIT files, they are not verified by the tax authorities. If recipients of interest incomes below the tax threshold don't bother to report their earnings, this could lead us to *overstate* the degree of inequality.[12]

Owner-occupied housing: For most lower and middle income households, their homes constitute a large share of their wealth. Since owner-occupied houses do not generate income, these assets are not reflected in the PIT dataset – an omission that is likely to further *overstate* the degree of inequality, and that we cannot correct for with the available data.

Pension assets: Interests in pension funds and long-term insurers are an even more important asset class for South African households than housing. However, pension and insurance assets are only taxable through the PIT when paid out to the beneficiary (as an annuity or lump-sum withdrawal), which would lead us to *overstate* inequality significantly. I propose to impute the value of pension assets from current pension and retirement annuity contributions, which are reported as deductions in the PIT. However, the lack of information on individual contribution periods and pre-retirement withdrawals limits the accuracy of this correction and likely leads us to *understate* the degree of inequality.[13]

Private trusts: While the investment incomes of trusts are liable to taxation, the PIT dataset does not link the tax files of private trusts to individual beneficiaries. Since private trusts are widely used among wealthy South Africans, their omission is likely to *understate* the degree of inequality further.

Business assets: Although the PIT system includes profits of unincorporated businesses, these are likely to include a significant labour component. Since the estimation on the basis of investment returns is highly

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[12]I impute non-reported interest income based on draws from a fitted distribution, which should provide a lower bound for the inequality of local interest income. See Section 3.3.3 for details on the imputation of interest income under the filing threshold.

[13]See Appendix C.2 for details on the imputation of pension assets.

sensitive (R100,000 in entrepreneurial income would be interpreted as one million Rand worth of business assets under a rate of return of 10 percent), I decide to exclude business profits from our measure of investment income. Since real business assets are among the most highly concentrated forms of wealth, this exclusion will further contribute to *understate* the degree of inequality.

Capital gains: In addition to regular income streams, many assets generate capital gains or losses when the current value differs from the purchase price. However, these paper gains or losses only become liable to PIT filing when they are sold, donated, bequeathed or otherwise disposed of. If the data spanned several decades, the distribution of reported capital gains and losses could provide very valuable insight on the underlying wealth distribution. Due to the irregularity of asset disposals, however, the inclusion of realised capital gains and losses in a cross-sectional study would bias our findings. I therefore exclude capital gains and losses from the investment income data, despite the fact that this also contributes to *understate* inequality.[14]

Tax evasion: Although PIT filings are verified in tax inspections, it is likely that a non-negligible portion of investment income bypasses the tax system due to tax evasion – particularly through offshore assets. As with private trusts, offshore portfolios are more common among the wealthy, thus constituting another omission that biases our estimates downwards.

Liabilities: The PIT dataset provides no information on liabilities. This could lead us to either over- or understate the degree of inequality: On the one hand, we implicitly treat indebted people as if they had zero or even positive wealth; on the other, we also overstate the wealth of highly leveraged

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[14]While I exclude local capital gains, I cannot exclude foreign capital gains since these series were not provided for confidentiality reasons. Foreign capital gains are relatively small – in 2011, 2,024 individuals reported foreign capital gains of R73,361 on average (compared to 54,050 individuals reporting local capital gains of R105,730 and 190,318 individuals reporting an average interest income of R55,537) (South African Revenue Service, 2012). Nevertheless, the failure to exclude individuals with high foreign once-off capital gains is likely to increase measured inequality significantly.

investors. Since assets are distributed very similarly to wealth in the NIDS, this indicates that the bias should only be moderate.

Whether our estimates of wealth inequality from taxable investment income are over- or understated (relative to the NIDS and relative to the true level of inequality) will depend on the relative magnitude of the individual biases.

3.3.2   Coverage of the NIDS and the PIT dataset

Who is included in the NIDS?

One of the main advantages of the NIDS dataset is its scope. As one of South Africa's largest household surveys, it covers roughly 8,986 households with 23,846 adult members. Despite a relatively high non-response rate on wealth-related questions, it still contains 18,820 observations on wealth per person – thus covering a larger share of the population than some of the American and European wealth surveys.

Despite the comparably large size of the NIDS, the survey is unlikely to provide an unbiased representation of the South African wealth distribution. It is commonly found that higher-income households are less likely to be successfully interviewed in surveys (Ravallion, 2003, Vermeulen, 2014, Wolff, 1987). SALDRU provides two sets of weights to correct for systematic differences in the probability that a household is interviewed in the initial and subsequent waves of the survey, as well as to calibrate the dataset to national, provincial and sex-race-age group population totals.[15] While these weights help to correct for the under-representation of middle-class households relative to poorer ones, they cannot correct for the fact that a survey with roughly 9,000 households is exceedingly unlikely to include one of the few thousand ultra-high-net worth households that tend to control a significant proportion of wealth in any country. Of the 10 South Africans on the African *Forbes* ranking, the poorest had a net worth of more than R3

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[15]I use SALDRU's post-stratified weights in all analyses of the NIDS. Using these weights, I do not find that item non-response rates differ systematically between income deciles. See Appendix B.2.1 and B.2.2 for details on sampling and response biases.

Table 3.1: PIT – Measure of "wealth"

Asset class	% of total	Income	Concentration	Covered in PIT?
Pension and long-term insurance assets	35	Various	Medium	Partly[†]
Other financial assets				
Cash equivalents	11	Interest	Medium	Yes[‡]
Other securities*	22	Interest and dividends	High	Yes[‡]
Real estate assets	26			
Owner-occupied		Implied rent	Low	No
Rented out		Rental income	High	Yes
Other non-financial assets (e.g., agricultural land, livestock, business assets)	6	Business and rental income	High	Yes
Liabilities	20	Interest	Low	No

Note: Portfolio composition in the national accounts and coverage in the PIT dataset. The distribution of total assets is estimated from the balance sheets for households and financial institutions. The degree of concentration is based on Piketty (2014) and Saez and Zucman (2014). *Other securities includes government securities, stocks, debentures, preference shares and ordinary shares. [†]Current contributions to pension and retirement annuity funds only. [‡]Local interest below the threshold of R22,300 and local dividend income in its entirety is exempt from the PIT, and the accuracy of exempt income is not verified in the tax inspection process.

billion (US$400 million). With a net worth of "only" R300 million, the richest person in the NIDS is thus well below this cut-off of the ultra-wealthy.[16]

Who is included in the PIT dataset?

South African residents are liable to file income taxes as soon as their income exceeds a certain filing threshold. In 2011, 5.9 million individuals filed their tax returns; about 17 percent of the adult population of 34.5 million.[17] Filing thresholds imply that our data is *censored* for the bottom 83 percent of the distribution: We have no other information on the incomes of the non-filing majority than that their labour income must have been less than R120,000 and their local interest income below R22,300 in 2010.

In addition to being bottom-censored, the PIT dataset is effectively top-coded for individuals with taxable incomes above R10 million (602 individuals in 2010–11, or 120 individuals in the 20 percent sample). For confidentiality reasons, SARS provides only aggregate statistics for this group of people.[18] Even with top-coding, the richest person in the PIT dataset reports an interest income of R22 million – in line with assets of R2–4 billion at a rate of return of 5–10 percent and a 20 percent share of interest-bearing

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[16]If there are 30 Rand billionaires in South Africa, a simple random sample would have to include at least 1.8 million people in order to include at least one of them with 80 percent probability (hypergeometric distribution: $0.8 = 1 - P(X = k) = 1 - \binom{K}{k}\binom{N-K}{n-k}\binom{N}{n}^{-1}$, where $K = 30$, $k = 0$, $N = 34,500,000$, and $n = 1,800,000$ is solved for iteratively).

[17]For labour income, the 2011 threshold is R120,000 (one employer) or R60,000 (more than one employer). With regards to investment income, the filing threshold is R22,300 for local interest and R3,700 for foreign interest or dividends – an amount consistent with financial assets of more than R300,000 at 2010 deposit interest rates of 6–8 percent (see Appendix C.1). The exception to this overlap are non-compliant high-income individuals (who do not file tax returns for the purpose of tax evasion) and low-income individuals who do file tax returns in order to claim deductions. Voluntary filing is common: In the 2011 assessment sample, 25 percent of filers have a labour income below R60,000 and 50 percent below R120,000, and 98 percent of filers have an interest income below the filing threshold of R22,300.

[18]While this top-coding does not bias our results on top wealth shares for the larger population, it does introduce a minor downward bias to some distributional metrics (such as Gini coefficients). It has been proposed to correct for right-censoring by simulating the topcoded values from a censored distribution (see e.g. Jenkins et al., 2011). Given the small number of top-coded observations (120 individuals in a sample of almost 1.2 million) and the complications arising from top-coding on the basis of a third variable (taxable income), I proceed with the imputation of averages.

assets. Although the *Forbes* rankings report even wealthier South Africans, this suggests that the coverage of the top tail is indeed much better in the PIT dataset than in the survey data.

3.3.3   Scaling and resampling

Scaling the bottom tail of the PIT

Since the PIT only includes the sub-population of tax filers, we have to make assumptions on the incomes of non-filers before calculating distributional metrics for the overall population. A standard assumption on the shape of the income distribution is a leptokurtic lognormal distribution: While the thick upper tail of the income distribution is described through a power law, the majority of incomes follow a lognormal distribution (Battistin et al., 2009, Lydall, 1976, Montroll and Shlesinger, 1982, Pareto, 1897). To "scale" the distributional estimates from the 5.9 million tax filers to the total adult population of 34.5 million, I simulate the incomes of non-filers by fitting a censored lognormal distribution to the data.

I first add 5.7 million observations ($5.7 = 0.2 \times (34.5 - 5.9)$) to the dataset, and set their incomes equal to the filing thresholds. I take logarithms and use a Tobit model to estimate the mean $\hat{\mu}$ and variance $\hat{\sigma}^2$ of the censored distribution. I then impute the missing data as random draws from a normal distribution $ln(y^*) \sim N(\hat{\mu}, \hat{\sigma})$, conditional on the data being below the threshold b. The conditional mean and variance for bottom-censored observations are derived as

$$E(y|y \leq b) = \hat{\mu} - \hat{\sigma}\frac{\phi(\beta)}{\Phi(\beta)} \tag{3.1}$$

$$Var(y|y \leq b) = \hat{\sigma}^2\Big[1 - \beta\frac{\phi(\beta)}{\Phi(\beta)} - \Big(\frac{\phi(\beta)}{\Phi(\beta)}\Big)^2\Big] \tag{3.2}$$

where b is the lower censoring value, $\hat{\mu}$ and $\hat{\sigma}$ the estimated mean and standard deviation of the censored distribution, ϕ the standard normal density, Φ the cumulative standard normal density, and $\beta = \frac{b-\hat{\mu}}{\hat{\sigma}}$ (see Greene, 2012, Ch.19).

Even among filers, individual data points might be censored because of tax exemptions on investment income. A person with a labour income of R200,000 and an interest income of R10,000 is liable to file taxes because he or she exceeds the filing threshold on employment incomes, but might decide to omit his or her interest income as it is irrelevant to the bottom line. Applying the scaling approach to these non-reporters (zero entries among filers) should correct for any such bias.

Resampling the top tail of the NIDS

While the PIT excludes the bottom 83 percent of the population, the NIDS runs the risk of under-representing the very top. While there are some very wealthy individuals in the NIDS, Daniels et al. (2014) suggest that these observations may just be the result of measurement error rather than of genuinely rich respondents. Indeed, a detailed analysis of the wealthiest people in the survey reveals some irregularities regarding the composition of assets and the associated income streams, supporting the measurement error hypothesis. Since it would be imprudent to discard all "too-rich-to-be-true" observations without replacement, I test the sensitivity of the results by dropping the wealthiest one percent of respondents from the dataset (therefore artificially truncating the sample to the right) and re-drawing them from a power-law distribution.

A variable x follows a power law if all $x > x_{min}$ are drawn from a probability distribution $p(x) = Cx^{-\alpha}$, where x_{min} is the lower bound on power law behaviour, the tail index α determines the weight of the tail (with lower α indicating a fatter tail), and C is a normalization constant that ensures that the total probability sums to one. I follow the procedure proposed by Clauset et al. (2009) to estimate α under different levels of x_{min}. In the NIDS, our estimates cluster around $\alpha \approx 1.0$ for the top 1-5 percent of the wealth distribution, although the fit of the distribution is poor. In the PIT, we are more successful at fitting a Pareto distribution for the top one percent of tax filers, and estimate a tail index of $\alpha \approx 1.5$. This estimate is closer to Pareto's original findings (Pareto, 1897), as well as to recent findings on the wealth distribution of advanced economies (Gabaix, 2009,

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Klass et al., 2006, Vermeulen, 2014). I resample the richest one percent of respondents (all individuals with more than one million Rand) using both the fitted ($\alpha = 1.0$) and "theoretical" ($\alpha = 1.5$) distributions, averaging the distributional results from 100 inverse random draws.[19]

3.3.4   Summary: Biases in NIDS and PIT

The main limitation of the NIDS is its coverage of the top tail of the wealth distribution and the quality of its responses across the distribution. Targeted wealth surveys such as the Eurosystem HFCS or the American SCF are specifically designed to reduce the sampling and response biases, and to ensure a high level of accuracy of responses by using a detailed questionnaire and extensive consistency checks during and after the computer-assisted interviews.[20]   Nevertheless, the HCFS understates aggregate household wealth (and particularly financial wealth) compared to the national accounts (ECB 2013b), and understates wealth inequality compared to results from rich lists (Vermeulen, 2014). Given the fact that wealth was just a "special theme" in the second Wave in the NIDS, the biases that are associated with wealth surveys are thus likely to be much more severe in the South African case.

Being mandatory and cross-checked in tax inspections, the PIT is not subject to the same biases as the NIDS. However, the main weakness of the PIT is the limited coverage of investment income and the challenges

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[19]Appendix B.4 provides details on the resampling methodology and summarises results on the fitted distribution.

[20]In the U.S. SCF and the French and Spanish HFCS surveys, information from tax records is used to create a separate sampling frame of wealthy individuals (Saez and Zucman, 2014, Vermeulen, 2014). In other countries, the HCFS attempts to oversample wealthy households on the basis of regional income (Vermeulen, 2014). In some European countries, the HFCS attempts to increase the sampling and response rates of wealthy households by providing incentives against the selection of "easier" households by interviewers. (see, e.g., Albacete et al., 2012). The survey design also contains measures to increase the accuracy of responses. For instance, households are not asked about the value of their life insurance, but about the inception date, contract duration, frequency and amount of contributions. In addition to over 150 internal checks, all survey responses are then analysed by experts, and inconsistent or unusual responses are confirmed or corrected in follow-up interviews (Albacete et al., 2012; ECB 2013a).

in drawing conclusions about the distribution of the underlying assets and liabilities. Table 3.2 provides an overview of the coverage and biases in the survey data and the tax records.

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Table 3.2: NIDS vs PIT – Coverage and biases

	NIDS	PIT
Coverage		
Pension and long-term insurance assets	Good in theory, poor in practice: many n/a	Good coverage of current contributions, but no information on total assets
Other financial assets	Good in theory, poor in practice: many n/a	Good for most assets except domestic equities and assets held through trusts
Real estate assets	Good	Rented out real estate only
Other non-financial assets	Business wealth as one-shot only	Business income includes labour component
Biases		
Sampling bias	Severe	n/a
Response bias	Limited	n/a
Recall bias	Severe	Limited (false responses for tax evasion reasons only)

Note: Comparison of coverage and biases in the NIDS and PIT data.

3.4   Wealth distribution: Results

3.4.1   Individual results

Despite the differences in the two data sources, their results on *income inequality* coincide closely. One percent of the employed population receives 11–12 percent of all labour income; together, the top decile receives 43–46 percent. Overall inequality is high, with a Gini coefficient of 0.58 in the PIT and 0.60 in the NIDS. Although these figures reflect poorly on the South African labour market, their comparability supports the validity of our scaling approach.[21]

With regards to investment income and wealth, the results coincide less neatly. Particularly top inequality is much higher in the tax records than in the survey data: one percent of the population owns 60 percent of wealth in the NIDS, but receives almost 90 percent of investment income in the PIT. Yet both sources agree on the extent of overall wealth inequality – likely because they are so close to the upper bound: ten percent of the population own almost all wealth (95 percent) and receive almost all investment income (99 percent); in both sources, the Gini coefficient approaches unity (see Table 3.3 and Figure 3.1 for the NIDS, and Table 3.4 and Figure 3.2 for the PIT). If these figures are in the vicinity of the truth, South Africa as a country is as unequal as the world as a whole (see Davies et al., 2016).[22]

3.4.2   Concepts of wealth and combined estimates

The comparison between the NIDS and the PIT is, in theory, a comparison between total wealth on the one hand and investment income on the other.

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[21]The distributional metrics for labour income inequality are based on the employed population only. For consistency, I assign missing incomes to 60 percent of the unobserved population in the PIT (based on an employment rate of 40 percent in the NIDS in the population aged 15+) before following the scaling approach for the remaining share of non-filers ($100 - 60 - 17$ percent $= 23$ percent of the population).

[22]Davies et al. (2016) estimate the global wealth distribution by estimating a relationship between income and wealth inequality (based on 31 countries with micro-level wealth data, not including South Africa). They estimate the global Gini coefficient at 0.91, the top 10 percent wealth share at 87 percent and the top 1 percent wealth share at 48 percent.

Table 3.3: NIDS – Income and wealth distribution

	Top 1%	Top 10%	Middle 40%	Bottom 50%	Gini
Wealth					
Full sample	60	95	6	-1	0.98
Top 1% resampled, $\alpha = 1.0$	69	96	5	-1	0.93
Top 1% resampled, $\alpha = 1.5$	45	92	9	-1	0.87
Income					
Employed population	11	46	43	12	0.60

Note: Quantile shares, NIDS, 2010, in percent. Calculations based on weighted sample using adult-level data and post-stratified weights.

Table 3.4: PIT – Income and wealth distribution

	Top 1%	Top 10%	Middle 40%	Bottom 50%	Gini
Investment income					
Local interest*	84	98	2	0	0.98
Total investment*	88	99	1	0	0.99
Total investment & pensions*	60	96	4	0	0.96
Income					
Employment income	12	43	45	12	0.58

Note: Quantile shares, PIT, 2010. Results scaled to the total adult population (see Section 3.3.3). *Adjusted for tax-exempt interest income.

Figure 3.1: NIDS – Income and wealth distribution
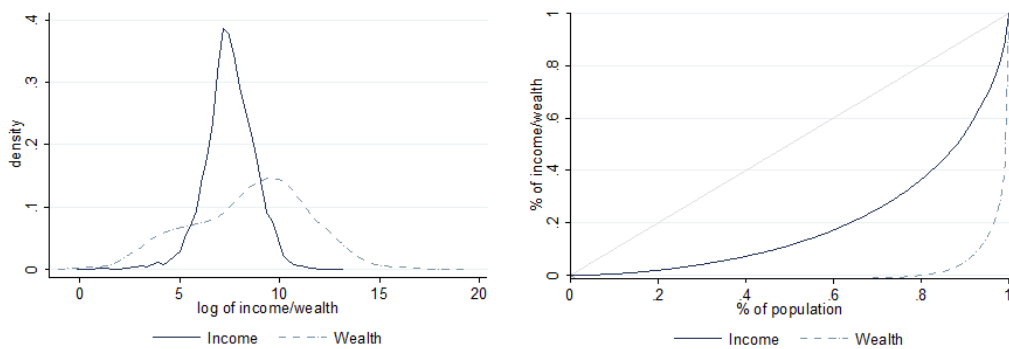
Note: Income distribution, NIDS, 2010. Calculations based on weighted sample using household-level data and post-stratified weights. Left panel: Kernel density curves of logged income; right panel: Lorenz curves.

Figure 3.2: PIT – Income and wealth distribution
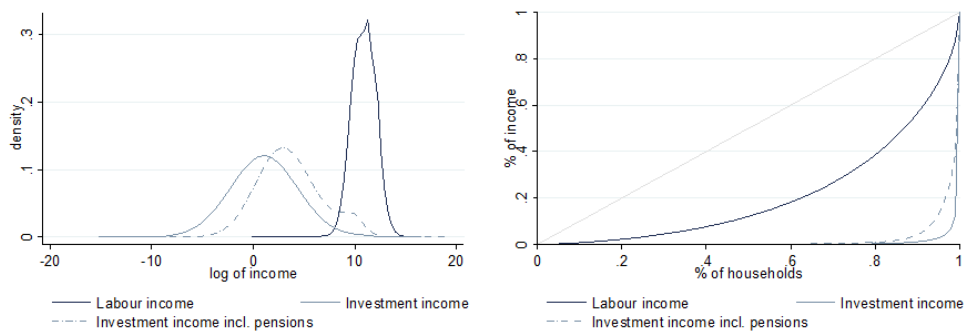
Note: Income distribution, PIT, 2010. Results scaled to the total adult population (see Section 3.3.3). Left panel: Kernel density curves of logged income; right panel: Lorenz curves.

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The coverage of the PIT is much more limited than the NIDS, but neither of the two measures is representative of the portfolio composition in the national accounts: The NIDS over-states the share of non-financial assets by a factor of 2, the PIT does not include non-financial assets at all; the NIDS under-states the share of pension assets by a factor of 3, the PIT provides only information on current contributions.

When we use the information on current contributions to adjust the PIT for investment income on pension assets, the top wealth shares in the PIT start to coincide almost perfectly with those in the NIDS. The share of the top percentile drops from 90 to "only" 60 percent; that of the top decile adjusts from 99 to 96 percent.[23] Since pension assets constitute the most important asset class for South African households, this measure seems more meaningful than the unadjusted measure from the PIT (and maybe even the NIDS). However, it is likely that it constitutes a lower bound for true pension inequality, since neither dataset provides information on interruptions to contribution periods and pre-retirement withdrawals from pension funds – both of which are possible under the South African system, and are likely to be more common among lower-income households (National Treasury, 2012).[24]

Since the PIT provides no information from which to make a comparable adjustment for owner-occupied housing and other non-financial assets, we instead "impute" the estimates of inequality from the NIDS by calculating a weighted average of the individual distributional metrics. With a Gini coefficient of at least 0.96 for pension assets (PIT), 0.99 for other financial assets (PIT) and 0.90 for non-financial assets (NIDS), and with portfolio

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[23]If we were to replace reported pensions in the NIDS with comparable imputations (using a fixed share of labour income as current contributions), the wealth share of the top one percent would drop to only 50 percent and re-introduce a wedge between results from the two datasets. However, the pension adjustment has much less impact on the wealth share of the top 10 percent (91 compared to 95 percent).

[24]To estimate the value of pension assets in the PIT, I assumed a price inflation of 6 percent, wage inflation of 8 percent, investment returns of 10 percent and a starting age of 25 to calculate the current value of all pension and retirement fund contributions. To account for pre-retirement withdrawals, I also applied a uniform 50 percent discount to the current value of these assets (although not for assets in retirement annuities). Appendices B.6 and C.2 give more details on the methodology.

shares of 36, 32 and 32 percent in the national accounts, we find a combined Gini coefficient of 0.95 and top wealth shares of at least 67 and 93 percent for the richest centile and decile.

While the findings on tail wealth are thus highly sensitive with regard to the concept of wealth under study, our finding that 10 percent of the population owns at least 90–95 percent of all wealth remains robust across all specifications.[25]

3.4.3 Resampling of tail wealth

The fact that top income wealth shares in the NIDS are comparable to the PIT is surprising given that survey data tends to understate the very top of the distribution. Given the relatively small number of observations on wealth in the NIDS (18,820 observations, of which only half are non-zero), our results risk being determined by a few (potentially erroneous) outliers rather than by the appropriate representation of genuinely wealthy people. To test the robustness of our estimates to such potential outliers, we can re-sample the top tail from a fitted or a theoretical distribution.

I drop and re-draw all individuals with a net worth of more than one million Rand (the top one percent of the wealth distribution in the NIDS) from the distributions described in section 3.3.3. While the fitted parametrization ($\alpha = 1.0$) results in even higher top wealth shares than the original data, the top one percent share drops to 45 percent when using the "theoretical" tail index of $\alpha = 1.5$. Since all other data in this chapter suggest that inequality is higher in South Africa than in the developed economies for which the tail index of 1.5 was derived, these results should be interpreted

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[25]Instead of broadening the coverage of assets in the PIT, we could also focus on a more limited concept of wealth in the NIDS. Looking at financial assets only, the degree of inequality in the NIDS surpasses even the unadjusted measure of inequality in the PIT; with regard to investment income, we find that inequality is somewhat lower. Note, however, that only 430 individuals reported non-zero investment income (compared to 13,505 individuals with non-zero wealth).

as a lower bound. For the top 10 percent wealth share, our lower bound remains robust at 90–95 percent under all parametrizations.[26]

3.4.4   Comparison with rich lists

For the wealthiest of all people, "rich lists" can provide additional information. According to the *Forbes Africa's 50 Richest* list, 10 South Africans had a combined net worth of $25 billion (R390 billion at year-end exchange rates) in 2015, almost five percent of the entire wealth of all 54 million citizens. New World Wealth, a consultancy, estimates that there were 46,800 high net worth individuals with a combined wealth of $184 billion (R2,140 billion) in the country in 2014. When compared with the aggregate data from the household sector balance sheets, this suggests that 0.1 percent of the South African population owns a quarter of total household wealth.[27] This high share lends some support to the very high top wealth shares presented in this chapter. If anything, our top wealth shares could be understated due to the failure to capture the very top of the distribution (NIDS) or their assets in complex ownership structures (PIT).

3.4.5   The equalising effect of households

Wealth surveys typically use households rather than individuals as the main unit of analysis (see, for example, ECB 2013a, 2013b). As with income and consumption, household-level data on wealth is understood to better reflect the fact that many assets and debts tend to be owned or guaranteed jointly by members of the household (such as the family house and mortgage, joint bank accounts, or even through the contingent division of property in the case of bereavement or divorce).

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[26]As a further sensitivity analysis, I also attempt to resample only those individuals that were identified as "outliers" in a multivariate outlier analysis (see Appendix B.3), and find that the results remain robust. For income, the findings are robust to resampling the top one percent from a fitted distribution with $\alpha = 2.0$.

[27]Assuming the wealth concept used by New World Wealth is consistent with the national accounts. Data available from *Forbes* (`www.forbes.com/africa-billionaires/list/`) and the New World Wealth South Africa Wealth Report 2015 description (`www.nw-wealth.com`) (full report not accessed).

If we consider household instead of individual-level data, the degree of inequality softens somewhat: The wealth share of the top 10 percent drops by 6 percentage points; the share of the middle 40 percent increase as much.[28] This reflects the fact that the pooling of wealth within households smoothes out some of the spikes in the wealth distribution, while the distribution for the bottom half of the population is largely unaffected. Although the PIT provides no information on household membership, we would expect to find a similar pattern in the tax database.

3.5 OTHER ANALYSES ON THE WEALTH DISTRIBUTION

3.5.1 Wealth distribution and demography

One advantage of surveys is that they contain questions on a wide range of topics other than personal finance, which allows researchers to analyse the wealth distribution by any number demographic, geographic or other characteristics. Tax records contain much less demographic information; in the case of the PIT we can infer only age and gender of the tax filer. In this section, I use these data for an overview of the wealth distribution by demographic characteristics.

Wealth and age

From a theoretical perspective, the most interesting link between wealth distribution and demography is that between wealth and age. According to the life-cycle hypothesis of consumption and saving, individuals save during their work-life and dis-save during retirement (Ando and Modigliani, 1963, Modigliani and Brumberg, 1954). This implies that very young and very old people should be asset poor, while people at their transition to retirement should be the wealthiest group.

Indeed, Figure 3.3 confirms this theory in the NIDS: Among individuals with non-zero wealth, median wealth increases steadily from less than R5,000 for youths to around R15,000 for the pre-retirement cohort, before declining

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[28]Detailed results for the household-level income and wealth distribution are provided in Appendix B.7.

back to R10,000 for the 75+ group. However, it would be incorrect to deduce that wealth inequality is explained entirely by the demographic pyramid: For all age groups < 55, within-group wealth inequality is as least as high as overall wealth inequality. A decomposition based on the Theil index suggests that less than one percent of total wealth inequality is explained by the inequality between age groups.

Inter-generational inequality is even less pronounced in the PIT. While there is a slight hump-shaped curve between ages 30 and 70—particular for lower-income people—, people under 30 and over 70 constitute the wealthiest age groups in the tax database. This discrepancy between the NIDS and the PIT could suggest that inheritances and bequests play a more important role among relatively well-to-do tax filers than among the larger population in the NIDS.[29]

Wealth, race and gender

Although there is no economic reason to expect a correlation between wealth and race or gender, the survey data confirms the suspicion that the degree of inequality remains high between racial groups – a legacy of the system of apartheid, which denied black citizens the access to most forms of capital until 1994 (see, e.g., McGrath, 1982). However, the NIDS also shows that the degree of inequality *within* the African group exceeds that for the overall population, being much higher than the level of inequality within any other racial group (see Figure 3.4). The decomposition based on the Theil index suggests that less than five percent of total wealth inequality and less than 15 percent ot total income inequality is explained by between-group inequality. This is consistent with earlier findings on the South African income distribution, according to which the structure of

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[29]In theory, the observed pattern could also point to a selection bias: Since very young and very old people are not generally employed, only those with high *investment* income become subject to tax filing requirements. However, the pattern persists when calculating the age-wealth profiles for recipients of employment income only. Since I do not track individuals over time, the life-cycle profile might also be shaped by generational effects (e.g., the greater impact of the financial crisis and economic downturn on younger people). I do not control for these.

inequality is increasingly shaped by growing inequality within racial groups (Leibbrandt et al., 2010, Van der Berg, 2010).

With regards to gender, both sources show little difference in the mean and median wealth of men and women, although the larger number of men in the PIT implies that men receive a larger share of total reported investment income than female taxpayers (60 percent versus 40 percent). In neither case does the Theil index suggest that inequality between men and women plays a role in explaining total wealth inequality.

Overall, the demographic analyses paint a more favourable picture of the quality of the survey data than the aggregate analyses did earlier: although the NIDS struggles to capture financial assets and very wealthy individuals, it seems to provide robust results on the wealth distribution in the majority population.[30]

3.5.2   Joint distribution of income and wealth

Although wealth generates income in the form of dividends, interest and rents, income and wealth are not generally closely linked. In the NIDS, the rank correlation between total income and wealth is 0.35; in the PIT, the equivalent figure for gross and investment income is 0.5. Both figures are in line with the correlations observed in other countries (0.2-0.6 in the OECD countries, see OECD, 2015).

The correlation between income and wealth is most pronounced in the upper end of the distribution: About 70 percent of people in the top income quintile of the NIDS are also in the top two wealth quintiles (and vice-versa), explaining why the correlation may be higher in the unscaled PIT than in the NIDS. With regards to race, we find a much higher correlation for the (richer and more egalitarian) white sub-population than for the African majority (as seen in the concentration curves presented in Figure 3.4). This suggests that the wealth of white households corresponds more closely to their incomes than in the African sub-population, where even high-income households often have very little wealth (and vice-versa).

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[30]Detailed results for wealth by race and gender in Appendix B.7.

Figure 3.3: Wealth by age
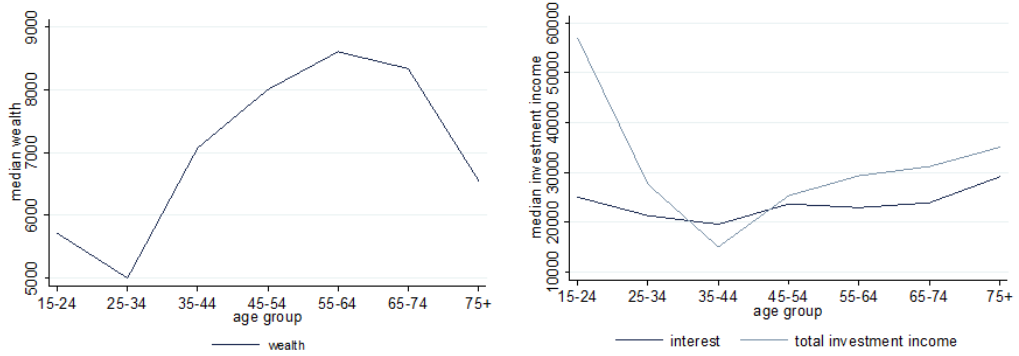
Note: Median wealth by age, NIDS and PIT, 2010, in Rand. Calculations exclude individuals with zero wealth / investment income. Left panel: NIDS, Right panel: PIT.

Figure 3.4: NIDS – Wealth by race
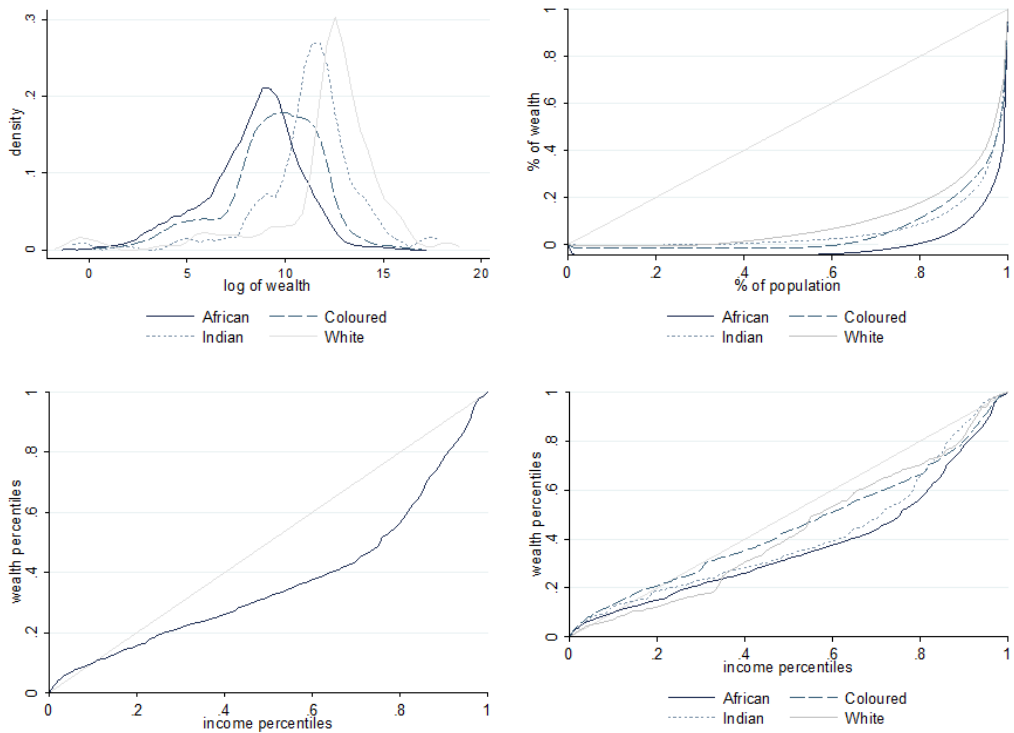
Note: Wealth distribution by racial group, NIDS, 2010. Calculations based on weighted sample using adult-level data and post-stratified weights. Top left panel: Kernel density curves of logged wealth; top right panel: Lorenz curves of wealth; Bottom panels: Concentration curves for income and wealth.

3.5. OTHER ANALYSES ON THE WEALTH DISTRIBUTION

Overall, the relatively low correlation between income and wealth suggests that the taxation of employment income targets a different group than the taxation of investment income and wealth. Alongside the greater degree of concentration of wealth, this discrepancy highlights the policy importance of studying the wealth distribution in addition to the income distribution.

Table 3.5: NIDS – Wealth distribution by asset class

	Full sample		Trimmed sample	
	Top 1%	*Top 10%*	*Top 1%*	*Top 10%*
Wealth	61	95	47	92
Total assets	62	95	50	92
Total liabilities	51	99	42	99
One-shot wealth	63	97	60	97
Pension and life assets	99	100	97	100
Non-pension financial assets	96	99	96	99
Real estate assets	54	80	32	71
Capital income	70	100	58	100

Note: Quantile shares, NIDS, 2010, in percent. Calculations based on weighted sample using adult-level data and post-stratified weights. "Trimmed sample" excludes outliers (see Appendix B.3).

3.6 Conclusion

Wealth is much more unequally distributed than income. One percent of the South African population owns at least half of all wealth, the top decile together owns more than 90–95 percent. With a Gini coefficient of about 0.95, wealth is as unequally distributed *within* South Africa as it is in the world at large. For labour income, the equivalent figures are roughly 10 and 45 percent, and the Gini coefficient is close to 0.6.

The fact that a large majority of people are asset-poor is not unique to South Africa: Even in rich countries, the wealth share of the bottom half amounts to only about five percent of total (OECD, 2015, Piketty, 2014). What stands out, however, is the small wealth share of the middle of the distribution, or the virtual absence of a socioeconomic group that Piketty refers to as "patrimonial" or "propertied" middle class – the emergence of which *"was the principal structural transformation of the distribution of wealth in the developed countries in the twentieth century."* (Piketty, 2014, p. 260). Table 3.6 compares the results for South Africa with other countries.

This chapter started with the hypothesis that the two data sets on investment income and wealth were incomplete and inaccurate, and needed to be integrated in order to gain robust estimates of the wealth distribution. I expected the survey data to represent only the bottom 95 percent or so of the population, while I knew that the tax data only covered the top 20 percent. I was thus surprised to find that the two data sets led to surprisingly similar conclusions once I defined appropriate censoring rules and parametric assumptions for the underlying distributions. Although the wealth shares for the top one percent of the population ranged from around 50 to just under 100 percent, the wealth share for the top 10 percent remained close to 90–95 percent across a variety of specifications. For labour income (whose definition is more comparable between the survey and the tax data), the distributional metrics coincided almost perfectly between the two sources.

The comparability of the scaled estimates could be a result of the extreme degree of concentration: With a top 10 percent wealth share above 90 percent even in the survey that was thought to *understate* wealth inequality,

Table 3.6: Top wealth shares across countries and sources

Country	Top 10%	Top 1%	Data	Reference
South Africa*	95	61	Survey	*author's calculations*
South Africa*	96	60	PIT + pensions	*author's calculations*
South Africa	72	40	Estimated	Stierli et al. (2014)
United States	75	34	Survey	Federal Reserve Bank (2014)
United States	79	37	Survey + Forbes	Vermeulen (2014)
United States	77	58	PIT	Saez and Zucman (2014)
France	50	18	Survey	ECB (2013b)
France	51	19	Survey + Forbes	Vermeulen (2014)
France*	61	21	Estate Tax	Piketty et al. (2006)
Germany	59	24	Survey	ECB (2013b)
Germany	68	33	Survey + Forbes	Vermeulen (2014)
World	87	48	Estimated	Davies et al. (2016)

Note: Comparison of top wealth shares across countries and data sources. *Asterisks denote wealth shares on the level of individuals rather than households.

all other estimates were bound to be close. Yet despite its shortcomings, this study concludes on the optimistic note that we can learn a lot about the wealth distribution even if the data are incomplete and inaccurate. This finding should provide some encouragement to researchers practitioners who wish to study wealth inequality in other countries in which the data is even scarcer than in South Africa.

Conclusion

South Africa has been a pioneer with regard to collecting and publishing data on household wealth. It is the first developing country to include detailed sectoral balance sheets in its national accounts, one of a few countries with a large-scale household wealth survey, and one of only a handful that gives researchers access to anonymised records from tax authorities. Yet, few researchers have given these data the attention it deserves. This dissertation endeavoured to change this.

The first chapter of this dissertation introduced the importance of balance sheets in macroeconomic analyses by highlighting the discrepancy between flow and stock measures of saving even over longer periods of time.

The most commonly used measurement of saving stems from the income side of the national accounts, in which saving is calculated as the residual between disposable income and consumption expenditures. According to this measure, household savings rates in South Africa have been in steady decline over the last five decades, falling from 10 percent of GDP in the 1950s to zero over the last years.

Looking instead at the balance sheet side of the national accounts (where saving is calculated as the change in wealth between two periods of time), the findings presented in this dissertation showed that household wealth increased by 5–10 percent of GDP per year over the last five decades. Households may not have been "putting aside" their incomes but have nevertheless grown richer, owing to a steady increase in the value of existing assets in their portfolios. Provided that households take these capital gains into account when making their saving and spending decisions, the chapter thus suggested that we would understate the extent to which households are making future-oriented choices if we looked only at the flow measure of saving.

CONCLUSION

Chapter 1 took a macroeconomic perspective on saving, but also introduced a critical distributional question. With wealth often being highly unequally distributed, would asset revaluations not disproportionately benefit only a small share of the population? Although *aggregate* saving is much higher under the balance sheet perspective than under the conventional view, the chapter thus concluded that the majority of the population likely saved little under either perspective.

The second chapter of this dissertation took a different angle on the discrepancies between flows and stocks in the long run, examining the relationship between the conventional measure of saving and the development of wealth over time and across countries. Following the approach proposed by Piketty and Zucman (2014), I decomposed the development of the South African private wealth-income ratio into savings-induced and revaluations-induced effects and compared the results to the authors' findings for the major advanced economies. In contrast to the household-centered perspective taken in the previous chapter, I also introduced a distinction between asset revaluations that are explained by corporate savings and those that are not.

While Chapter 1 showed that households had (on aggregate) become much wealthier than their (flow) savings behaviour would have implied, Chapter 2 showed that this discrepancy was nevertheless less pronounced than in the advanced economies. Private wealth amounted to 240 percent of national income in 1975, in line with the levels of 200–300 percent in the major advanced economies. Today, South Africa's private wealth-income ratio still stands at 255 percent, while those of the advanced economies have doubled to 400–700 percent.

Using Piketty and Zucman's approach, I traced this divergence to structural differences between the countries: While the prolonged growth of private wealth in rich countries was driven primarily by household savings and the booming housing market, South Africa's more recent growth in wealth was generated almost entirely through corporate savings and the strong performance of the stock market. Since financial wealth tends to be

more highly concentrated than housing assets, this is likely to have different distributional implications than those of Piketty's sample of rich countries.

The analyses in Chapter 2 therefore raised similar distributional concerns as Chapter 1. In combination with the high income share of capital relative to labour ($\alpha \approx 40\%$), the low overall wealth-income ratio pointed to a very high macroeconomic rate of return on capital ($r \approx 15\%$ per year), which likely accrued to a small share of the population only. With very limited data on household-level wealth, however, the chapter could not quantify the size of this sub-population. To improve the transparency of the personal wealth distribution, Chapter 3 turned to the measurement of wealth inequality in South Africa.

When I started writing this dissertation, the only information on the South African wealth distribution came from the second wave of the National Income Dynamics Survey (NIDS), which was conducted in 2010–2011. Although the NIDS showed that wealth was highly unequally distributed, this information was deemed to be of limited accuracy, owing to the social sensitivity and cognitive complexity of wealth-related questions as well as to the lower tendency of wealthy households to participate in surveys (Daniels et al., 2014). To gain a more robust perspective on the wealth distribution, I attempted to compare the NIDS to a previously unpublished dataset of almost 1.2 million personal income tax (PIT) records for the 2010–2011 tax year. Since tax filing is mandatory for people with incomes above certain thresholds, I argued that the PIT data should not be subject to the same biases as the NIDS. It is, however, subject to different limitations: Only some forms of wealth generate taxable investment incomes, and less than 20 percent of the South African population file income taxes at all.

To render the data comparable, I treated the PIT as a proxy for the wealth of the tax-filing tail of the distribution, and "scaled" the results to the total population by simulating the wealth of non-filers from a bottom-censored lognormal distribution. As a robustness analysis, I corrected the NIDS for potential misreporting of top wealth; dropping and re-drawing the richest one percent from a top-censored Pareto distribution. Since neither the

CONCLUSION

NIDS nor the PIT reflected the asset composition in the national accounts, I also combined the estimates using the PIT to measure the concentration of financial assets, the NIDS to measure the concentration of non-financial assets, and the national accounts to define appropriate weights.

A highly encouraging result of Chapter 3 was the extent to which the measures of income inequality coincided between the two data sources: I found that one percent of the population earned 11–12 percent of all incomes, while ten percent earned 43–46 percent. Although this overlap provided support for the scaling approach, the wealth distribution remained much harder to pinpoint. Depending on the measure used, top one percent shares ranged from 60 percent in the NIDS to almost 90 percent in the PIT. The broader the measure under consideration, however, the more the two sources started to converge. Despite the limitations of the data, I eventually felt confident to conclude that ten percent of the population owned at least 90–95 percent of all wealth. With a Gini coefficient of about 0.95 (compared to 0.60 for incomes), this makes South Africa as unequal as the world at large.

The extreme degree of economic inequality in South Africa is often linked to the legacy of apartheid. Black citizens were denied access to most forms of capital until 1994, leading to a highly unequal wealth distribution between racial groups. While the analyses presented in Chapter 3 confirmed that non-white households are still much poorer on average than white households, it also showed that inequality *within* the African majority population far exceeds the inequality of all other groups. Paradoxical as it sounds, the presence of (disproportionately wealthy) white households *lowers* overall wealth inequality in South Africa. This finding supports existing research on incomes, according to which South Africas unequal income distribution is increasingly shaped by growing inequality within groups (Leibbrandt et al., 2010). It also suggests that some of the policies aimed at empowering black South Africans have disproportionately benefited a new economic elite.

Policy Implications

In contrast to advanced economies (where wealth inequality has been growing alongside the aggregate level of wealth), South Africa struggles with extreme wealth inequality at low aggregate wealth levels. Given this specific situation, this dissertation suggests that any policies aimed at lowering wealth inequality should balance redistribution from the top with wealth formation at the middle and bottom of the distribution.

The first policy lever to promote more egalitarian wealth formation is thus to enhance saving among poorer and middle-class households. Many areas of economic policy can contribute toward this aim: Monetary policy can promote saving and discourage capital flight by providing a stable macroeconomic environment, and regulatory and tax authorities can help to enforce or encourage wealth formation in specific asset classes. The introduction of restricted tax-free savings accounts in March 2015 has already had an effect in this regard: The market-research firm *intellidex* reports that more than 260,000 accounts were opened within the first year of the policy, one fifth of which are estimated to belong to first-time savers.[31]

A bigger effect could potentially be achieved through pension reform. Pension assets constitute the most important form of wealth despite low participation and preservation rates (only half of formal employees are covered by occupational pension schemes, and particularly lower-income households frequently cash out their pension assets when switching between jobs). Recent reforms have already sought to raise contributions and limit early withdrawals from provident funds by harmonizing the tax treatment and annuitization requirements with other pension funds. In addition, the National Treasury is currently considering comprehensive changes in the decision architecture of contributors, such as automatic enrolment, default investment strategies, default preservation, and default pay-out as

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[31]Source: intellidex, June 2016. Report available at `www.intellidex.co.za/TFSA2016`.

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annuities.[32] The experience from other countries shows that such changes can have a dramatic impact on people's savings behaviour (**???**).

The second policy lever could be a revenue-neutral shift in taxation from labour to capital. The majority of tax revenues collected from households currently comes from employment incomes (35 percent of total tax revenues), whereas investment incomes constitute merely 1 percent of the total revenue and wealth itself is taxed only through the very ineffective estate duty (0.1 percent of total revenues). Since income and wealth is not perfectly correlated, this means that households at the top of the *income* distribution might be taxed more heavily than households at the top of the *wealth* distribution. Shifting a larger share of the tax burden to capital (as foreseen, at least directionally, in the proposals on estate tax reform by the Davis Tax Committee) could be especially beneficial to the goal of equitable wealth formation if the additional yield were used to offset the shortfall from the tax exemptions on small savings accounts or pension contributions.

As the discussion of the data in Chapter 3 indicated, however, there are practical difficulties with regard to an effective taxation of top wealth. Most forms of wealth are convertible and mobile, and can easily be shifted between asset classes, ownership structures and tax jurisdictions. Since such wealth management is costly, the richest households are most likely to take advantage of any loopholes. The recent *Panama Papers* leak indicated the extent to which the efficacy of wealth taxes is limited by the fact that large fortunes can be moved out of the reach of national tax authorities. This highlights both the importance and the challenge of designing wealth taxation in a way that it does not end up targeting the nascent propertied middle class instead.

The third lever, which is related to the first, is to reduce indebtedness among poorer and middle-class households. Although the majority of debt is often taken to fund asset purchases, the NIDS suggests that about five percent of the population has debts that exceed the value of their assets, and that this share is higher among lower-income households. Other data suggests

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[32]Draft default regulations of 22 July 2015 available at `http://www.treasury.gov.za/publications/RetirementReform/`

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that lower-income segments make considerable use of unsecured consumer credit, which is often extended under very high interest rates and obscure terms.[33] A greater emphasis on financial consumer protection and financial literacy training could help citizens make more informed financial decisions and protect them from debt-related poverty-traps.

Research Implications

Although South Africa is ahead of most other countries with regard to collecting macro- and microeconomic balance sheet data, both data sources are still in their infancy. Any additions and revisions to these data sources may lead to different results on the level and distribution of private wealth.

With regards to the macro-level data, the full integration between the flow and stock side of the national accounts is still underway at the time of writing this dissertation. Flows and stocks are linked through returns on capital, and the fact that my own estimate of these returns is much higher than those in other countries could indicate that wealth is still understated relative to incomes. It would be valuable to calculate returns on the level of individual asset classes to identify the origins of such an understatement and guide the integration of the flow and stock side of the national accounts going forward. Such an exercise would be straightforward for researchers with access to more granular national accounts data than currently published by the SARB.

With regards to the micro-level data, the discrepancies between survey, tax and national accounts data revealed the extent of the current limitations. One reason for the poor quality of micro-level wealth data is that neither of the existing sources really intended to measure wealth: the NIDS is not designed to be a wealth survey, and the PIT system is not intended to be a wealth tax. Both sources could be improved, however, without a major overhaul of the existing systems. The accuracy of the survey data with regard to wealth could be improved by adopting wealth-specific sampling

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[33]Source: National Credit Regulator, Consumer Credit Market Report, June 2016; The Economist, Payday Mayday, August 16 2014

CONCLUSION

and survey design strategies for wealthy households that were developed for the recent *Household Finance and Consumption Survey* of the Eurosystem (see Chapter 3). The questionnaires for wealthy households could then be tied to the existing NIDS panel. The coverage of the tax data could be improved by linking the existing PIT records with information from the dividend withholding tax (for equities), the deeds office (for real estate), and the credit bureaus (for debts), and by linking the PIT files of trusts to those of their beneficiaries.[34] Time itself will also help: as more data is released in the future, researchers will be able to identify anomalies over time and arrive at more robust estimates in panel analyses.

Aside from statistics, this dissertation introduced several economic questions on private wealth in South Africa. In particular, it did not answer the question of *why* it is that wealth is so much more concentrated than incomes. From a theoretical perspective, several factors that can contribute to this disconnect: a gradient between income and saving (*do the rich save more?*), a gradient between wealth and investment opportunities (*do the rich get better returns on their savings?*), a gradient between wealth, demographics and bequests (*do the rich have fewer children to whom they bequeath their assets?*), or a distortion created by policies such as means-tested government grants. A better understanding of the role of these factors would allow to make more targeted recommendations on building a propertied middle class in South Africa.

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[34]To protect the anonymity of tax filers, these links would have to be made by SARS before depersonalising the ID numbers.

Appendix A

Saving and wealth in the national accounts

This appendix contains additional information on the data on saving and wealth in the South African national accounts (section A.1), which were used in Chapter 1 and 2. It also elaborates on two methodological aspects of Chapter 1, namely the calculation of revaluation effects (section A.2) and the estimation of depreciation expenses (section A.3).

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APPENDIX A. SAVING AND WEALTH IN THE NATIONAL ACCOUNTS

A.1   NATIONAL ACCOUNTS DATA

Tables A.1 and A.2 provide an overview over the data on saving in the South African National Income and Production Accounts; Table A.3 shows how saving can be derived from the Balance Sheets. Figure A.1 illustrates the connection between the National Income and Production Accounts and the Balance Sheets in the System of National Accounts.

Assets, liabilities and wealth

Wealth is defined as the residual between the market value of all assets and liabilities, a quantity also known as 'net worth'. Although the combined assets of the household sector typically exceed its liabilities, the net worth of individual households can also be negative.

The SNA includes all marketable financial and non-financial assets as assets, but excludes non-marketable assets such as human or institutional capital. Non-financial assets include housing assets (residential buildings and land) and other tangible assets (non-residential buildings and land, plant and machinery, as well as cultivated assets) of the household sector. Financial assets consist of cash equivalents, bonds, equities and foreign financial assets.

In the South African balance sheets financial assets are recorded as assets with monetary institutions, interests in pension funds and long-term insurers, and other financial assets. A breakdown by asset class can be estimated by applying the portfolio composition of the respective counterparties— monetary institutions, pension funds and long-term insurers as well as unit trusts—to the total of household assets held with these institutions. In practice, I consider all assets with monetary institutions as cash equivalents and apply the portfolio composition of unit trusts to the *other financial assets* component.

Private wealth, public wealth and national wealth

Since the national accounts are based on the residency principle, the wealth of a nation is the wealth of its residents (all institutional units with a 'center of economic interest' in the country). In the national accounts, these residents

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Table A.1: Construction of national accounts data

Measure	Main sources and methodology
Disposable income of households	The responsibility of compiling the South African national accounts is split between StatsSA (production and income side), and the SARB (expenditure side and institutional sector accounts). To reconcile the SARB estimates with the StatsSA estimates of GDP, the former is adjusted by a residual item.
Final consumption expenditure by households	Estimates of the main expenditure aggregates are compiled by the SARB on the basis of household surveys and verified against supply and use estimates in the benchmark year. In all subsequent quarters, the base-year estimates are extrapolated using retail sales data from surveys and other sources (e.g., industry associations) (South African Reserve Bank, 2015).
Non- financial assets of households	Non-financial assets of households comprise residential and non- residential buildings, non-agricultural land, construction works, machinery and equipment, computer and related equipment, transport equipment, agricultural land and orchards, and inventories at market value. Stocks are derived by the SARB from national account capital stock measures; market values are obtained by multiplying them by an appropriate asset price index (in the case of residential buildings, an average house price index). The capital stock itself is constructed on the basis of the flows of capital formation and capital consumption in the NIPA ('perpetual inventory method') (Kuhn, 2010).
Financial assets of households	Financial assets of households comprise assets with monetary institutions; interest in pension funds and long-term insurers; equities, bonds and other domestic financial assets; as well as financial assets abroad. Data on financial assets are sourced by the SARB from monetary institutions, pension and provident funds and long-term insurers as well as other various sources (Kuhn, 2010).
Financial liabilities of households	Financial liabilities of households consist mainly of mortgage advances and consumer credit. Data on financial liabilities are sourced by the SARB from the monthly regulatory returns submitted to the Bank Supervision Department (for mortgage advances) from the National Treasury and from industry associations (Kuhn, 2010).

Note: Details on the construction of income, expenditure and wealth in the South African national accounts.

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Table A.2: HOUSEHOLD SAVING IN THE NIPA

Account		Categories	Code	2014
		Gross operating surplus	**6826**	**486**
Allocation of primary income account	1	Compensation of employees	6240	1 731
	2	Property income received	6827	396
	2a	*Interest*	*6828*	*54*
	2b	*Dividends*	*6829*	*160*
	2c	*Property income attributed to insurance policy holders*	*6830*	*182*
	2d	*Rent on land and subsoil assets*	*6831*	*0*
	3	Less: Property income paid	6832	167
	3a	*Interest*	*6833*	*164*
	3b	*Rent on land and subsoil assets*	*6834*	*3*
	4	**Gross balance of primary income**	**6835**	**2 445**
Secondary distribution of income account	5	Social benefits received	6836	326
	6	Other current transfers received	6837	211
	6a	*Non-life insurance claims*	*6838*	*141*
	6b	*Miscellaneous current transfers*	*6839*	*70*
	7	Less: Taxes on income and wealth	6845	354
	8	Less: Social contributions paid	6840	207
	9	Less: Other current transfers paid	6841	150
	9a	*Net non-life insurance premiums*	*6842*	*141*
	9b	*Miscellaneous current transfers*	*6843*	*9*
	10	**Gross disposable income**	**6844**	**2 271**
Use of disposable income account	11	Adjustment for the change in net equity in pension funds reserves	6845	39
	12*	Less: Residual	6846	6
	13	**Total available resources**	**6847**	**2 304**
	14	Less: Final consumption expenditure	6007	2299
	15	**Gross saving**	**6848**	**5**
	16	Less: Consumption of fixed capital	6849	59
	17	**Net saving**	**6200**	**-54**
Capital account	**15**	**Gross saving**	**6848**	**5**
	16	Receivable capital transfers	6850	18
	17	Less: Payable capital transfers	6851	0
	18	Less: Change in assets**	6852	70
	19	**Net lending (+) / borrowing (−)**	**6855**	**-47**

Note: Household savings in the National Income and Production Accounts, 2014, in ZAR billions. *Statistical discrepancy between the expenditure components and gross domestic product; **Gross fixed capital formation and changes in inventories.

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Table A.3: Household wealth in the Balance Sheet

	Categories	Code	2013	2014
	Non-financial assets	**6920**	**2 583**	**2 853**
	Residential buildings	6921	2 126	2 358
	Other non-financial assets	6922	458	495
Assets	***Financial assets***	**6923**	**6 449**	**7 057**
	Assets with monetary institutions	6924	762	895
	Interest in pension funds and long-term insurers	6925	3 430	3 810
	Other financial assets	6926	2 257	2 388
	Total household assets	**6927**	**9 032**	**9 910**
	Liabilities	**6928**	**1 696**	**1 783**
	Mortgage advances	6929	833	854
Liabilities & net wealth	Other debt	6930	868	929
	Net wealth	**6931**	**7 336**	**8 127**
	Memo: Net wealth including durable consumer goods	6933	7919	8760
	Total household liabilities and net wealth	**6932**	**9 032**	**9 910**

Note: Household wealth in the Household Sector Balance Sheets, 2013 and 2014, in ZAR billions.

APPENDIX A. SAVING AND WEALTH IN THE NATIONAL ACCOUNTS

are grouped into three institutional sectors: households, corporations and the public sector. The household sector includes private households, non-profit institutions serving households as well as private trusts and friendly societies. The public sector comprises all levels of government, non-profit institutions controlled by the government and social security funds. The corporate sector consists of financial and non-financial corporations and quasi-corporations (unincorporated businesses with separate financial accounts), whether they are owned by households or government entities. Unincorporated businesses *without* separate financial accounts are included in the household or the public sector respectively.

When it comes to flow variables, the household and corporate sector are typically added together to form the private sector. With regards to *wealth*, however, the household sector alone is sufficient to represent the private sector (see Piketty, 2014, Piketty and Zucman, 2014). This is because all assets and liabilities of businesses are ultimately owned by the shareholders – households, government entities or foreigners. In the first and second case, they are reflected in the household and public sector balance sheets respectively; in the third case, they enter the net foreign asset position (see Section A.1).

Since the compilation of the balance sheets for the public sector is ongoing at the time of writing, this article is limited to the analysis of *household wealth*, which I refer to interchangeably as *private wealth* or *wealth*. Denoting it by W, public wealth by W_p and and national wealth by W_n, the relationship between all three variables can be written as: $W_n = W + W_p$.

National wealth, domestic wealth and net foreign assets

In a closed economy, the wealth of a country's residents is equivalent to the domestic capital stock (K), i.e. the capital available for production and housing within the country's boundaries.[1] In an open economy, however, the capital stock of a country can differ from the wealth of its residents, as part

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[1]I include housing assets in the capital stock for consistency with Piketty's work. In general, housing assets are not considered to form part of the productive capital of the economy.

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of the national wealth is invested abroad while part of the domestic capital is held by foreigners.

The value of a country's external assets $(+)$ and liabilities $(-)$ is recorded in its international investment position (IIP). A positive IIP means that a country's external assets exceed its liabilities or that the country is a net creditor, which indicates that its residents invest part of their wealth abroad. With a negative IIP, a country is a net debtor, and its capital stock exceeds the wealth of its residents: $W_n = K + IIP$.

APPENDIX A. SAVING AND WEALTH IN THE NATIONAL ACCOUNTS

Figure A.1: SAVING AND WEALTH IN THE SNA
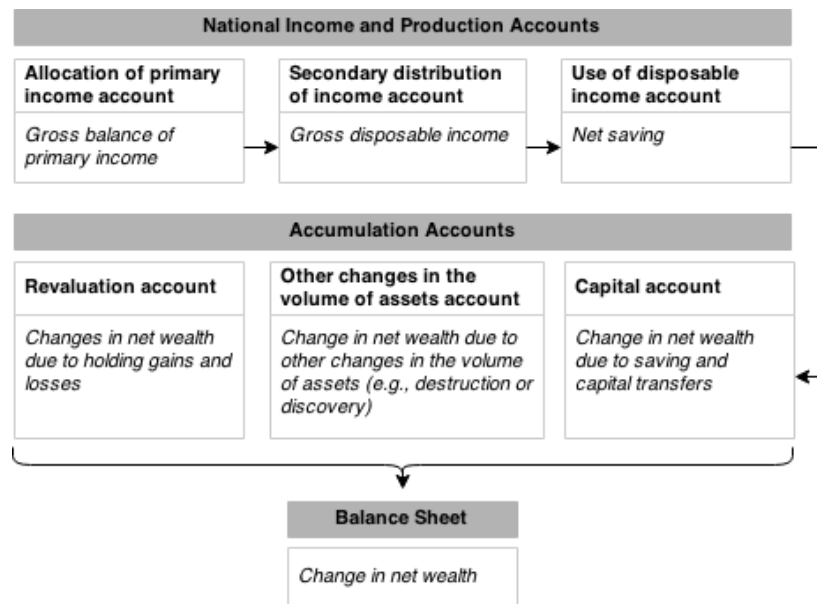
Note: Flow and stock measures of saving in the 2008 System of National Accounts.

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A.2 Calculating revaluation effects

The assets of the household sector are comprised of non-financial and financial assets, the former consisting primarily of real estate and the latter comprising equities and fixed-income securities. On the liability side, households have debt in the form of mortgages and other obligations, while their wealth constitutes the balancing item between the value of assets and the amount of debt. While the latter is determined at the time that the debt is contracted, the value of the former is determined daily on the market. Formally speaking, the value of household assets equals the sum-product of the quantity and the current price of each asset, such that the change in the value of assets—and hence in wealth—between two points in time can be decomposed into a quantity effect and a revaluation effect by applying a standard growth accounting procedure as proposed by Scobie and Henderson (2009).

Letting V_t denote the value, Q_t the quantity and P_t the price in time t, and letting δ be a difference operator, the standard growth accounting procedure can be written as:

$$V_t = Q_t \times P_t \tag{A.1}$$

$$\%\Delta V_t = \%\Delta Q_t + \%\Delta P_t + \%\Delta P_t \times \%\Delta Q_t \tag{A.2}$$

$$\Delta V_t = \underbrace{\%\Delta Q_t \times V_{t-1}}_{\text{Quantity effect}} + \underbrace{\underbrace{\%\Delta P_t \times V_{t-1}}_{\text{Price effect}} + \underbrace{(\%\Delta P_t \times \%\Delta Q_t) \times V_{t-1}}_{\text{Interaction term}}}_{\text{Revaluation effect}} \tag{A.3}$$

To distinguish between real and inflation-induced revaluations, I use the same approach to decompose nominal prices into a real and an inflation component ($P_t = P_t^R \times CPI_t$):

APPENDIX A. SAVING AND WEALTH IN THE NATIONAL ACCOUNTS

$$\Delta V_t = \underbrace{\%\Delta Q_t \times V_{t-1}}_{\text{Quantity effect}} + \underbrace{\%\Delta P_t^R \times V_{t-1}}_{\text{Real price effect}} + \underbrace{\%\Delta CPI_t \times V_{t-1}}_{\text{Inflation effect}} \qquad (\text{A.4})$$

$$+ \underbrace{(\%\Delta P_t^R \times \%\Delta Q_t) \times V_{t-1} + (\%\Delta CPI_t \times \%\Delta Q_t) \times V_{t-1}}_{\text{Interaction terms}}$$

$$+ \underbrace{(\%\Delta P_t^R \times \%\Delta CPI_t \times \%\Delta Q_t) \times V_{t-1}}_{\text{Triple interaction term}}$$

In the most general terms, an increase in real wealth thus can thus stem from two sources: a price-induced increase in the value of assets over inflation and a change in the quantity of assets relative to liabilities.

A.3 ESTIMATING DEPRECIATION EXPENSES

A.3.1 Physical capital depreciation

I estimate depreciation of durable goods using a straight-line depreciation method over five years, based on the schedule of write-off periods acceptable to SARS (e.g., 3 years for computers; 5 years for cars; 6 years fro furniture and fittings). Adjusting the denominator, GDP, to include depreciation does not change the result.

A.3.2 Human capital depreciation

Empirical studies on the depreciation of education often find a decelerating depreciation pattern, with more rapid depreciation for people out of the workforce than those who use their skills in the workplace. Studying the depreciation of human capital depreciation from interrupted work careers, for instance, Mincer and Ofek (2011) find that the reduction of future wages associated with each year outside the workforce (corrected for tenure-related effects) are highest in the first year and average 0.6-1.1 percent per year in the long-run. Groot (1998) models the current value of formal education as $(1-\tau)^T S$ (where τ denotes the depreciation rate and S the stock of education). He estimates τ at 11-17 percent, which points to a rapid (but decelerating) depreciation of the stock of formal education and emphasizes the importance of lifelong learning to maintain the education stock. Arrazola and Hevia (2004) employ a similar model, in which they include an estimate for the contribution of work experience to the stock of qualifications. Recognizing that work experience contributes to maintaining the capital stock, they arrive at a depreciation rate of only 1-1.5 percent per year.

Since the NIPA figures on education presumably include primarily formal education and not on-the-job training, it seems most appropriate to use Arrazola and Hevia's estimates for employed individuals and Groot's estimates for individuals outside the workforce. A weighted average on the basis of an employed share of 42 percent among the South African working-

APPENDIX A. SAVING AND WEALTH IN THE NATIONAL ACCOUNTS

age population in 2014 suggests a depreciation rate of 8.5 percent.[2] It is important to recognize that this is a very rough estimate based on two other rough estimates from different countries in different times as well as a rough estimate on the historical education expenditure (and thence education stock) of households in South Africa. It means that half the value of the stock of education is lost after eight years. Only ten percent of the value remains after 25 years, and nothing after sixty years.

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[2]The working-age population in itself constitutes only 52 percent of the population. Since we are interested in the depreciation of education over the future working life of the individuals that currently invest in education, though, I use the employed share of the working-age population as a proxy.

Appendix B

Wealth in the NIDS

This appendix contains additional information on the wealth data in the second wave of the National Income Dynamics Study (NIDS) and on the methodology used to analyse it the third chapter of this thesis (sections B.1 - B.6). It also contains additional tables on some of the results that were discussed only briefly in that chapter, notably on the distribution at the level of households and the distribution of wealth within and between demographic groups (section B.7).

APPENDIX B. WEALTH IN THE NIDS

B.1   Non-response and imputations

There are two types of missing values in survey data: Unit non-response occurs when a household or individual is not successfully interviewed (because he or she is unavailable or refuses to participate); item non-response occurs when an interviewee does not answer a specific question (because he or she doesn't know the answer or refuses to answer). For the latter case, NIDS/SALRDU provides a set of regression-based imputations (see Brown et al., 2015).

Since imputations run the risk of smoothing out the wealth distribution, I do not use imputed series. However, I treat missing values in three straightforward ways: First, I substitute missing values for zeros when this follows from previous responses on categorical questions (e.g., setting banking assets to zero if the answer to "Do you have a bank account?" was negative). For some variables, the NIDS poses bracket questions ("Would you say the amount was more or less than X Rand?") when respondents don't know the value of their income or wealth. In this case, I substitute missing values on the quantification question for the mid-point of the resulting brackets. Third, I follow SALDRU's approach of substituting valid answers to the one-shot question for missing values on income and wealth, as described in Section 3.3.1. Fourth, I substitute one-shot responses when these exceed the bottom-up estimate in absolute terms due to item non-responses on category level (i.e, the individual or household does not have valid responses for all classes of assets and liabilities).[1] Table B.1 provides an overview of this process for four selected variables, while Table B.2 summarizes the process of construction the final wealth aggregates.[2]

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[1]The results from the one-shot wealth question are an imperfect substitute for bottom-up data: On the adult level, the correlation between bottom-up and one-shot wealth is 14 percent, on the household level it is 42 percent.

[2]The NIDS also includes durable goods, informal loans from family or friends and unpaid service bills or taxes. For consistency with the national accounts, I do not consider these items as assets and liabilities. Although housing is included in the household questionnaire, the individual questionnaire contains a question on outstanding home loans. I use these data to impute missing values on the household level.

Table B.1: TREATMENT OF MISSING VALUES: SELECTED VARIABLES

| | Adult Questionnaire | | | Household |
	Labour income	Banking assets	One-shot wealth	One-shot wealth
Questionnaires	23 846	23 846	23 846	8986
Entries for question	17 601	16 869	16 872	6196
% of total	74	71	71	69
% of total, weighted	86	82	82	91
Categorical questions ("yes/no" or "zero/non-zero")				
Don't know (%)	0	0	44	37
Refused (%)	0	2	5	6
Answered no/zero (%)	77	66	36	36
Answered yes/non-zero (%)	23	32	15	21
"Quantifiable" responses	4018	5449	2469	1326
% of total	17	23	10	15
Quantification questions				
Missing (%)	0	1	4	0
Don't know (%)	3	14	18	26
Refused (%)	8	20	1	1
Quantified (%)	88	65	77	73
"Raw" observations	3541	3559	1910	964
% of total	15	15	8	11
Data imputations				
Drop 'unjustified' zeros	0	−1302	−2	0
Include missing zeros*	13 515	11 101	6038	2227
Values from brackets*	511		461	321
Used observations	17 567	13 358	8407	3512
% of total	74	56	35	39
% of total, weighted		60	45	55

Note: Treatment of missing values, selected variables, NIDS, 2010. Un-weighted counts. *Replacement of missing values with data from categorical questions (zero values for "no"/"zero"-answers). **Replacement of missing values with data from bracket questions (e.g., R2500 for the bracket R0-5000).

APPENDIX B. WEALTH IN THE NIDS

Table B.2: DERIVATION OF TOTAL WEALTH

	Item	Survey	Response rate (%) Total	Non-zero	Notes
	Private pension	A	78	1	
+	Life insurance	A	77	5	
=	*Assets: pension/life*		80	2	(1)
	Cash on hand	A	76	19	
+	Bank account	A	60	15	
+	Trusts, stocks, shares	A	81	0	
=	*Assets: other financial*		66	27	(1)
	Personal loan	A	81	2	
+	Study loan	A	82	0	
+	Vehicle finance	A	81	1	
+	Hire purchase	A	82	2	
+	Credit card	A	81	2	
+	Store card	A	81	6	
+	Mashonisa loan	A	82	1	
+	Micro loan	A	82	0	
=	*Liabilities: non-mortgage*		82	11	(1)
	Net business wealth	A	29	1	(2)
⇒	*Individual-level wealth (bottom-up)*		81	31	(3)
	Assets: real estate	H	70	57	
+	Assets: livestock	H	85	4	
−	Liabilities: mortgages	H	95	7	
⇒	*Household-level wealth (bottom-up)*		94	59	(4)
⇒	*Total individual wealth (bottom-up)*		81	31	(5)
	One-shot wealth	A	45	17	(2)
⇒	*Total individual wealth*		93	55	(6)

Note: Derivation of household-level wealth data, NIDS, 2010. Calculations based on weighted sample using post-stratified weights. Specific notes: (1) Aggregation of above items; (2) From one-shot question; (3) Aggregation of financial assets, financial liabilities (−), net business wealth; (4) Aggregation of real estate assets, mortgage liabilities (−), livestock assets; (5) Allocation of real estate wealth evenly to co-owners (where available) or household members, allocation of livestock assets evenly to household members; (6) Imputation of valid, non-zero one-shot question for missing values or zero values in bottom-up estimate or when one-shot response exceeds bottom-up estimate in absolute terms due to item non-responses on category level (not all asset/liability classes with valid responses).

B.2 Sampling and response biases

B.2.1 Sampling bias and survey weights

A sampling bias arises when a survey systematically under-samples specific groups. SALDRU provides two sets of weights to correct for sampling biases in the NIDS. *Design weights* correct for biases in the probability that a household is included and interviewed in the survey. *Post-stratified weights* further adjust the weights to reflect the national, provincial and sex-race-age group population totals as given by current population estimates in each wave. Since income, expenditure and wealth variables tend to be correlated with sex, race and age, SALDRU recommends the use of these weights to reduce the sampling bias for cross-sectional analyses (Brown et al., 2015, Leibbrandt et al., 2009, Wittenberg, 2009).

As Table B.3 shows, the use of post-stratified weights has little impact on the estimates of income inequality, but lowers our estimate for (top one percent) wealth inequality significantly.

B.2.2 Response bias

A response bias arises if respondents to the survey or certain questions within the survey differ systematically from non-respondents. The typical finding is that better-off households are less likely to participate in surveys.

Figure B.1 depicts non-response rates by income deciles. It suggests that non-response rates do not differ strongly between income deciles, and are actually higher among higher-income individuals once we impute one-shot questions for non-responses. This finding is confirmed in a formal F-test on the null hypothesis of equal income between respondents and non-respondents (see Table B.4). One reason for the positive gradient between derived response rates and incomes could be that a "break-even" response to the one-shot wealth question is counted as zero wealth, while the response that the individual would have "something left over" needs to be quantified to count as non-missing.

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Table B.3: Distributional implications of survey weights

	No weights	Design weights	Post-stratified weights
Wealth			
Top 1 %	79	66	61
Top 10 %	98	97	95
Middle 40%	4	4	6
Bottom 50%	−2	−1	−1
Total (%)	100	100	100
Income			
Top 1 %	15	13	11
Top 10 %	47	48	46
Middle 40%	40	41	42
Bottom 50%	13	11	12
Total (%)	100	100	100

Note: Quantile shares, NIDS, 2010, in percent. Calculations using adult-level data.

In contrast to the finding that non-respondents have equal (bottom-up) or lower (derived wealth) incomes, the same tests suggest that non-respondents are more highly educated than respondents. Although we also find that non-respondents to the bottom-up wealth questions are more likely to be white and female than respondents, the results are inconclusive for age, race and gender at the level of derived wealth.

APPENDIX B. WEALTH IN THE NIDS

Figure B.1: Response rates by income quintile
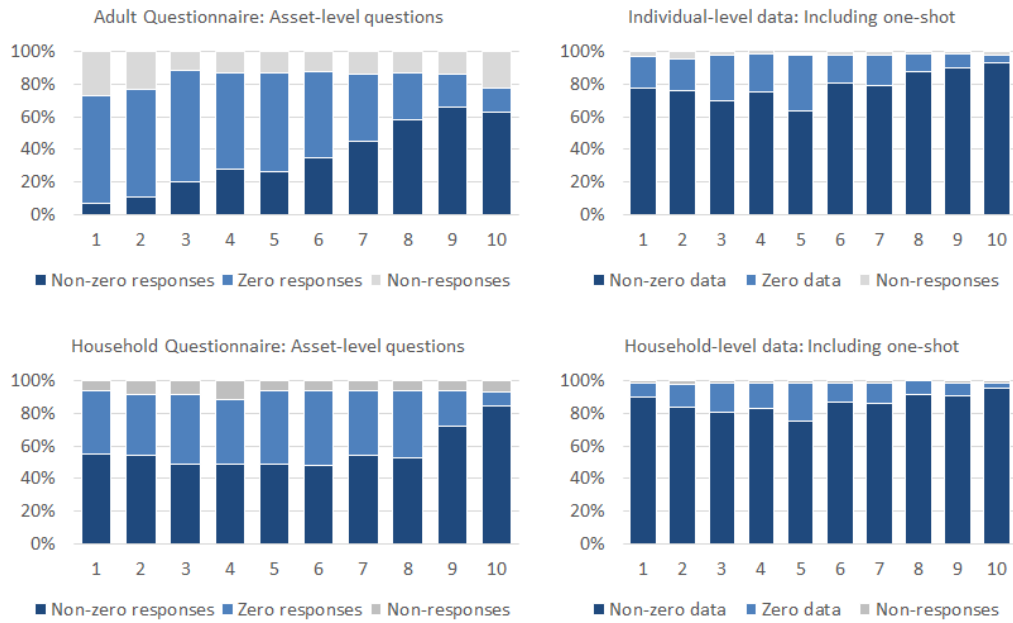
Note: Response rate by income quintile (total income), NIDS, 2010. Left column shows response rates (including split between zero and non-zero quantifications) for asset-level questions; right column shows availability of data once asset-level questions from individual and household survey are combined with one-shot responses.

Table B.4: TEST FOR RESPONSE BIAS

	Share of total (%)		Mean income (R)		F-Test
	Resp.	*Non-Resp.*	*Resp.*	*Non-Resp.*	
Bottom-up					
Individual	81	19	2 850	3 253	0.75
Household	92	8	6 506	5 872	0.39
Derived wealth					
Individual	94	7	2 988	1 518	12.7***
Household	99	1	6 457	6 647	0.00

Note: Comparison of survey means of monthly income by respondent status on wealth questions, NIDS, 2010. "Bottom-up" refers to the completion of the wealth-related questions in the adult- or household questionnaire, "Derived wealth" includes one-shot wealth alongside results from both adult questionnaires. Column "F-Test" reports the value of the F-statistic and indicates the p-value (*** : $p < 0.01$, ** : $0.01 \leq p < 0.05$, * : $0.05 \leq p < 0.1$). Calculations based on weighted sample using adult-level data and post-stratified weights.

B.3 Outliers

I attempt to systematically identify outliers using the multivariate approach proposed by Billor et al. (2000) and implemented in STATA by Weber (2010). This algorithm starts with the subset with the smallest Mahalabonis distance from the whole sample, and iteratively adds all observations with a distance smaller than some threshold, defined as a percentile of the χ^2-distribution (Billor et al., 2000, Weber, 2010). One challenge when using this method is therefore the specification of the relevant variables, the other is the definition of the threshold: Which characteristics plausibly predict a household's wealth, and how far shall we allow them to deviate from the predicted levels before we dismiss the household as an outlier?

Ideally, we would like to determine the outliers based on a broad set of predictive variables. Since wealth generates income in the form of interest, dividends or rents, I include the person's income from capital sources (interests, dividends, rents and private pension incomes), alongside his or her total income and an indicator whether or not he or she receives government grants (which, being means-tested, should be inversely related to wealth). In line with the life-cycle hypothesis of savings and wealth, I also include the age and squared age of the individual. I include level of education of as a proxy of lifetime income as well as financial acumen. Finally, I include an indicator of whether a person uses sophisticated financial products – either a private pension, life insurance or trusts, stocks and shares, and whether he or she is a co-owner of the house.

Table B.5 summarizes the results of the multivariate outlier detection model. As soon as we exclude about 20 people, the wealth share of the richest 10 percent starts to stabilize at around 90 percent. The analysis of these outliers suggests that we are excluding primarily the wealthiest people in the survey, although we also drop several people whose wealth is low compared to their incomes. The mean and median wealth and incomes of the outlier population are much larger than that of the full sample.

Table B.5: MULTIVARIATE OUTLIER ANALYSIS

Threshold	Outliers	Wealth		Income	
		Top 10%	Top 1%	Top 10%	Top 1%
0.01%	24/13 497	92	47	57	17
0.05%	32/13 497	92	47	56	16
0.10%	374/13 497	90	33	56	16
0.50%	388/13 497	89	29	55	15
1%	402/13 497	89	28	55	15
5%	438/13 497	88	23	53	11
10%	454/13 497	88	24	52	11
Full sample	0/19 436	95	61	58	17

Note: Multivariate outlier detection based on the household's income (total and capital income), age/squared age and education level, as well as indicator variables for the ownership of a home, a bank account, pension annuity, trusts, stocks or shares, and of receipt of a government grant. "Threshold" denotes the 1-x^{th} percentile of the χ^2-distribution; "Outliers" gives the number of outliers identified under this threshold. Calculations based on weighted sample using adult-level data and post-stratified weights.

B.4   Re-sampling of the top tail

A variable follows a power law if it is drawn from a probability distribution

$$p(x) = Cx^{-\alpha} \quad \text{if } x \geq x_{min} \tag{B.1}$$

where x_{min} is the lower bound on power law behaviour, the "tail index" α determines the "weight" of the tail, and C is a normalization constant that ensures that the total probability sums up to one. Taking logarithms, this means that $\ln p(x) = \alpha \ln x + \text{constant}$, so a power law distribution is consistent with a linearly downward-sloping histogram on a log-log chart (Clauset et al., 2009, Mitzenmacher, 2001). The break-point between the concave and straight portion of the histogram then provides an indication for the value of x_{min}.

Figure B.2 shows the log-log histogram for labour income and wealth in the NIDS. For both variables, the chart indicates power-law behaviour only in the top 0.5 percent of the distribution. I then follow the procedure proposed by Clauset et al. (2009) to fit and test a power law distribution under different levels of x_{min}.[3] Tables B.6 and B.7 summarize the results for the NIDS and the PIT, which suggest power-law behaviour within a larger share of the population .

With estimates for x_{min} and α, we can make conditional draws from the distribution using inverse random sampling,

$$x = \frac{x_{min}}{U^{1/\alpha}} \tag{B.2}$$

where U denotes uniformly distributed random number over the interval [0,1). Since I only re-sample a limited number of observations, I run 100 draws with replacement for each re-sampled individual, and average the resulting top-wealth shares and Gini coefficients over these draws.

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[3]Clauset et al. (2009) suggest to chose the threshold at which the Kolmogorov-Smirnov statistic (which measures the distance between the density functions of the actual and fitted data) is minimized.

Figure B.2: Power-law distribution (NIDS)
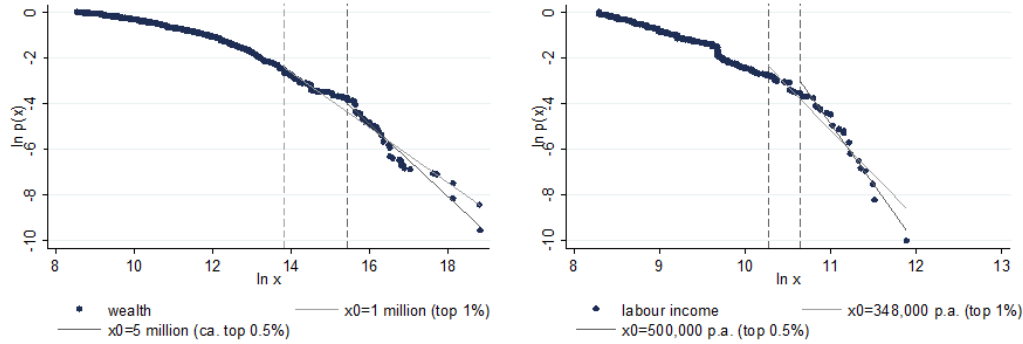
Note: Empirical complementary cumulative distribution function (CCDF) on a log-log chart, NIDS, 2010. Plots of raw adult-level data.

Table B.6: Power law distribution (NIDS)

w_{min}	Observations	% of total	KS	α
500 000	383	2.0	0.12***	1.0 (0.05)
750 000	267	1.4	0.10***	1.0 (0.06)
1 000 000	209	1.1	0.13***	1.1 (0.07)
1 250 000	160	0.8	0.15***	1.0 (0.08)
2 500 000	83	0.4	0.26***	1.0 (0.11)
5 000 000	61	0.3	0.24***	1.8 (0.23)

Note: Fitting the power law distribution for wealth $> w_{min}$, NIDS, 2010. Column "KS" reports the value of the (combined) Kolmogorov-Smirnov statistic and indicates the p-value (*** : $p < 0.01$, ** : $0.01 \leq p < 0.05$, * : $0.05 \leq p < 0.1$). Column "α" reports standard errors in parentheses. Calculations based on weighted sample using adult-level data and post-stratified weights.

APPENDIX B. WEALTH IN THE NIDS

Table B.7: Power law distribution (PIT)

w_{min}	Observations	% of total (unscaled)	KS	α
50 000	89 857	7.7	0.01***	1.4 (0.01)
75 000	50 446	4.3	0.02***	1.4 (0.01)
100 000	34 239	2.9	0.02***	1.5 (0.01)
125 000	25 124	2.1	0.03***	1.5 (0.01)
250 000	9331	0.8	0.01	1.6 (0.02)
500 000	2968	0.3	0.02*	1.6 (0.03)

Note: Fitting the power law distribution for total investment income $> w_{min}$, PIT, 2010. Column "KS" reports the value of the (combined) Kolmogorov-Smirnov statistic and indicates the p-value (*** : $p < 0.01$, ** : $0.01 \leq p < 0.05$, * : $0.05 \leq p < 0.1$). Column "α" reports standard errors in parentheses. Calculations based on unadjusted, unscaled PIT data.

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B.5 PORTFOLIO COMPOSITION

Table B.8 compares the portfolio composition in the NIDS data to the national accounts. One salient feature in this comparison is the understatement if financial assets relative to the non-financial assets in the survey. Pension and non-pension financial assets each constitute a third of total assets in the national accounts, but only 10 percent of total assets in the NIDS. While the composition of liabilities matches the national accounts more closely, the debt-asset ratio shows that liabilities are understated to an even greater extent than assets, leading to an overstatement of net wealth. This finding is largely robust to the removal of potential outliers with regard to wealth (as identified in Appendix B.7).

Table 3.5 reports the wealth distribution by asset class. It shows that the distribution of total assets is very similar to the distribution of net wealth, which justifies the comparison between wealth in the NIDS and assets in the PIT.

Table B.8: Portfolio composition

	Full NIDS sample	Trimmed sample	Pension adjusted	National accounts
Pension/life assets	11	16	47	36
Non-pension financial assets	9	13	5	32
Real estate assets	76	67	45	26
Other non-financial assets	4	4	2	6
Total assets	100	100	100	100
Mortgage debt	52	76	52	57
Other debt	48	24	48	43
Total liabilities	100	100	100	100
Liabilities/assets (%)	11	6	7	20
Wealth/income (%)	538	426	774	231

Note: Portfolio composition, NIDS, 2010, in percent of total assets (liabilities). "Trimmed sample" excludes outliers (see Appendix B.3). "Pension adjusted sample" includes adjustment for pensions (see Appendix B.6). Calculations based on weighted sample using adult-level data and post-stratified weights, using complete observations only (i.e. individuals without missing values on the level of any asset class: $n = 4,917$ in full sample; $n = 4,275$ in trimmed sample).

B.6 PENSIONS IN THE NIDS

Despite the fact that half of private- and public-sector employees are covered by occupational pension schemes (National Treasury, 2012), only five percent of adults reported owning a pension or retirement annuity in the NIDS, and only a third of these were able or willing to provide a quantification. I attempt to correct for this by imputing pension assets for all employed individuals with zero- or non-responses regarding the current value of these assets.

Under the assumption of consumer price inflation (π_p) of 6%, wage inflation (π_w) of 8% (including promotional effects), nominal investment returns (r) of 10%, a constant contribution rate of 15% of the annual labour market income (y) and a starting age of 25 years, we can estimate the current value of a person's pension from his or her age and current contributions ($c_{curr} = 0.15 \times y$). Since pension funds allow people to withdraw their pension assets when switching between jobs, I also apply a 50% withdrawal discount (w) on the estimated assets in pension funds.[4]

I first estimate the initial pension and retirement fund contribution at age 25 (c_{ini}) per Equation B.3, and then calculate the current value of previous contributions per Equation B.4, where n denotes the number of years between 25 and the current age:

$$c_{ini} = \frac{c_{curr}}{(1 + r)^n} \tag{B.3}$$

$$p_{assets} = c_{ini} \times \frac{(1 + r)^n - (1 + \pi_w)^n}{(r - \pi_w)} \times (1 - w) \tag{B.4}$$

This imputation raises the share of pension assets from just above 10 to to just below 50 percent of assets – considerably higher than in the national accounts (see Table B.8). Since withdrawal rates are likely higher for low-income people (who switch jobs more often and have greater need to use their pensions to support consumption between jobs), this estimation likely understates true inequality (National Treasury, 2012).

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[4]The author acknowledges the advice of Davy Corobulo and Natalie Van Zyl with regards to realistic assumptions on retirement saving dynamics in South Africa.

B.7   Wealth, race and gender

Tables B.9 and B.10 contain detailed results for the wealth distribution by racial group and gender. With regards to race, Table B.9 shows that between-group inequality remains very high, but also shows that within-group inequality of the African group exceeds that for the overall population, being much higher than the level of inequality within any other racial group. With regards to gender, Table B.10 shows little difference in the mean and median wealth of men and women.

Table B.9: WEALTH AND RACE

	African	Coloured	Indian	White
Median wealth ('000 R)	0	0	10	200
Average wealth ('000 R)	32	68	994	1 810
Top 10% wealth share (%)	98	84	84	72
Middle 40% (%)	6	17	16	27
Bottom 50% (%)	-4	-1	0	1
Total (%)	100	100	100	100
Observations	15 321	2 547	218	585

Note: Wealth by racial group, NIDS, 2010. Calculations based on weighted sample using adult-level data and post-stratified weights.

Table B.10: WEALTH AND GENDER

	NIDS		*PIT (unscaled)*	
	Male	Female	Male	Female
Median wealth ('000 R)	0	0	0	3
Average wealth ('000 R)	105	103	18	15
Top 10% wealth share (%)	95	94	73	60
Middle 40% (%)	7	7	28	41
Bottom 50% (%)	-2	-1	-1	-1
Total (%)	100	100	100	100
Observations	8 004	10 667	668 369	493 397

Note: Wealth by gender, NIDS and PIT, 2010. NIDS calculations based on weighted sample using adult-level data and post-stratified weights. PIT calculations based on total investment incomes, with adjustments for tax-exempt interest income and pensions (unscaled, relative to the tax-filing sub-population).

Appendix C

Wealth in the PIT

This appendix contains additional information on the data in the second wave of the Personal Income Tax (PIT) assessment sample of 2011 (section C.1), on the imputation of pension assets (section C.2) and on the results before scaling to non-filers (section C.3). It also provides an overview of the assessment sample of 2014, which was made available by SARS but which was not analysed in the third chapter of this thesis (section C.4).

C.1   PIT Data and Sample

C.1.1   PIT assessment sample

The South African Revenue Services gave us access to a 20 percent sample of the 2011 income tax assessment. Table C.1 provides an overview over the *series* provided in the assessment sample, and the derivations of the variables used in this chapter. Table C.2 then provides an overview over the *observations* in the 20 percent sample.

C.1.2   PIT filing thresholds

Whether or not someone is included in the PIT database depends on their liability to file income taxes. In 2011, South African residents were liable to file personal income taxes if their incomes exceeded the following thresholds (SARS, 2011):

– income from a single employer exceeds R120,000 for the year, and/or

– income from more than one employer exceeds R60,000, and/or

– local interest income in excess of R22,300 for taxpayers below the age of 65 or R32,000 for taxpayers aged 65 and older and/or

– foreign interest or dividend income in excess of R3,700, and/or

– income from own business, irrespective of the amount.

According to the NIDS, the labour income threshold should be exceeded by only 3-7 percent of employees, while the investment income threshold should be exceeded by about one third of recipients of investment incomes. In reality, about 95 percent of tax filers (16 percent of the population) declared incomes from employment in the PIT, while only 7 percent (1 percent of the population) declared incomes from investments.

APPENDIX C. WEALTH IN THE PIT

Table C.1: PIT – Data Overview

	Item	Code	Notes
	Local interest	4201	Local interest earned[†]
+	Local capital gains	4250	Excludes the basic exemption for capital gains (exclusion rate in 2010-11: 75%)
−	Local capital losses	4251	
+	Other gains	42*	Local dividends[†]; rental profits/losses; income from building societies; income from fixed period shares and deposits; royalties; foreign investment income (interest, dividends, capital gains/losses); gambling gains/losses
−	Other losses	42*	
=	*Investment income incl. capital gains*	Derived	
+	Business profits	01-34*	Profits/losses from unincorporated businesses or trades
−	Business losses	01-34*	
=	*Business income*		
+	Normal income	36	Local and foreign labour and pension income
+	Fringe benefits	38	
+	Lump sum income	39	Local and foreign lump-sump income, including special remuneration and pension/ provident fund lump-sums
=	*Labour income[‡]*		
=	*Gross income*		All incomes received by the individual
−	Deductions	40	E.g., Taxes paid under pay-as-you-earn; pension, provident or medical fund contributions
−	Exemptions		The exempted portion of interest income, all local dividends
=	*Taxable income*		Taxable income used to determine the normal tax due (before any rebates and tax credits)

Note: Overview over the data in the PIT assessment sample. *Asterisks refer to the subset of items under the respective SARS Code that not mentioned separately in the table. [†] Local interest below the threshold of R22,300 and local dividend income in its entirety is exempt from the PIT, and the accuracy of exempt incomes is not verified in the tax inspection process. [‡]Employment income derived from taxable normal and lump sum income (only taxable portion of normal and lump sum income provided by SARS).

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Table C.2: PIT – Sample Overview

	Number	Notes
Total population	49 991 300	
Of which aged 15+	34 487 100	
Submitted tax records	5 876 889	
Implausible/null values	956	Implausible or null values excluded by SARS
Remaining tax records	5 875 933	
Of which high-earners	602	"High earners" with taxable incomes > R10 million to be considered separately for confidentiality reasons
20% sample excluding high-earners	1 175 187	Assessment sample as made available by SARS to the author
Ages 15+ only	1 173 469	
20% sample of high-earners	120	Summary statistics on all high-earners made available by SARS (mean, standard deviation, minimum, maximum, 25th, 50th and 75th percentiles)

Note: Overview over the observations in the PIT assessment sample. Population totals from StatsSA mid-year population estimates.

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C.2   Pensions in the PIT

The PIT provides no information on investment incomes on pension assets. However, the PIT contains data on current contributions to pension or retirement annuity funds, which allow us to estimate the current value of pension assets in analogy to the procedure described for the NIDS (see Appendix B.6). The main difference is that we can read current contributions directly from the data (as opposed to estimating it at 15% of current earnings), and that we can distinguish contributions to pension funds and from contributions to retirement annuity funds. Since assets in the latter cannot be withdrawn before retirement, I apply the 50% discount to the assets in pension funds only.

Since the PIT works records investment incomes rather than the underlying assets, the annual investment income on pension assets needs to be estimated per Equation C.1:

$$p_{income} = p_{assets} \times r \qquad\qquad (C.1)$$

I set the investment income from pension assets to zero for people below 25, and to missing for people above 65.[1] When calculating distributional statistics for pension assets (or total investment income including pension assets), I then work on the population below 65 years only.[2]

When estimating investment incomes on pension assets with this approach, they constitute almost 80 percent of total investment incomes. Yet, the imputation seems to still understate true pension wealth significantly: imputed pension wealth in the PIT amounts to only 21 percent of the "total assets of private self-administered pension and provident funds".

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[1]Ideally, we would set only retirees to missing, while keeping zero pension wealth for people above 65, who do not receive a pension and do not contribute to pension or retirement annuity funds. However, the current SARS dataset does not distinguish between labour and pension incomes under employment income.

[2]To scale investment incomes to the total population, I use a censoring value of R1,950, at which I arrive by applying the median ratio of pension investment incomes to labor incomes to the filing threshold to labor incomes.

As in the case of the NIDS, our estimates likely understate the true inequality of pension wealth significantly (since withdrawal rates and interruptions to contribution times are likely higher for low-income people).

C.3   PIT Unscaled results

Table C.3 and Figure C.1 provide results on the wealth distribution within the tax-filing sub-population (prior to scaling), and show the importance of the adjustments made to the measure of wealth. The imputation of interest incomes below the filing threshold via a bottom-censored log-normal distribution is the most important adjustment in the unscaled sample. In the scaled sample, the imputation of interest incomes below the filing threshold has a much smaller impact.

Table C.3: PIT – In-sample (unscaled) distribution

Income source	Share $\neq 0$	Top 10%	Top 1%	Gini
Employment	91	38	10	0.52
Local interest	3	100	77	0.99
Other investment	5	105	82	1.09
Total investment	7	104	67	1.05
Pensions[†]	52	62	22	0.79
Local interest, adjusted for tax-exempt omissions*	100	36	12	0.46
Total investment, adjusted for tax-exempt interest*	100	50	24	0.59
Total investment, adjusted for tax-exempt interest & pensions[‡]	100	47	19	0.59

Note: Quantile shares, PIT, 2010. Results relative to the tax-filing population (not scaled to non-filers). Second column contains share of non-zero observations. *Adjustment for omissions of tax-exempt interest income described in Section 3.3.3. [†]Adjustment for investment income on pension assets described in Appendix C.2; Distributional metrics for the population < 65 years only. [‡]Distributional metrics for the total population (results for the population < 65 years only marginally lower). Note that in the presence of individuals with negative investment incomes, the Gini coefficient is no longer bounded to one (see also OECD, 2015).

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Figure C.1: PIT – In-sample (unscaled) distribution
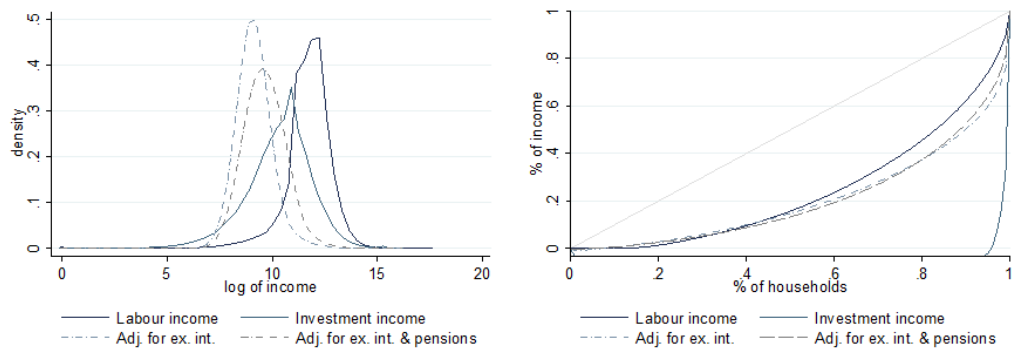
Note: Income distribution, PIT, 2010. Unscaled results. Left panel: Kernel density curves of logged incomes; right panel: Lorenz curves.

C.4   PIT 2014: Main results

SARS also provided us with a 20 percent sample of the 2014 tax assessment for 2013-2014 tax year. Table C.4 summarizes the results for the within-sample distribution. It suggests that inequality is slightly lower than in the 2010-2011 tax year, although this is likely due to higher filing rates.

Table C.4: PIT – 2010-2011 vs 2013-2014

Income source	Share $\neq 0$	Top 10%	Top 1%	Gini
2011				
Employment	91	38	10	0.52
Local interest	3	100	77	0.99
Other investment	5	105	82	1.09
Total investment	7	104	68	1.05
2014				
Employment	94	36	10	0.49
Local interest	4	100	78	0.99
Other investment	7	102	81	1.02
Total investment	9	102	71	1.01

Note: Quantile shares, PIT, 2010 and 2013. Results relative to the tax-filing population (not scaled to non-filers). Second column contains share of non-zero observations. Note that in the presence of individuals with negative investment incomes, the Gini coefficient is no longer bounded to one (see also OECD, 2015).

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