SPATIAL ECONOMIC ATTRIBUTES OF AIRPORT-CENTRIC DEVELOPMENTS IN CAPE TOWN AND JOHANNESBURG

by

MASILONYANE MOKHELE

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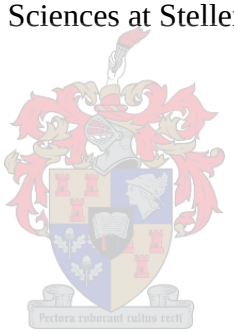

Supervisor: Prof Hermanus Stephanus Geyer

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DECLARATION

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ABSTRACT

The existing knowledge lacks empirically informed description and explanation of the economic fundamentals driving the forces of attraction of airports. This void is arguably a result of the absence of an appropriate theoretical framework to guide the analyses. The aim of the study was therefore to contribute towards a theoretical framework that describes and explains forces that drive the location and mix of airport-centric developments. Towards achieving this aim, the objectives of the study were: one, to establish the type of economic activities that are located on and around the Cape Town and OR Tambo airports, and analyse the reasons for locating there; two, to identify a propulsive economic element found around the Cape Town and OR Tambo airports, and analyse the linkages they have with the airport-centric developments and airports; three, to analyse the spatial, economic and structural linkages within the airport-centric developments of the Cape Town and OR Tambo airports, between the airport-centric developments and the airports, as well as the airport-centric developments' linkages with their metropolitan areas and other regional, national and international airport-centric developments and locations; four, to establish the changes that have occurred over time in the form of the airport-centric developments of the Cape Town and OR Tambo airports.

To address the research objectives, the study adopted a case study approach, centred on the Cape Town and OR Tambo international airports and surrounds in South Africa. A survey was used as a main data collection method, with the investigations informed primarily by the conceptualisation of the growth pole theory. From the findings, the Cape Town and OR Tambo airports were discovered to have propulsive economic qualities that act as significant forces of attraction in the clustering of firms. Together with their airport-centric developments, the two airports were discovered to have growth pole properties because of the linkages that occur within the study areas, and the linkages that exist between the airport-centric firms and the airports. It was noted that the transport-oriented firms (typified by couriers and freight carriers) act as anchors in some fellow airport-centric firms making use of elements of urbanisation economies, particularly as regards the use of the two airports for airfreight services.

The study contributed towards a spatial economic theory of airport-centric developments, using the following concepts as building blocks: economic space, relational firm, geographical and organisational proximity, relational scale and pattern; understood in terms of their interconnections with the concepts of linkages, agglomeration economies, clustering, and the propulsive economic element. The theoretical framework is summarised as follows. One, airport-

centric firms are not atomistic islands that merely transmit market transactions, but are characterised by intra-firm and inter-firm linkages. Two, the economic space that airport-centric firms are part of is not equivalent to geographical space. Three, in their business operations, airport-centric firms rely on a combination of geographical proximity and organisational proximity. Four, geographical scale does not restrict the operations of the economic space of airport-centric firms, resulting in a combination of spatial clustering and organisational clustering.

Keywords: agglomeration economies, airports, airfreight, airport-centric firm, airport-centric development, Cape Town International Airport, clustering, economic space, globalisation, OR Tambo International Airport, propulsive economic element, South Africa, model of airport-centric developments, theory of airport-centric developments, proximity

OPSOMMING

In die bestaande kennis is daar ’n gebrek aan empiries geïnformeerde beskrywing en verduideliking van die ekonomiese grondbeginsels wat die kragte van aantrekking van lughawens dryf. Hierdie leemte is moontlik ’n gevolg van die afwesigheid van ’n gepaste teoretiese raamwerk waarvolgens analises gerig kan word. Daarom was die doel van hierdie studie om by te dra tot ’n teoretiese raamwerk om kragte wat die ligging en vermengsing van lughawe-sentriese ontwikkelinge dryf te beskryf en te verduidelik. Om hierdie doel te verwesenlik is die oogmerke van die studie die volgende gewees: een, stel vas watter soort ekonomiese aktiwiteite in en rondom die Kaapstad en OR Tambo Lughawens geleë is, en analiseer die redes vir die keuse van hierdie ligging; twee, identifiseer ’n voortdrywende ekonomiese element wat rondom die Kaapstad en OR Tambo Lughawens te vinde is, en analiseer die koppelvlakke wat hulle met die lughawe-sentriese ontwikkelings en lughawens het; drie, analiseer die ruimtelike, ekonomiese en strukturele koppelvlakke binne die lughawe-sentriese ontwikkelinge van die Kaapstad en OR Tambo Lughawens, tussen die lughawe-sentriese ontwikkelinge en die lughawens, sowel as die lughawe-sentriese ontwikkelinge se koppelvlakke met hulle metropolitaanse areas en ander streeks, nasionale en internasionale lughawe-sentriese ontwikkelinge en liggings; en vier, stel vas watter veranderinge in die vorm van lughawe-sentriese ontwikkelinge van die Kaapstad en OR Tambo Lughawens oor tyd plaasgevind het.

Om die navorsingsoogmerke te bewerkstellig, het die studie ’n gevallestudiebenadering gebruik en dit toegespits op die Kaapstad en OR Tambo Lughawens en omliggende omgewings in Suid-Afrika. ’n Opname is as die belangrikste dataversamelingsmetode gebruik, met die ondersoeke primêr geïnformeer deur die konseptualisering van die groeipoolteorie. Aan die hand van die bevindinge is ontdek dat die Kaapstad en OR Tambo Lughawens voortdrywende ekonomiese eienskappe het wat as beduidende kragte van aantrekking in die saambondeling (*clustering*) van firmas optree. Saam met hulle lughawe-sentriese ontwikkelinge, is ontdek dat die twee lughawens groeipooleienskappe het, as gevolg van die koppelvlakke wat in die bestudeerde areas voorkom, en die koppelvlakke wat tussen die lughawe-sentriese firmas en die lughawes bestaan. Daar is gelet dat die vervoer-georiënteerde firmas (tipies koeriers en vragdraers) as ankers in sommige mede- lughawe-sentriese firmas optree en gebruik maak van elemente van verstedelikingsekonomieë, veral rakende die gebruik van die twee lughawens vir lugvragdienste.

Die studie het bygedra tot ’n ruimtelike ekonomiese teorie van lughawe-sentriese ontwikkelinge, deur gebruik te maak van die volgende konsepte as boublokke: ekonomiese ruimte, relasionele firma, geografiese en organisatoriese nabyheid, relasionele skaal en patroon; verstaan in terme van hulle interkonneksies met die konsepte van koppelvlakke, opeenhoping-ekonomieë, saambondeling, en die voortdrywende ekonomiese element. Die teoretiese raamwerk word vervolgens opgesom. Een, lughawe-sentriese firmas is nie atomistiese eilande wat bloot marktransaksies oorbring nie, maar word ook gekenmerk deur intra-firma- en inter-firma-koppelvlakke. Twee, die ekonomiese ruimte waarvan lughawe-sentriese firmas deel is, is nie ekwivalent aan geografiese ruimte nie. Drie, in hulle sake-werksaamhede maak lughawe-sentriese firmas op ’n kombinasie van geografiese nabyheid en organisatoriese nabyheid staat. Vier, geografiese skaal beperk nie die werksaamhede van die ekonomiese ruimte van lughawe-sentriese firmas nie, wat lei tot ’n kombinasie van ruimtelike saambondeling en organisatoriese saambondeling.

Sleutelwoorde: opeenhoping-ekonomieë, lughawens, lugvrag, lughawe-sentriese firma, lughawe-sentriese ontwikkeling, Kaapstad Internasionale Lughawe, saambondeling (*clustering*), ekonomiese ruimte, globalisasie, OR Tambo Internasionale Lughawe, voortdrywende ekonomiese element, Suid-Afrika, model van lughawe-sentriese ontwikkelings, teorie van lughawe-sentriese ontwikkelings, nabyheid

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CONTENTS

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ACRONYMS AND ABBREVIATIONS

ACSA	Airports Company South Africa
CBA	Cost-Benefit Analysis
CBD	Central Business District
CID	City Improvement District
CTIA	Cape Town International Airport
DFW	Dallas-Fort Worth
DIA	Durban International Airport
EDC	European Distribution Centre
FIRE	Finance, Insurance and Real Estate
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GVA	Gross Added Value
ICAO	International Civil Aviation Organisation
IDZ	Industrial Development Zone
IOA	Input-Output Analysis
IUDF	Integrated Urban Development Framework
KSIA	King Shaka International Airport
KZN	KwaZulu-Natal
LIA	Lanseria International Airport
LM	Local Municipality
MAS	Multi-Airport System
MAUP	Modifiable Areal Unit Problem
MIA	Miami International Airport
MM	Metropolitan Municipality
MNE	Multinational Enterprise
MSA	Metropolitan Statistical Area
NEG	New Economic Geography
NGI	National Geo-spatial Information
NRF	National Research Foundation
ORTIA	OR Tambo International Airport
SADC	Southern African Development Community
SANS	South African National Standards

SIC	Standard Industrial Classification of economic activities
SPSS	Statistical Package for Social Sciences
TCUW	Transportation, Communications, Utilities and Warehousing
UK	United Kingdom
USA	United States of America
W&D	Warehouse and Distribution

1 INTRODUCTION AND OVERVIEW

This opening chapter is structured into seven sections that provide a brief overview of the dissertation. Section 1.1 presents a background to the study by highlighting the origins of flying generally and in South Africa, as well as the evolution of the form and economic activity composition of airports and surrounds. Thereafter, the section outlines aspects that are covered comprehensively in the existing knowledge of airports and surrounds, which therefore did not form a major part of the study. With a view to avoiding misinterpretations, the key concepts employed in the study are defined in Section 1.2. On the background of limitations of existing knowledge on the spatial economic attributes of airports and surrounds, Section 1.3 outlines the research problem that the study intended to address. In light of the problem identified, Section 1.4 presents the aim of the dissertation, followed by the specific research questions and objectives. Section 1.5 focuses on the underlying philosophical orientation, research design, and a summary of the research methodology and methods utilised in the study. The penultimate section spells out the unique attributes of the study, which resulted in distinct theoretical and practical contributions to the topic of spatial economic attributes of airports and surrounds. The section also highlights the limitations of the study. Section 1.7 closes the chapter by presenting the structure of the dissertation.

1.1 BACKGROUND AND RATIONALE

It is well known that airports are part of the air transport industry, whose goal is to transport people and goods within countries and between countries (Lichfield 1973). The vision of flying has its origins in the renowned drawings of flying machines sketched by Leonardo da Vinci in the fifteenth century (Benzimra 1973; Fujita 1999; Launius 1999). After many attempts at flying, the first successful flight occurred in 1903 with the Wright brothers in North Carolina, United States of America (USA) (Bednarek 2001; Hetherington 1999; Urry 2009; Wells 2000). In South Africa, the first flight subsequently occurred in 1909 in East London (Cockbain 1994; de Freitas 1968).

In light of the brief origins of flying above, Wells (2000) notes that airports[1] existed from around 1909, although Bednarek (2001) is of the view that referring to some of the earlier flying and landing sites, like the one used by the Wright brothers, as airports might be an exaggeration. From 1914 with the start of the First World War, civil airports diminished and all airports were

[1] Throughout history, airports were associated with different names used interchangeably in various parts of the world, namely landing field, flying field, airfield, air (plane) station, air depot, airdrome and aviation field (Bednarek 2001; Gordon 2008).

used for military purposes (Wells 2000). Subsequent to the conclusion of the First World War, civil airport development improved as the borders of European countries opened and aircraft travelled between different cities (Gordon 2008). The world's first scheduled civil air service occurred in 1919, with a flight from London Airport (Hounslow) to Paris in France (Masefield 1968). Though some commentators maintain that Hounslow was not an airport, but a grassed tract accommodating hangars and a customs office, it nonetheless marked an important milestone in the history of airports (Allen 1968). In the USA, Bednarek (2001) points out that from 1919, in addition to being used by the military, airports were established to serve the post office. In South Africa, following experimental flight of mail in Cape Town (de Freitas 1968), more trial mail flights were made in the 1920s, including a service between Cape Town, Port Elizabeth and East London, flown by the South African Air Force (Cockbain 1994).

The enthusiasm of airports improved considerably in the 1920s when the first commercial aircraft were introduced (Allen 1968). In the same decade, the world was influenced by the syndrome of air-mindedness, which referred to the enthusiasm for aircraft and the belief of their potential to improve human life (Corn 1983, cited in Adey 2006). Possibly as the influence of air-mindedness, modernists regarded airports as key to the city of the future (Gordon 2008), and from the 1920s prominent urban planners expressed views on airport planning (Bednarek 2000). The planners' views dealt with the ideal location of airports, and the connections of airports within and among cities. The views expressed in turn directly and indirectly provided suggestions on land uses that could be located on and around airports. According to Gordon (2008), Le Corbusier believed that to augment the beauty and attractiveness of airports, they should be surrounded by open spaces. Bednarek (2000) points out that George B Ford held similar views, as he believed that the ideal location of airports would be adjacent to farms, playfields, cemeteries or water bodies. John Nolan asserted that airports have to be located on the outskirts of cities, except in cases where large open fields could be created by filling-in areas along rivers and harbours (Bednarek 2000). Although Hubbard, McClintock & Williams (1930) and Sealy (1955) note that airports be located close to town centres, it can be concluded that the earlier views of urban planners are evidence that historically and largely before the 1970s, airports were considered as mere aviation infrastructure where aircraft land and take off, and passengers and cargo transit (Freestone 2009; Hartwig 2000, cited in Van Wijk 2007; Kesselring 2009; Lowther et al. 1970; Urry 2009).

In addition to the limited views on airports and surrounds, throughout their history airports have been associated with the negative effects resulting from airport noise and aircraft noise, which in

turn can influence and perpetuate the negative and limited views on airports. It is important to note that airport noise and aircraft noise are not synonymous. When discussing airport noise, Gottlieb (1971) indicates that common sources of noise on and near airports are: one, aircraft taking off and landing; two, aircraft undergoing maintenance; three, engine tests; and four, ground power units, machinery and personnel. Thus, aircraft noise is but one (although arguably the dominant) type of airport noise. With a background of aircraft noise issues, airports were considered a nuisance for the geographically proximate areas. In order to apprise airport operators, policymakers and other stakeholders of latest information, Mestre (2008) synthesises research undertaken on the negative effects of aircraft noise. The studies completed since 1985 were selected, annotated and categorised into eleven topic areas pertaining to the effects of aircraft noise, namely (1) health effects of aviation noise; (2) annoyance and aviation noise; (3) sleep disturbance and aviation noise; (4) speech interference and aviation noise; (5) effects of aviation noise on schools; (6) effects of aviation noise on parks, open space, and wilderness areas; (7) aviation low-frequency noise and vibration; (8) aviation noise effects on wildlife and domestic animals; (9) aviation noise effects on property values; (10) effect of meteorology on aviation noise; and (11) effect of topography and ground absorption on aviation noise (Mestre 2008).

Despite the bleak background highlighted above, the transforming spatial form, structure, land use composition and function of airports and surrounds require a better understanding of their spatial economic attributes. The evolution can be traced to the first civil airport terminal and hotel opened at Croydon in 1928 (Masefield 1968). A further turning point in the change of airport environs was the introduction of restaurants within the terminals, whereby people visited airports to watch aircraft take off and land (Gordon 2008; Prins 2009). In addition, some airports increased their revenues by charging admission fees to their premises, and by holding air shows. Over time, different economic activities were introduced on and around airports. In the analysis of the impact of air travel on the economic and geographical structure of American cities, Karsner (1997) notes that between the 1940s and the 1980s, airports and the firms located in their surrounds competed with traditional central business districts (CBDs) as business and leisure centres. Chapter Two among others discusses the type of economic activities located on the following airports and surrounds: Atlanta, Burbank, Dallas Fort Worth, Frankfurt, Long Beach, Los Angeles, Memphis, Narita, Chicago O'Hare, Schiphol, Orange County, OR Tambo, Van Nuys, Seattle-Tacoma, John Wayne, Glendale-Burbank-Pasadena, Shannon, Cork, London, Hereford, Sumter, Hayward, Frederick, Fairmont and Miami. As shown in Chapter Two, it is

crucial to note that not all airports are characterised by changes in spatial form and economic activity mix.

With the changing form, structure, land use composition and function of airports and surrounds, there are three aspects that are covered extensively by the existing knowledge. Firstly, as evident in Mestre's (2008) synthesis, the impacts of aircraft noise on the surrounding communities are well documented globally. Goldschagg (2007); Nchemanyi (2006); Pillay, Archary & Panday (2011); Von Holdt (2003); and Van der Merwe & Von Holdt (2005, 2006) conducted research on the effects of aircraft noise in South Africa; and summarised as follows. Goldschagg (2007) employed aircraft prediction models to establish potential effects of night-time aircraft noise. The study focused on residential areas surrounding the OR Tambo International Airport (ORTIA). Nchemanyi (2006) investigated the psychological effects of aircraft noise on residential and school activities at a neighbourhood located close to Cape Town International Airport (CTIA). Pillay, Archary & Panday (2011) analysed the hearing status of individuals living close to the airport, in comparison to those living approximately 30 km from the airport.[2] Van der Merwe & Von Holdt (2005) focused on residential areas (communities) in the vicinity of CTIA, and utilised Geographical Information System (GIS) technology to demarcate a noise-controlled area around the airport. Van der Merwe & Von Holdt (2006) used GIS to establish the potential noise exposure of sensitive land uses in the noise-affected areas around CTIA.

The second aspect that is covered comprehensively in the literature pertains to the institutional[3] arrangements that influence development and operations of airports, as well as the emergence of economic activities on and around airports. In addition to conflicts and negotiations pertaining to the development and expansion of airport's core infrastructure and facilities in the form of runways and terminals, the institutional arrangements that influence airport-centric developments have been studied comprehensively by, inter alios, de Jong, Suau-Sanchez & Droß (2008) at Schiphol, Barcelona and Munich airports; Galvin (2010) at Schiphol and Orly airports; Nunn, Drew & Carl (1996) at American airports as regards competitive location choice decisions of airlines' maintenance and operating centres; Walker & Barker (2010) at Brisbane Airport; Van Boxtel & Huys (2005) at Schiphol Airport; Knippenberger (2010) at Schiphol Airport;

[2] Pillay, Archary & Panday (2011) do not specify the airport that their study focused on.

[3] The term institution has a long history dating back to around 1725, and has been used in the disciplines of philosophy, sociology, politics and geography, but despite the term's long existence, there is no consensus on its definition (Hodgson 2006). The most widely used definition is that of North (1990, 1996), who defines institutions as the formal rules, the informal constraints, and the enforcement characteristics of each. Institutions take the form or organisations, laws and regulations, whose purpose is to coordinate economic activities by promoting or discouraging development (Aoyama, Murphy & Hanson 2011).

Knippenberger (2015) at Frankfurt Airport, focusing specifically on the neighbouring city of Morfelden-Walldorf; and Van Wijk (2007; 2008) at Schiphol, Frankfurt, Narita and Tokyo airports.

At this point, it is important to note that it would be simplistic to completely divorce the aircraft noise and institutional matters from the analyses of firms that are located on and around airports.[4] On the one hand, government's policies, land use control instruments and financial incentives or penalties to an extent play a role in shaping cities (Anas, Arnott & Small 1998; Smith 1971). Such controls can have a role in directing and influencing the nature of firms that locate on and around airports (this is however not always the case as shown in Chapter Two); and Gottlieb (1971) discusses various controls that attempt to protect the airport from encroachment, and those necessary to protect the community from airport operations, while also trying to make the airport area appealing to commercial activities. The work of Roeseler (1971) provides a good example of how Kansas City attempted to guide development around Kansas City International Airport through land use control measures. Furthermore, the International Civil Aviation Authority (ICAO) continuously formulates guidelines on land use planning in the vicinity of airports (see, for instance, ICAO 1985).[5] In South Africa, in addition to the ICAO principles, the guidelines of the South African National Standards (SANS) are used to control the location of land uses on and around airports (see Standards South Africa 2003; 2008). Moreover, South Africa (2015c) addresses the interaction between an airport and its environment, and particularly deals with aspects of land use, which are directly related to the operations of an airport. On the other hand, and associated with the preceding consideration, aircraft noise can result in certain economic activities that are not sensitive to noise locating geographically close to airports, and noise-sensitive uses being pushed away from the airports. The brief discussion above shows that aircraft noise and institutional matters cannot be disregarded completely from the topic of spatial economic attributes of airport-centric developments.

The third topic that is covered thoroughly in the literature relates to the economic impacts of airports, as documented worldwide in standard airport economic impact reports. This section of the dissertation provides only a synopsis of these methods, as the matter is discussed at length in Chapter Two. It is crucial to note that the presentation of the methods hereunder does not imply that the dissertation adopted them (see Chapter Two for limitations of these methods). In South

[4] North (1990) eloquently presents the general importance of institutions in economic analyses.

[5] ICAO is an agency of the United Nations, whose main role is to promote efficient and safe international air transport (see, for instance, Glassner 1996).

Africa, Luke & Walters (2010) measure the economic impact of ORTIA, CTIA and Durban International Airport (DIA). DIA was subsequently decommissioned in 2010, and replaced by King Shaka International Airport (KSIA) (see Section 1.4.1). ACSA (2011) conducted a macro-economic impact study for CTIA. Karlsson et al. (2008) provide a synthesis of how airport economic impact studies are conducted generally, and review the methods and models used to define and identify, evaluate and measure, and communicate the impacts. The authors discuss various analytical methods, models, and tools that are used for airport economic impact studies, as well as their applicability and trade-offs, including limitations, trends and recent developments. In some countries, similar studies are referred to as social and economic impact of airports, and ACI (2004) collated and updated the impact of fifty-six European airports on the economy.

Due to comprehensiveness of existing knowledge on aircraft noise and institutional aspects, a position was taken in the study that these two aspects should not be cornerstones of new research on firms that are located on and around airports. As mentioned before, these aspects were not discarded completely. Though the standard economic impact studies have been conducted widely, they overlap greatly with the analyses of spatial economic attributes of firms situated on and around airports, hence they are reviewed in Chapter Two to assess their usefulness. Despite the knowledge on airports and surrounds from these different facets, there is a lack of empirically informed description and explanation of the economic fundamentals driving the forces of attraction of airports. In the light of this deficiency, the research problem is outlined in Section 1.3, and the research aim, questions and objectives spelled out in Section 1.4.

1.2 CLARIFICATION OF CONCEPTS

While the preceding section provides a preamble to the research problem, the current section defines the key concepts that the study revolved around. Although it could be argued that a discussion of the concepts fits into Chapter Two, it is important to clarify the concepts at this point because they are integral to the discussion to follow on the research problem, aim, questions and objectives. These are the concepts of airport-centric firms and developments, agglomeration economies, linkages, clustering (spatial and organisational), and propulsive economic activities.

1.2.1 Airport-centric firms and developments

The concept of airport-centric firms and developments is the cornerstone of the dissertation given that it forms part of the study's title. Before defining the concept, it is essential to locate it

within the various terms that might have similar meanings; given that numerous terms and models are associated with economic activities that locate on and around airports. These are airport city (Conway 1993; Kasarda 2009), aerotropolis (Kasarda 2009; Kasarda & Lindsay 2011), airport region (Schlaack 2010), airfront (Blanton 2004), global transpark (Kasarda 1998; Sit 2004), airport corridor (Schaafsma 2008, cited in Freestone & Barker 2011), airea (Schlaack 2010), decoplex (Conway 1993), aircity, aeropolis, aeropark, aviopolis, avioport, flight forum, sky city, airpark, aero city and aeroscape. Airport authorities, developers and governments promote these models as economically and physically integrated initiatives of the airport and urban development (Guller & Guller 2003, cited in Schlaack 2010). Among the aforementioned terms, airport city and aerotropolis can be distinguished as the most dominant in the literature. Airport city is used worldwide to refer to the growth of aviation and non-aviation activities on and around airports (Walker & Stevens 2008) due to their dependence on the airports. According to Kasarda (2009), as more firms are attracted to airport cities and along the transportation infrastructure linking such developments, a new urban form emerges. This urban form is referred to as aerotropolis, consisting of developments that could extend up to about 30 kilometres from airports (for instance, see Kasarda & Lindsay 2011). Chapter Two critically reviews the various terms and models of the idealised form of airports and surrounds, to assess their usefulness to the research objectives and questions presented in Section 1.4.

In the background of the various models and terms, it is important to note that in the literature, the only known explicit definition of the concept of airport-centric development is provided by GAO (2013), as development that is located: one, on the airport property and intended to augment the airport's non-aviation revenue; and two, outside the airport, intended to enable the broader metropolitan area economically by leveraging proximity to the airport. The GAO definition does not explicitly include firms that are located within the airport terminals.

As regards the position of the dissertation, the term 'airport-centric firms' is formulated from two words denoting airport as a location around which firms locate. Unlike the GAO's (2013) definition and the different terms highlighted above, the dissertation did not have a priori claim that the airport is the catalyst or attraction of the firms located in its geographical proximity. The role of the airport as a force influencing the location of firms was investigated in the dissertation as is evident in the research objectives to follow. Therefore, amidst the different terms and models, the dissertation adopted the concept 'airport-centric development' to refer to a group of 'airport-centric firms'. These are firms that are located:

1. Around the airport: at areas located in the geographical proximity of the airport, but outside the airport land;
2. On the airport's land, but not within the terminal; and
3. Within the airport's terminal.

1.2.2 Agglomeration economies

The definition of agglomeration economies advanced in the dissertation used as a starting point Parr (2002), who argues that agglomeration economies consist partly of internal economies and partly of external economies; wherein each component needs to be understood in terms of scale, scope, and complexity, as discussed below.

1.2.2.1 Economies internal to the firm

The economies internal to the firm are controlled by the firm and are not (directly) affected by the actions of other firms. Internal economies of scale are also known as economies of horizontal integration, and refer to benefits to the firm that result from increases in the extent of its operations. Internal economies of scope (lateral integration) are realised because of the diversity of products and/or services provided by the firm. The notion of economies of scope is based upon the understanding that the joint undertaking by a firm of two or more activities could occur more efficiently than would be the case if separate firms undertook such activities (Panzar & Willig 1981; Parr 2002). Whereas scope deals with the multi-product or multi-service nature of the activities of a firm, the internal economies of complexity (vertical integration) refer to the multi-process of production, and more generally to the fact that the activities of a firm involve separable stages. When such complexity exists within a firm, the structure is referred to as internal vertical integration. Economies of complexity therefore occur when the undertaking of various stages by a single firm results in lower total costs (or efficiency generally) for the end product or service than would be the case if separate firms carried out the stages (Parr 2002).

Parr (2002) notes that agglomeration economies based on internal economies of scale, scope, and complexity do not result in spatial clustering of firms. Typically, but not necessarily, internal economies result in individual firms becoming larger. In addition to agglomeration economies above, the dissertation investigated dispersion economies. Polenske (2008) argues that dispersion economies occur if savings result when firms disperse their activities away from the head office. The concept of dispersion economies partially informs elements of organisational clustering discussed later in the chapter.

1.2.2.2 Economies external to the firm

External economies are dependent on the existence and actions of other agglomerated firms, and are therefore beyond the total control of the individual firm (Parr 2002). They comprise localisation economies, urbanisation economies and activity-complex economies. Localisation economies derive from the common location of independent firms in the same industry. These economies are therefore external to the firm but internal to the industry (Parr 2002). Agglomeration economies of this type were considered by Marshall (1920), and formed the foundation for what is known as industrial districts.

Urbanisation economies are typical of diversified urban areas, and result from the common location of firms involved in different and unrelated economic activities. For example, urbanisation economies could result from the use of transportation facilities (Isard 1956) such as airports in the context of the dissertation. Urbanisation economies, which are external to the individual firm and also to the industry, are internal to the urban concentration. It is argued that urbanisation economies may be understood as economies of scope, that is, as a function of the scope or diversity of production and services within the urban concentration (Parr 2002).

Activity-complex economies result from the common location of a set of firms that exist in a production or service provision chain so as to form an activity complex. These economies are primarily a function of the interrelatedness of firms. In this regard, a firm has backward or upstream linkages to the firms supplying it and forward or downstream linkages to the firms it supplies. Activity-complex economies are external to the firm but internal to the complex to which it belongs (Parr 2002). It should be noted that despite its benefits, agglomeration could beyond a certain scale generate disadvantages or agglomeration diseconomies (see Isard 1956).

1.2.3 Linkages

Linkages are required for the realisation of agglomeration economies (and dispersion economies) discussed above. Linkages therefore refer to the flows of information, materials and/or services between firms, and flows within a firm. A firm's linkages can be classified into three categories: one, backward linkages, which provide goods and services as input for its activities or output; two, forward linkages, which provide links with customers purchasing its products or services. The terms *backward* and *forward linkages* are synonyms for *upstream* and *downstream linkages* as shown in the discussion above of activity-complex economies. If businesses are linked through an input-output (buyer and supplier) structure, the downstream industry forms the market for the upstream industry (Malmberg & Maskell 2002; Porter 1990; Venables 1996). The

firms in the vertical arrangement are therefore business partners and collaborators (Malmberg & Maskell 2002). The third category pertains to sideways, lateral or horizontal linkages, which are interactions with other firms involved in the same processes that share the customers and technology (Porter 1990), à la Hotelling (1929) and Palander (1935). The horizontal dimension consists of rivals and competitors, given that the firms share the same market (Malmberg & Maskell 2002).

Further to three categories of linkages above, the dissertation investigated two types of linkages, which are not explicitly emphasised in the literature. Informed by the notion of urbanisation economies, the study investigated linkages that exist between the airport-centric firms and the airports. The importance of clarifying this dimension of linkages will be evident in the discussion of research objectives and questions to follow. As noted earlier, informed by the concept of dispersion economies, there was a need for understanding linkages within a firm in cases where the activities are spread across various geographical areas. To sum, the concept of linkages was used in the dissertation to refer to flows of information, materials and/or services in accordance with the four categories, namely backward, forward, lateral, and linkages within a firm.

1.2.4 Clustering

The existence of linkages and the associated agglomeration economies (and dispersion economies) can result in the clustering of firms. The dissertation investigated clusters in terms of two interrelated categories that are differentiated by the element of spatial proximity. In the first understanding, clusters are defined in terms of linked firms located in the same geographical area, referred to as spatial clusters. In the second interpretation, clusters are understood as firms that are linked, regardless of their separate geographical locations, referred to as organisational clusters. Simmie (2008) cites Airbus as a good example of an organisational cluster. Various parts of the Airbus final product are manufactured in different European countries. While none of the countries or locations can individually be regarded as an aircraft-making cluster, when consolidated across national borders, they constitute the European aircraft-manufacturing organisational cluster (Simmie 2008).

The dissertation took a position that clustering can be based on agglomeration economies that are internal and external to a firm. As regards the internal dimension, when a head office of a firm has functional linkages with multiple units of the same firm – regional headquarters and production units for instance – whether located within the same geographical area, city, country or even across national borders, such a situation would be understood as organisational cluster

resulting from internal economies of scale, scope or complexity (see Chapter Six). There might however be instances where the operations of the subsidiaries of multi-locational firms are not dependent upon one another, implying weak (or absence of) linkages. This would not be regarded as a cluster, as shown in Chapter Six with a discussion of franchises.

1.2.5 Propulsive economic activities

The concepts of linkages, agglomeration economies and clustering, which were investigated in airport-centric developments in this study, could potentially be influenced by the concept of propulsive economic activities. The propulsive element of economic activities of firms is associated with the growth pole theory discussed in Chapter Three. It denotes an economic sector or firm that the clusters are organised around. Given the dual classification of clustering above, the impact of propulsive elements can be on spatial clusters, and organisational clusters. A propulsive element has the following distinguishing attributes: firstly, it is relatively large; secondly, it is fast growing; thirdly, it has a high intensity of linkages with other industries or firms; and fourthly, it is innovative (Boudeville 1966; Buttler 1975). Among these characteristics, the magnitude of linkages and size are the ones that best define propulsive economic activities. The understanding of propulsive economic qualities is in part similar to the notion of the ‘domination effect’ (Perroux 1950b).

1.3 RESEARCH PROBLEM

While the preceding section outlines the dissertation’s understanding of the key concepts so as to avoid misinterpretations of the research problem, questions and objectives, the current section sketches out the research problem. In light of gaps in existing knowledge, the problem spells out what the dissertation aspired to investigate, and as such the problem forms the heart of the dissertation. In addition to the extensive knowledge on the impacts of aircraft noise and institutional matters that influence airport-centric developments (refer to Section 1.1 above), the existing literature (reviewed in Chapter Two) has four main limitations. The limitations are discussed at length in the subsequent chapter, and include limited explanation, sole reliance on secondary sources of information, restricted scope of investigations, and inadequate consideration of the key concepts. These limitations are summarised as follows.

Firstly, the literature puts primary focus on describing the land use composition of airport-centric developments, the economic impact of airports and normative models of airport-led development, without comprehensively explaining the forces and processes that drive the location and mix of such developments. There is inadequate explanation of the kinds of firms

that locate on and around airports, and particularly the reasons they locate there. Limited explanation characterises the following studies: Conventz (2010); Giuliano & Small (1991); McMillen & McDonald (1998); Prosperi (2007, 2008); Shukla & Waddell (1991); Sohn (2004); Swanepoel (2012); Van Wijk (2007).

Secondly, the majority of existing studies solely use secondary and aggregated sources of information. These are Appold (2015); Apold & Kasarda (2013); Bowen (2008); Button et al. (1999); Conventz (2010); Daniels (1982); Fehribach, Rutherford & Eakin (1993); Giuliano & Small (1991, 1999); McMillen & McDonald (1998); Prosperi (2007; 2008); Shukla & Waddell (1991); Sivitanidou (1996); Struyk & James (1975); Sohn (2004); Swanepoel (2012); Vahaly (1976). Such studies are prone to ecological fallacy, which occurs when analyses based on area unit yield results that are different from those that would be obtained from data on individuals.

Thirdly, the existing literature does not consider explicitly the key concepts of linkages, agglomeration economies, clustering, and the propulsive properties of economic linkages. This is a particular limitation of airport economic impact studies and models of airport-led development. Some studies do consider the aforementioned concepts, but do not analyse sufficiently, as is the case with Hoare (1974, 1975); Giuliano & Small (1991, 1999); Prosperi (2007; 2008); Rogerson (1998); Warffemius (2007).

Fourthly, the literature is characterised by limited scope of investigations resulting in a partial picture of the spatial economic attributes of airport-centric developments. The studies are either restricted to firms in pre-selected economic sectors and firms of certain employment-size; or biased towards investigating the influence of pre-selected factors on airport-centric firms' choice of location. The following studies have at least one limitation of the aforementioned: Bowen (2008); Delaney (1988); Fehribach, Rutherford & Eakin (1993); Hoare (1974); Prosperi (2007); Rogerson (1998); Shukla & Waddell (1991); Sivitanidou (1996); Sohn (2004); Swanepoel (2012); Vahaly (1976); Warffemius (2007).

1.4 RESEARCH AIM, QUESTIONS AND OBJECTIVES

Working towards addressing the research problem outlined in Section 1.3 above, the current section outlines the research aim, questions and objectives.

1.4.1 Research aim

The research problem identified boils down to a lack of clear conceptualisation of the spatial economic attributes of airport-centric developments. The insufficient conceptualisation is arguably a result of the absence of an appropriate theoretical framework to guide the analyses. Given this theoretical void, the aim of the study was to contribute towards an empirically informed theoretical framework to describe and explain forces that drive the location and mix of airport-centric developments. Although the theoretical framework proposed is informed by the empirical investigations of the Cape Town and Johannesburg airport-centric developments in South Africa (see Section 1.5.3 below for a summary of research methodology used), it is intended that it could in future be tested in different contexts, and be improved upon.

Towards achieving the aim, the study explored the interconnections between the relationally interpreted concepts of economic space, geographical and organisational proximity, relational firm, scale and pattern; and linkages, agglomeration economies, clustering and propulsive economic element, in so far as they have relevance to forces that drive the location and mix of airport-centric developments. These intertwined concepts accordingly served as building blocks of the contribution towards a theoretical framework discussed in Chapter Seven.

The aim of the study, stated above, was meant to contribute towards theoretical and policy discourse in, amongst others, urban and regional planning, development economics and human geography (specifically economic geography and transport geography). It is often argued that aircraft and airports play a role similar to the one previously played by railways and highways (McCann & Shefer 2004) in shaping the land use patterns in cities (for development trends of airports and surrounds, refer to literature review in Chapter Two). For instance, historically, Isard & Isard (1945) analyse the potential implications of the advent of aircraft on the economic structure and the progress of society; and argue that the consequent increase in mobility would further stimulate the dispersion of population and economic activities within urban areas. In the same manner, other scholars emphasise the role that changes in transport technology play in the distribution of land use (see, for instance, Wells 1903; Janelle 1969; Beyers & Fowler 2013), as discussed further below. Improvements in transport technology improve connectivity between places, and in the process augment the travelling speeds, the quantity of goods and passengers transported (Janelle 1969; White & Senior 1983), and the geographic reach of travel (Aoyama, Murphy & Hanson 2011). Aircraft are prime examples of technology that transports passengers and cargo across the world at high speeds, and facilitated through airports.

The impact of transportation technology and infrastructure should be understood against the backdrop of the concept of accessibility. Aoyama, Murphy & Hanson (2011) argue that, as both a driver and outcome of economic progress, accessibility is fundamental to the distribution of land use; given that without accessibility, there can neither be production nor consumption. Mohring (1993), as quoted by Berechman (1995), argues that while the main objective of transportation investments is to improve accessibility, the ability of a given infrastructure investment to bring about other positive impacts serves as a motivation for undertaking the investment. As such, the anticipated ability of transport infrastructure investment to generate employment and promote spatial economic development is another major driving force behind the allocation of resources for such purposes (Berechman 1995).

Given that transportation investments, such as development of airports in the context of the dissertation, are among the largest of (public) investments, their anticipated impacts need to be considered carefully (Giuliano 1989). Using an example of the most recent airport establishment in South Africa, to decipher the magnitude of the investment, King Shaka International Airport (KSIA) was constructed before the 2010 FIFA Soccer World Cup, to replace the Durban International Airport (DIA), at a cost of R6.8 billion (ACSA 2009).[6] In line with the argument of Berechman (1995) above, Robbins & Velia (2013) note that the proponents (and also part-funders) of the establishment of KSIA based their support of the investment on the argument that the new airport would not only allow for growing passenger numbers, but would also augment economic integration of the region and markets elsewhere, through facilitating the exports and imports. Given such massive investments, Pirie (2013) argues that new transport geographies are being created at selected areas in South Africa, in the process widening the divide between areas of transport privilege and those of transport deprivation. In light of the discussion above, the divide is thus created in terms of accessibility, distribution of land use, other positive spin-offs, as well as negative externalities. For the latter aspect, refer to a discussion on airport noise in Section 1.1.

To stress the importance of the relationship between transportation, accessibility, and distribution of land use, it is also important to note that contemporary focus of human geography (specifically transport geography and economic geography) still includes transportation analysis, which was central to the sub-discipline in the 20th century, particularly between the 1950s and the 1970s (Hanson 2000). Furthermore, work in human geography still analyses relationships

[6] As at 30 June 2010, the exchange rate of South African Rand (R) was approximately as follows: 1 United States Dollar = R7.6492; 1 British Pound = R11.5079; 1 Euro = R9.3562 (South African Reserve Bank 2010).

between regions, cities and transport flows (for instance, see Hall & Hesse 2013; Hesse 2013). As evident with the discussion of location theory in Chapter Three, in geographical analysis, transport is still an important factor (but by no means the only one, or necessarily the dominant) toward understanding variations in the distribution of economic activity (White & Senior 1983).

As the focus of the dissertation is airports (as component of the air transport industry), their importance in spatial economic development is in part reflected in the worldwide upsurge of models of airport-led development (particularly airport city and aerotropolis), summarised in Section 1.2.1 above and critically reviewed in Chapter Two. Similar to trends across the world, recent research and planning initiatives in South Africa are influenced by the planning models of airport-led development. The following examples bear testimony to the presence of such models in the South African academic circles. As reviewed in Chapter Two, Swanepoel (2012) explores the aerotropolis concept for the Ekurhuleni airport region,[7] with a view to understanding the influence of ORTIA on the surrounding industrial areas. In a country characterised by high levels of inequality, Crosby (2012) investigates the relevance of the aerotropolis proposed at KSIA, so as to understand whether it would be an engine for economic growth, or merely an initiative that would benefit the affluent minority. Using the concepts of airea and aerotropolis, Hanly (2015) formulates a 20-year spatial development framework for the Cape Town International Airport (CTIA) and environs.

As stressed by Giuliano (1989), relationships between land use and transportation are not only key factors to understanding the nature and evolution of urban form, but also have important policy implications. At a planning and implementation level, the following illustrate the growing enthusiasm with airport-led development in South Africa. The industrial areas around ORTIA are claimed to be the epitome of Africa's first aerotropolis (see, for instance, Ekurhuleni Municipality 2013; Mail & Guardian 2013a; 2013c). The aerotropolis vision, centred on ORTIA, also features prominently in the planning policies of the Ekurhuleni municipality (see Ekurhuleni Municipality 2011); and Figure 1.1 below shows how the Ekurhuleni municipality intends to apply the aerotropolis concept to the broader municipal area.

[7] The notion of airport region is ambiguous, and OECD (1975) notes that it could possibly be defined in two ways, each with advantages and disadvantages. Firstly, it could be defined as a definite geographical area; and secondly, it could be defined in terms of the airport's sphere of influence that is not restricted to a particular geographical area (OECD 1975).

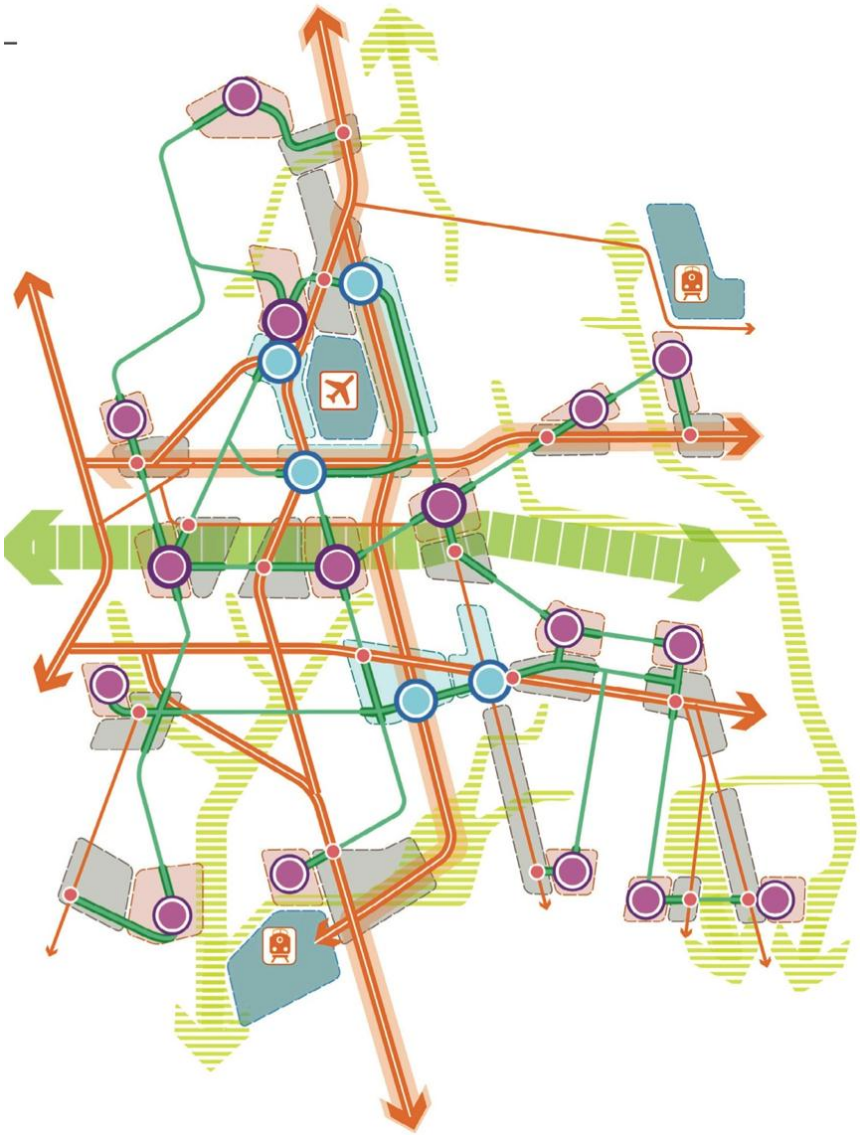

Figure 1.1 Ekurhuleni aerotropolis development concept Source: Ekurhuleni Municipality 2015b

In Cape Town, ACSA (together with various stakeholders) has recently launched an aerotropolis programme centred on CTIA (ACSA 2015), with a view to capturing the development benefits for the broader metropolitan area. However, unlike in Ekurhuleni, the aerotropolis concept does not feature in the planning policies of the City of Cape Town municipality.

The developments emerging at KSIA are branded as Aerotropolis KwaZulu-Natal (KZN) (for instance, see ACSA 2015). One of the main development proposals on and around KSIA is the Dube Trade Port, and two aspects are worth highlighting, namely the agrizone and tradezone. The land within the agrizone would be leased out to commercial farmers for growing export-oriented produce. Located between the runways to maximise access to the airport services, the trade zone is intended to facilitate the value adding and logistics processes of the Dube Trade Port; encompassing logistics, assembly, warehousing, manufacturing and offices (South Africa 2014a).

Over the years, the City of Johannesburg municipality has had a difficulty in spatially and economically integrating Lanseria International Airport (LIA) into the broader Johannesburg and, from around 2007, the area has been the subject of attempts to promote development around Lanseria (Klug, Rubin & Todes 2014). One of these attempts is known as Cradle City (Figure 1.2), which the proponents say would have the best elements of the so-called aero cities, with an ambitious floor area of the size of Cape Town CBD (Eicker 2009a).

Figure 1.2 Development proposal around Lanseria Airport Source: Eicker 2009a

In Bloemfontein, Mangaung municipality intends to develop approximately 2000 ha of vacant municipal land, in the vicinity of Bram Fischer International Airport, into an aerotropolis (see Mail & Guardian 2013b) known as Airport Development Node. An idea that emerged in around 2012, the Airport Development Node would be implemented at a cost of about R100 billion; and to reflect the magnitude of the proposal, its ambitious first phase (with a land area of approximately 700 ha) will be the size of the existing Bloemfontein CBD (Mangaung Municipality 2014).

It is also important to note that long before the introduction of models of airport-led development in South Africa, ACSA had initiated programmes at its airports to unlock the landside development potential, so as to augment the non-aviation revenue (refer to Chapter Five, Section 5.1, for a discussion on ACSA's sources of revenue). ACSA-owned airports that have been the subject of such initiatives, with varying levels of success as regards implementation, include OR Tambo, Cape Town, Bram Fischer,[8] Kimberley, George, Upington, East London and Port Elizabeth airports.

Further, it is crucial to note that transport infrastructure (including airports) has been part of urban and regional planning policy frameworks in South Africa, driven at the national government level (see Chapter Five, Section 5.1, for a discussion on the spheres of South African government). From the 1990s, the country adopted the strategy of Industrial Development Zones (IDZs) to promote development around transport hubs (international airports and seaports) to ease the processes of importing and exporting and thus improve the investors' competitiveness. Notably, ORTIA is one of the four IDZs designated in the country between 2001 and 2010 (Nel & Rogerson 2013). ORTIA IDZ, known then as the Johannesburg International Airport IDZ, was designated in 2002 (see South Africa 2002). In 2014, following in the footsteps of ORTIA, the Dube Trade Port IDZ was designated at KSIA (South Africa 2014b). As regards rail and road-based movement systems, planning policy debates in South Africa have, of late, been characterised by the notion of transit-oriented development (TOD)[9] concentrating along transport lines, particularly at main intersections and train stations (for example, see City of Cape Town Municipality 2013; City of Johannesburg Municipality 2013).

The discussion above is testament to the relevance of airports and airport-centric developments in academic and policy work in South Africa and internationally. In contributing towards an empirically informed theoretical framework to describe and explain forces that drive the location and mix of airport-centric developments, the dissertation was intended to contribute to the discourse highlighted above. Although framed on airports, the dissertation was meant to also contribute to discussions about road, rail and water-based modes of transport (see Chapter Seven, Section 7.3.2 on recommendations for future research).

[8] It should be noted that the ACSA-driven initiatives on the landside of Bram Fischer International Airport are not part of the Mangaung municipality's Airport Development Node mentioned earlier in the chapter due to, among others, institutional factors. However, the overview provided here will not go into those complexities.

[9] Although there is no generally accepted definition of TOD among different role players, there is some form of agreement in that TOD refers to dense, diverse and pedestrian-friendly land uses located in the vicinity of transport nodes that translate into higher patronage. In contrast, monofunctional development close to transport infrastructure is typically regarded as transit adjacent, not transit oriented (Transportation Research Board 2004).

1.4.2 Research questions

The research aim stated above gave rise to four research questions, which were subsequently used to delimit the investigations of the study. The questions were set as follows:

1) Which kinds of activities are located on and around the Cape Town and OR Tambo airports, and why do they locate there?
2) What are the propulsive economic elements found around the Cape Town and OR Tambo airports, and what linkages do they have with the airport-centric developments on the one hand and the airports on the other?
3) What are the spatial, structural and economic linkages within the airport-centric developments of the Cape Town and OR Tambo airports, as well as airport-centric developments' linkages with the two airports, the metropolitan areas they are located in, and with other regional, national and international airport-centric developments and locations?
4) What changes have occurred in the form of the airport-centric developments of the Cape Town and OR Tambo airports over time?

1.4.3 Research objectives

In light of the foregoing research aim and questions, the specific objectives of the dissertation were to:

1) Establish the type of economic activities that are located on and around the Cape Town and OR Tambo airports, and analyse the reasons for locating there.
2) Identify the propulsive economic element found around the Cape Town and OR Tambo airports, and analyse the linkages they have with the airport-centric developments and airports.
3) Analyse the spatial, economic and structural linkages within the airport-centric developments of the Cape Town and OR Tambo airports, between the airport-centric developments and the airports, as well as the airport-centric developments' linkages with their metropolitan areas and other regional, national and international airport-centric developments and locations.
4) Establish the changes that have occurred over time in the form of the airport-centric developments of the Cape Town and OR Tambo airports.

1.5 PHILOSOPHY, RESEARCH DESIGN AND SUMMARY OF METHODS

The current section fulfils three tasks. Firstly, it outlines the philosophical orientation that underlined the study. Secondly, it discusses the research design; and thirdly, it summarises the research methodology and methods adopted in the study.

1.5.1 Philosophical orientation

Research has to be conducted within the scope of a philosophical orientation of a discipline (Creswell 2009; Johnston 1986a; Keat & Urry 1975), which in the context of the dissertation is the sub-discipline of human geography. The clarification of a philosophical framework in the study is meant to avoid a problem noted by Sayer (1979), where human geographers normally engage in methodological discussions without considering the guiding philosophy. The key elements of a philosophy are its epistemology and ontology (Johnston 1986a). Epistemology addresses the questions of the nature and origin of knowledge, whilst ontology deals with the nature of reality, or of what can be known; and essentially relates to what are acceptable as facts (Johnston 1986a; Runeson & Skitmore 2008). Clarity on both epistemology and ontology is required to guide the methodology (Del Casino Jr et al. 2000; Johnston 1986a) and the overarching research design discussed later in the chapter. There are three main categories of philosophy in human geography, namely the positivist, humanistic and structural approaches. These approaches are discussed below, followed by an indication of a standpoint that was considered most appropriate towards addressing the aim and objectives of the dissertation.

There are various philosophical orientations under the umbrella of humanistic approaches, namely idealism, pragmatism, phenomenology, and existentialism. Generally, the aim of humanistic approaches is to improve the researcher's self-knowledge and understanding of research subjects (people) in their environments, and not necessarily to explain a particular phenomenon (see Johnston 1986a; Tuan 1979). The epistemology of humanistic approaches is based on the idea that knowledge is subjective, implying that the phenomenon of concern does not exist independent of the researcher. Therefore, the proponents of humanistic approaches believe that knowledge exists in one's experience of the phenomenon, and knowledge can be improved by analysis of that experience. The ontology of humanistic approaches is that knowledge can only be obtained from what exists in the mind of the researcher (Johnston 1986a). As the aim of humanistic approaches is not to explain, but primarily to increase the researcher's awareness of the sources of knowledge (Tuan 1975), they were considered not appropriate to guide the description and explanation of forces that drive the location and mix of airport-centric developments.

The conclusion above on the inappropriateness of humanistic approaches for the dissertation leaves the discussion to positivism and realism (the latter is part of the umbrella of structural approaches). Although the two are regarded as contrasting philosophies, they have some similarities that are important to highlight. Asheim (1990) notes that the confusion between positivism and realism also arises because in the instrumentalism-realism dichotomy, the two can be called realist.[10] In contrast to humanistic approaches, positivism and realism have a common understanding of science as an objective and rational enquiry that aims to describe and explain. As noted later in the chapter, they differ in their understanding of how description and explanation can be achieved. The notion of objectivity shared by realism and positivism refers to the idea that researchers must objectively use empirical data to test or develop theories. This evidence should be of a quality that researchers from different philosophical standpoints could to a certain extent agree upon it. Objectivity also denotes the idea that research objects exist independently of the researchers' beliefs and opinions about them. As regards the notion of rationality, realists and positivists have a view that there are research standards that must be adhered to, regarding what counts as adequate explanation, of what it is that researchers must try to achieve by the theories, of the way in which empirical evidence should be used to assess and/or develop theories. The difference lies in what these standards are (Keat & Urry 1975), as noted below.

Positivism is based on the epistemology that what is observable can be known with a greater degree of certainty than the unobservable; and the ontology that the observables can be regarded as making better reference to items in the world (Keat & Urry 1975). While those who reject positivism argue that it conflates epistemology with ontology (see Williams 1981), the discussion covered here will not go into such debates. The adequate positivist explanation has to include statements of two kinds. The first indicates antecedent conditions, which are conditions that are realised prior to, or at the same time as the phenomena to be explained. The statement of the second kind expresses laws whose truth or falsity can only be known by empirical means. Thus, the phenomenon is explained by exposing it to general laws, and providing empirical evidence that its attributes are consistent or inconsistent with those laws. If adequately expressed and tested, the two sets of statements (encompassing antecedent conditions and laws) explain the phenomenon of concern (Keat & Urry 1975). The challenge of positivism is that to formulate the two statements above, and adequately explain phenomena require a long time, and obtaining

[10] Instrumentalism is based on the premise that theories are merely devices that generate testable predictions. Theories are therefore understood as instruments, and as such, only their utility can be assessed, and not their truth or falsity. Often a contrast is drawn between instrumentalism and realism, as the two different views about the nature of science, where 'realism' is used to denote the view that theories are to be assessed for their truth or falsity, and not just for their instrumental capabilities (Keat & Urry 1975).

empirical evidence to test the laws is also a lengthy process (that requires multiple case studies and ideally longitudinal studies). If positivism were adopted in the dissertation, it would require analyses of numerous airport-centric development case studies to adequately identify the regularities. Given the time and financial constraints of a doctoral research, the explanations derived in this study (and contributions towards a theoretical framework and model) would not be truly positivist.

Like positivism, realism is concerned with empirical research, but without expressing the antecedent conditions and laws. The epistemology of realism is that the world of appearances does not necessarily reflect the underlying mechanisms and processes, implying that the observable patterns of land use on and around airports do not provide a complete picture of the spatial, economic and structural processes at play. To investigate the mechanisms, realism has an ontology which posits that what exists (that is, the forces creating the structures and patterns) can only be understood through well-grounded thought and in-depth analyses (Johnston 1986a). Compared to positivism, realist research can be conducted quickly, as it typically investigates a limited number of cases, which are believed to be typical of the overall population to be explained. As one of the proponents of realism, Harré (1979), notes, the limitation of such approach is that the selected cases may not exactly be typical of the population, resulting in inaccurate explanations and generalisations. It is also important to note that according to Keat & Urry (1975), for realists, a model denotes a relatively early stage in the process of theory-building. Among others, this is because the model has not yet been tested on multiple case studies to refine it. The contribution towards a theory model of airport-centric developments (in Chapter Seven) should therefore be understood in this context.

Given the time constraints that the dissertation had to be completed within, realism was considered appropriate to guide the analyses of forces that drive the location and mix of Cape Town and Johannesburg airport-centric developments. It is important to note that realism was not used as a fallback as it is amenable to studies undertaken quickly, but importantly the epistemology and ontology of realism are appropriate as interpreted above (as the epistemology and ontology of positivism are also appropriate). As noted earlier, realism does not intend to identify regularities and develop laws, as the level of analyses undertaken would not permit such. As a concluding remark, a position taken in the dissertation was that realism and positivism are not necessarily mutually exclusive, unlike, for instance, Sayer (1985c) who regards them as contrasting philosophies. This implies that future work that would build on the findings of the

dissertation can be based on a positivistic approach depending on the availability of resources and time to allow for such an approach.

1.5.2 Research design

This section outlines the design of the study to show how the various research components are linked (Ackoff 1953).[11] Massey & Meegan (1985) indicate that an aspect that has to be clarified at an early stage of research design is whether the research intends to discover patterns or to analyse the underlying processes. Upon the basis of the realist philosophy (discussed above) and the relational interpretation of space, proximity, firm, scale and pattern (in Chapter Three), the intention of the dissertation was not only to identify and describe patterns, but to try to identify the forces and processes that drive the location and mix of airport-centric developments generally.

Towards formulating a research design, the dissertation drew upon the distinction of intensive and extensive research designs, as propounded by Harré (1979); Sayer (1992; 2000); Sayer & Morgan (1985); and from a slightly catholic perspective, Johnston (1986b).[12] The two design types serve different purposes, with the intensive design primarily explanatory and extensive design mainly descriptive. Although different, these designs are not mutually exclusive, can be complementary and thus be combined in one study (Sayer & Morgan 1985). The two design types are discussed further below.

Extensive research focuses on discovering the properties and patterns within a population (Sayer 1992). In the ideal form of extensive design, all members of a phenomenon's population are examined, which in the context of the dissertation would imply analysing all the units of analysis within the three levels of analysis as presented below. In practice however, the researcher examines the sample that is representative of the population. In the extensive design, some result is guaranteed, since all members (or a representative sample) are investigated, and there are certainly to be some elements that can be quantified (Harré 1979) and description thereof undertaken.

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[11] Research design denotes a plan of how research is conducted (Creswell 2009; Mouton 2001). It guides the process of collecting, analysing and interpreting data (Manheim & Rich 1986, cited in Andranovich & Riposa 1998) by linking data with the research questions, and ultimately to the conclusions drawn (Yin 2009). Creswell (2009) and Creswell & Clark (2007) add that the research design links the philosophical position adopted in a research to specific research methods. The research design should therefore show how the philosophy of realism informs the research methods.

[12] The defining difference of Johnston (1986b) is related to his interpretation of realism, which is accommodating to the use of quantitative methods, unlike other proponents of realism who question the need for quantitative methods, and therefore regard quantification as unnecessary within a research inclined to realism.

As a reaction to extensive research, there are views in human geography that the measures of statistical or numerical associations do not, by themselves, explain phenomena (see Sayer 1982). This matter is revisited further in Chapter Two, with a discussion of the limitations of literature. Johnston (1986b) notes that to some human geographers, science is equated with both positivism and quantification. As such, in rejecting the positivistic approach, some human geographers dismiss the application of quantitative methods and procedures that are necessary to, but not solely associated with positivism. The positivistic approach almost always involves quantification, but a quantitative approach does not necessarily imply a positivistic approach. Thus, not to adopt the positivistic approach must not be equated with rejecting certain means that are often regarded as exclusive to that philosophical orientation. Though not positivistic, the study was based on this understanding and used statistical techniques to aid description. Johnston (1991) reiterates that as a means of manipulating information, quantification can be employed within any philosophy of science. It is associated with positivism through its use to infer and to make generalisations and laws. It can be associated with other philosophies as a descriptive tool. In the study, quantification was therefore applied within a realist philosophy (see Johnston 1986b) to investigate forces that drive the location and mix of airport-centric developments at Cape Town and OR Tambo International airports.

In intensive research design, the primary concern relates to how a process works out in a particular case or in a limited number of cases. This design involves the examination of a typical member of a population in an attempt to discover as many as possible of the properties that such a member possesses (Harré 1979). While in extensive studies, the criteria by which samples are drawn have to be decided in advance and strictly adhered to, in intensive studies the units of analysis to be investigated may be selected as the research proceeds and as an understanding of the composition of the population is developed (Sayer 1992) through the extensive approaches. Valentine (2001) however cautions that the flexibility of intensive design should not compromise the thoroughness of a research process.

According to Harré (1979), the advantage of the intensive design is that many properties can be investigated together, their structural relations and interactions ascertained, and a detailed description and explanation achieved. There is however risks associated with this design. The results may be misleading as the member chosen as typical of the population may not necessarily possess the characteristics of the broader population. Since the number of members investigated is limited, a researcher may select and analyse a unit that is a distortion of the typical member of the population (Harré 1979). Given the peculiar strengths and limitations of extensive and

intensive designs, the study combined the two, to complement each other. This two-pronged design informed the research methods summarised below and outlined in Chapter Four.

1.5.3 Summary of research methods, and units and levels of analysis

To achieve the research aim and objectives outlined in Section 1.4 above, the dissertation adopted a case study approach. The descriptive and explanatory aspects were investigated at two South African case studies located in Cape Town, Western Cape province; and Ekurhuleni in the broader Johannesburg area, Gauteng province. These are Cape Town and OR Tambo international airports and surrounds, respectively. The indicative extent of the case studies is shown in Figures 1.3 and 1.4 below, and their broader spatial economic contexts are described in Chapter Five. The methods used to collect data were based predominantly on a survey and qualitative interviews; informed by the philosophical orientation and research design above. Where relevant, secondary sources of data were used, particularly with respect to Chapter Five.

Given the use of case study approach, it is important to clarify the levels of analysis and units of analysis that the study's investigations focused on. Level of analysis refers to a level of reality to which descriptions and explanations in a research refer (Neuman 2000). Andranovich & Riposa (1993) note that identifying a level of analysis permits a research process to analyse a phenomenon in a manner that sheds light on the details of a problem within the context from which such a problem emerged and exists. Three levels of analysis were considered in the study, which are firms that are located: one, around the airport; two, on the airport's landside; and three, within the airport's terminals. These levels are the three components of the definition of airport-centric firms outlined in Section 1.2.1. Moving a step lower than the levels of analysis, units of analysis denote the units a researcher uses when investigating a phenomenon (Neuman 2000). The study's units of analysis were the individual firms[13] that are located within the three levels of analysis. The research methods adopted in the dissertation are discussed at length in Chapter Four.

[13] The dissertation used the words business, establishment and firm interchangeably.

Figure 1.3 Johannesburg study area

Figure 1.4 Cape Town study area

1.6 CONTRIBUTION OF THE RESEARCH AND LIMITATIONS

Research has to be conducted with a view towards contributing to a better understanding of a phenomenon of interest, which in the context of the dissertation was to identify forces that drive the location and mix of airport-centric developments. This section outlines the importance of the study in terms of two interrelated aspects: one, uniqueness; and two, theoretical and practical importance. The section also highlights the main limitations of the study.

1.6.1 Uniqueness of the study

The study had two main attributes that make it original and unique to the topic of spatial economic attributes of airport-centric developments. Firstly, by conducting detailed empirical analyses to describe and explain forces that drive the location and mix of airport-centric developments, the study contributes to the existing knowledge. In light of the limitations of literature discussed in Chapter Two, the study fills a void in the existing knowledge.

Secondly and most significantly, the study contributed towards an empirically informed theoretical framework to be used in future to analyse forces that drive the location and mix of airport-centric developments (see Chapter Seven). The growth pole theory was used as a cornerstone of this framework. It is important to note that attempts have been made before to analyse airports through the lens of growth pole theory (see, for instance, Hoare 1974), and it was the aim of this study to improve on certain aspects of Hoare's (1974) study. Further, although Bhat (2010) claims to apply the growth pole theory to what he calls a mini-aerotropolis (see Chapter Two for a discussion of aerotropolis), his assertion was not informed by empirical analyses. Bhat (2010) is of the view that feeder airports act as key industries that promote economic growth in the surrounding region. More critically, the existing studies attempt to use the growth pole theory (and other relevant theories) as an analytical tool, without contributing towards a theoretical framework that addresses airport-centric developments specifically. Warffemius (2007) attempts to develop a model of airport-centric developments, based on the new economic geography (NEG) framework. However, given the limitations of that study as detailed in Chapter Two, aspects of the model developed are questioned. The study therefore breaks new ground by attempting to contribute towards a theory that could be improved upon.

1.6.2 Contribution of the study

Given the study's aim in Section 1.4.1, the contributions of the dissertation are two-fold, relating to theory (basic research) on the one hand and practice (applied research) on the other. Basic research focuses on theory building, whilst applied research is policy oriented (Andranovich &

Riposa 1993; Babbie 2001; Neuman 2000). On a theoretical level through empirical findings, the dissertation contributes to a better understanding of the underlying spatial and economic factors (including linkages) and forces that influence the location and mix of airport-centric developments. The analyses culminated in a contribution towards a theoretical framework that describes the spatial economic attributes of airport-centric developments. On a practical or policy formulation note, the study provided suggestions that could be used by authorities (government departments and airport management) and other stakeholders to approach, direct, guide and manage the growth of airport-centric developments.

1.6.3 Limitations of the study

Chapter Seven discusses the extent to which the aim and objectives of the study were achieved. That chapter also proposes possible areas for future research on the topic of spatial economic attributes of airport-centric developments. It is nonetheless important to highlight the main limitations of the study, which should be taken cognisance of in future studies. Though the outcome of the study was not affected negatively, the investigations suffered the following limitations, emanating particularly from the research methods employed.

Firstly, in some instances, the firm's representatives who were part of location decision-making processes of their firms were not available to participate in the survey. In other instances, the representatives could not answer certain questions as they only joined the firms after the firms' located at the current premises at the two cases studied. Further, as Simon (1962) argues, researchers should not rely on one respondent in a firm, but rather on a number of personnel who participate in different aspects of the firm; given that information is normally spread among different individuals.

Secondly, the attempt to investigate firms involved in various economic activities was a limiting factor as regards the questionnaire formulated for the survey. Different forms of linkages could not be identified sufficiently because the questions had to be applicable to all airport-centric firms, while trying to keep the telephonic interviews as short as possible.

1.7 ORGANISATION OF THE DISSERTATION

The dissertation is organised into seven chapters, as shown in Figure 1.5 below, and summarised thereafter.

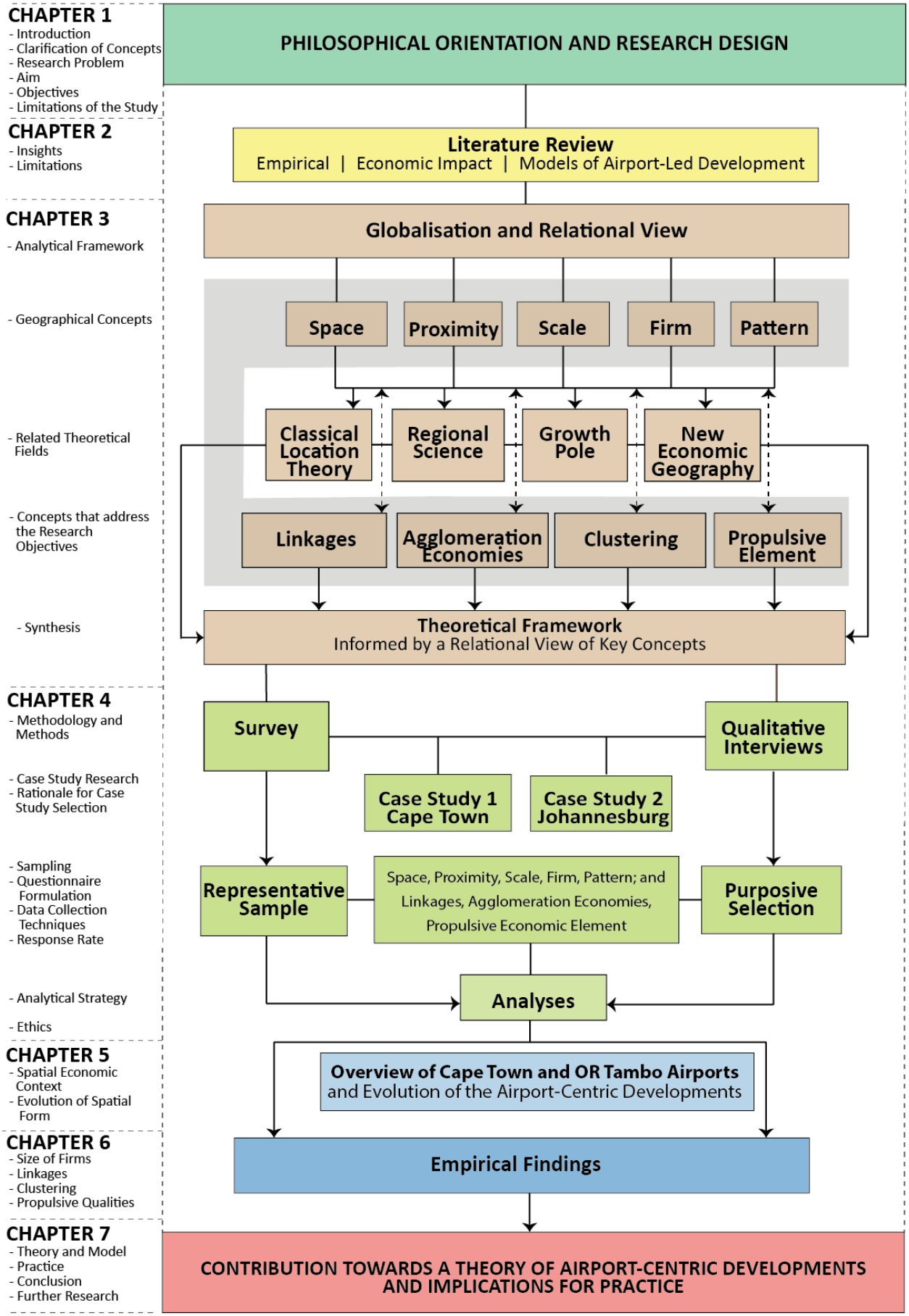

Figure 1.5 Outline of the study

The current chapter introduces the study with a general overview of the evolution of the land use composition of airports and surrounds. On the background of gaps in literature that attempts to describe and explain the spatial economic attributes of airport-centric developments, the chapter stated the research problem. The chapter then provided the aim of the study; after which the research objectives, questions and design were provided towards achieving the set aim. The chapter interpreted a set of interrelated concepts that underpinned the study, namely airport-centric developments, linkages, agglomeration economies, clustering and propulsive economic qualities.

Chapter Two critically reviews literature that deals with the spatial economic attributes of airport-centric firms. The chapter covers literature that analyses airport-centric developments' land use composition, factors that influence the choice of location, standard airport economic impact studies, and models of airport-led development. The review culminates in a synthesis of limitations of the literature towards a comprehensive description and explanation of forces that drive the location and mix of airport-centric developments. A key limitation identified pertains to a lack of a well-grounded conceptualisation of the spatial economic attributes of airport-centric developments.

Chapter Three systematically adopts an existing theoretical framework that is appropriate for the conceptualisation of forces that drive the location and mix of airport-centric developments. The chapter advances a relational interpretation of the concepts of economic space, firm, geographical and organisational proximity, scale and pattern. After assessing various theories with some relevancy to the study, the chapter discovers the growth pole theory to be the most appropriate framework for analysing forces that drive the location and mix of airport-centric developments; while not disregarding the relevancy of other theories.

Chapter Four discusses the methodology and methods that were used towards achieving the aim and objectives of the study. The chapter outlines the dissertation's mixed method approach comprising the quantitative and qualitative aspects. A case study is adopted as a main research approach, which is centred on the case studies of Cape Town and Johannesburg airport-centric developments, in South Africa. The stratified sampling technique used is described in the chapter, including methods used to collect and analyse data.

Chapter Five introduces the Cape Town and OR Tambo airports; and presents the evolution of the spatial form of the Cape Town and Johannesburg airport-centric developments since the establishment of Cape Town and OR Tambo airports. These are the only airports in South Africa that are surrounded by substantial and diverse concentrations of economic activity; hence their selection as case studies in Chapter Four.

Chapter Six presents the findings of the investigations conducted on the Cape Town and Johannesburg airport-centric developments. The research questions are used to structure the chapter, and the findings culminate in the identification of the propulsive economic qualities of the Cape Town and OR Tambo airports, and the respective airport-centric developments. The chapter also draws similarities and differences between the spatial economic attributes of the two cases studied.

Chapter Seven synthesises the findings, and contributes towards a spatial economic theory and model that can in future be used to analyse forces that drive the location and mix of airport-centric developments. Based upon the contribution towards a theoretical framework, the chapter provides the practical implications with regards to the spatial economic analysis of airports and surrounds; and ways that the emergence and growth of airport-centric developments could be approached, directed and managed. The dissertation is concluded with recommendations for future research.

2 LITERATURE REVIEW

The preceding chapter introduced the study, and presented the research problem, aim, questions and objectives. The purpose of this chapter is to critically review literature that deals with the topic of spatial economic attributes of airport-centric developments. To delimit the scope of the chapter, the review does not cover literature on the impact of airport noise, and institutional arrangements that influence airport-centric developments. Chapter One overviewed the state of knowledge on airports and surrounds, and concluded that because the two aforementioned aspects have previously been investigated comprehensively, they would not be the primary focus of the study. However, as noted in that chapter, it is acknowledged that airport noise and institutional aspects cannot be disregarded completely in the analyses of forces that drive the location and mix of airport-centric developments; given that they could influence the type of firms that locate on and around airports.

For comprehensiveness of review, the scope of literature covered is not restricted to pre-selected airports, or academic discipline of the authors.[14] Literature that is relevant to the topic of spatial economic attributes of airport-centric developments can be categorised into three related themes. The first group covers publications that empirically describe and explain airport-centric developments' land use composition and factors that influence the choice of location. The second category encompasses literature on the measurement of economic impacts of airports. Thirdly, there is a group that deals with models that propose the idealised spatial form of development on and around airports. Informed by these broad categories, the chapter is organised into five main sections. The first section reviews the empirical literature; while the second part deals with the standard methods used to measure the economic impacts of airports. This is followed by a discussion of models that are used to plan developments on airports and surrounds. Drawing upon the preceding sections, the fourth part synthesises the limitations of literature. This separate discussion of limitations is adopted to avoid repetition between the sections, because some of the limitations identified are applicable across the different groups of literature. The last section summarises and concludes the literature review.

Before commencing the review, it is critical to summarise briefly the study's interpretation of the key concepts outlined in Chapter One, Section 1.2. This summary is necessary at this point because the literature's usage of the concepts hereunder is not similar to the study's

[14] The scope of some literature reviews is limited by the academic discipline of the authors. For instance, in his paper entitled 'geographic perspectives of air transportation', Vowles (2006) limits the review to the work published by geographers on the topic of air transportation.

understanding. The first is the concept of clustering. The dissertation understood the associated concept of linkages as a factor fundamental to the existence of spatial and organisational clustering of firms. As such, as regards spatial clustering, firms located at geographically proximate locations, but without linkages, are not regarded as part of clusters but do form part of the concentrations in which they are located. The third concept is agglomeration economies, which the dissertation regarded as consisting of components of internal and external economies, and best understood in terms of the aspects of scale, scope and complexity (see Parr 2002). With the presentation of literature in Sections 2.1, 2.2 and 2.3, conflicting and limited understanding of these concepts in literature (and limitations pertaining to the methods employed) will be highlighted briefly and deferred for a coherent discussion in Section 2.4 with the synthesis of limitations.

2.1 DESCRIPTION AND EXPLANATION OF AIRPORT-CENTRIC DEVELOPMENTS: EMPIRICAL LITERATURE

This section reviews literature that directly and indirectly analyses the spatial economic attributes of airport-centric developments. The dissertation regarded direct studies as those whose objective is to analyse airports and/or surrounds. Indirect studies have airports and/or surrounds only as variables in the investigations, which incidentally become relevant to the topic of airport-centric developments. Thirty studies listed in Table 2.1 form the core of the section, and are categorised into two overlapping themes, namely studies that focus on the land use composition of airport-centric developments, including consideration of airport-centric developments as employment subcentres in the metropolitan areas; and studies that investigate the factors that influence the location of firms on and around airports. It is important to note that these categories are not mutually exclusive, given that some studies deal with both themes simultaneously.[15] Although Table 2.1 arranges the studies in alphabetical order (per theme) according to the authors' surname, for a smooth flow of the review, the imminent presentation of literature does not strictly follow the same arrangement. Rather, the studies are grouped according to the similarity of their terms of reference or, as it were, subthemes.

[15] Alternative approach to classifying the literature would be in terms of the economic activities covered by the studies, such as manufacturing, commercial, offices and so on. However, the problem with such approach is that some of the studies reviewed deal with two or more economic activities; hence a decision was taken to rather categorise the literature according to the theme addressed, and use other areas of similarity as subthemes.

Table 2.1 Empirical literature reviewed

THEME 1: LAND USE COMPOSITION AND AIRPORT-CENTRIC DEVELOPMENTS AS EMPLOYMENT SUBCENTRES			
Author	**Year**	**Country of focus**	**Relevant airport or area**
Appold	2015	United States of America	Fifty-one metropolitan areas
Appold & Kasarda	2013	United States of America	Areas around 25 major passenger airports
Button, Lall, Stough & Trice	1999	United States of America	Cincinnati-Northern Kentucky, Pittsburgh and Milwaukee General Mitchell airports
Conventz	2010	Netherlands and Germany	Schiphol and Frankfurt airports
Delaney	1988	Ireland	Shannon and Cork airports
Giuliano & Small	1991	United States of America	Long Beach, Burbank, Los Angeles, Orange County and Van Nuys airports
Giuliano & Small	1999	United States of America	Los Angeles Airport
McMillen & McDonald	1998	United States of America	Chicago O'Hare Airport
Percoco	2010	Italy	Multiple airports in 103 provinces
Prosperi	2007	United States of America	Atlanta, Dallas-Fort Worth and Memphis airports
Prosperi	2008	United States of America	Miami International Airport
Sohn	2004	United States of America	Baltimore-Washington, Reagan Washington and Washington Dulles airports
Struyk & James	1975	United States of America	Richmond and Boston airports
Swanepoel	2012	Republic of South Africa	OR Tambo Airport
Twomey & Tomkins	1995	United Kingdom	Manchester Airport
Van Wijk	2007	Netherlands, Germany and Japan	Schiphol, Frankfurt, Tokyo Haneda and Narita airports
THEME 2: FACTORS THAT INFLUENCE AIRPORT-CENTRIC FIRMS' CHOICE OF LOCATION			
Author	**Year**	**Country of focus**	**Relevant airport or area**
Bowen	2008	United States of America	Not specific to particular airports
Bowen & Leinbach	2003	Singapore, Malaysia and the Philippines	Not specific to particular airports
Daniels	1982	United States of America	Seattle-Tacoma Airport
Federal Aviation Administration	1967	United States of America	Hereford, Sumter, Hayward, Frederick, Fairmont and Minnesota airports
Fehribach, Rutherford & Eakin	1993	United States of America	Dallas-Fort Worth Airport
Hoare	1974	United Kingdom	Heathrow Airport
Hoare	1975	United Kingdom	Heathrow Airport
Keeble	1968	United Kingdom	Heathrow Airport
Kramer	1988	Netherlands	Schiphol Airport
Rogerson	1998	Republic of South Africa	OR Tambo Airport
Shukla & Waddell	1991	United States of America	Dallas-Fort Worth Airport
Sivitanidou	1996	United States of America	Los Angeles, Glendale-Burbank-Pasadena and John Wayne airports
Vahaly	1976	United States of America	
Warffemius	2007	Netherlands	Schiphol Airport

2.1.1 Land use composition and airport-centric developments as employment subcentres

Prosperi (2007) investigated whether developments around Atlanta, Dallas-Fort Worth (DFW) and Memphis international airports can be regarded as spatial clusters, in the style of Porter (2000).[16] The findings revealed that Atlanta airport-centric development is a cluster of manufacturing, warehousing and wholesaling firms, while DFW is surrounded by a cluster of finance, information technology and computer services' firms. Memphis airport-centric development was found to be a cluster of transportation firms. Two sets of secondary information were utilised towards these findings. The first set was used to calculate the location quotients, which is a measure of spatial concentration of firms relative to broader areas. The measure concludes that if the quotient calculated is above one for a particular industry in an area,

[16] Porter (2000:16) defines a cluster as "… a geographically proximate group of interconnected companies and associated institutions… linked by commonalities and complementaries."

the industry is concentrated in that area. While acknowledging the significance of location quotient, the dissertation argues that by itself this technique is insufficient in understanding clusters, as it does not analyse the linkages between firms. The second set was used to classify firms by their employment size, as very large (with greater than 1000 employees), large (with greater than 500 employees), medium (with greater than 250 employees) and small (with less than 250 employees). The lesson for the dissertation was that employment size could be used to measure the sizes of airport-centric firms. However, the classification of firms according to the number of employees raises a concern in that across the studies reviewed, there is no common understanding of what constitutes very large, large, medium and small firms.

Following the work above, Prosperi (2008) analysed the spatial clustering of economic activities around Miami International Airport (MIA) in the USA. The study discovered that between 1998 and 2005; cargo and related activities replaced wholesaling firms to become the dominant economic sector around MIA. Prosperi (2008) used a theoretical framework including systems of airports, and economic cluster theory. The former is based on the observation that there tends to be networks of airports within metropolitan areas. For the dissertation, analyses in similar lines were covered for the Johannesburg case studied that accommodates two main commercial airports of ORTIA and Lanseria (see Chapters Five and Six). Prosperi (2008) used the existing maps, and statistical information for the zip codes covering MIA and surrounds, which was used to categorise the firms by employment size. The use of information aggregated at areal units (such as zip codes) is common across other studies reviewed below, and is therefore discussed at length with the synthesis of limitations, in Section 2.4.

Giuliano & Small (1991) developed a method for analysing employment subcentres in Los Angeles, and using the 1980 data, the study identified 32 centres of which five were located around Long Beach, Burbank, Los Angeles, Orange County and Van Nuys airports. Learning from this finding, the dissertation put particular attention on investigating Cape Town and Johannesburg airport-centric developments as specialised centres in their respective metropolitan areas (also refer to a discussion of airports as locational constants and non-central places, in Chapter Three). Giuliano & Small (1991) concluded that Long Beach and Burbank airports are clusters of specialised manufacturing, while Los Angeles, Orange County and Van Nuys airports are clusters of mixed industrial, with more production-oriented industries and less service-oriented activities. Giuliano & Small (1991) contend that this attribute of the location of production-oriented activities is typical of areas that started out as manufacturing districts close to transport facilities and attracted a variety of functions over time. This finding necessitated the

dissertation to analyse the evolution of the Cape Town and Johannesburg airport-centric developments (see Chapter Five). It is important to note that cluster analysis above was based on hierarchical method which links successive pairs of observations based on their similarities, and the iterative-partitioning method which commences with a predetermined number of clusters, and redefines them so as to maximise the within-cluster dissimilarity relative to between-cluster dissimilarity (Giuliano & Small 1991). This interpretation of clustering is different from the dissertation's understanding, and is therefore revisited later with the synthesis of limitations.

Following their 1991 work, Giuliano & Small (1999) analysed the growth of subcentres in Los Angeles, through formulating hypotheses and testing them using the 1970 to 1980 secondary data. One set of hypotheses pertained to the influence of transportation facilities on the growth of subcentres, specifically proximity to airports and freeways, and the study discovered little support showing the importance of proximity to airports and freeways. Another set of hypotheses related to economic productivity of subcentres, which, according to Giuliano & Small (1999), are factors that affect the economies of agglomeration, congestion, land scarcity, and the growth prospects of firms. The study did not find evidence on the importance of agglomeration economies in the emergence and growth of subcentres, some of which are airport-centric developments.

Focusing on areas surrounding 25 major passenger airports in the USA, Appold & Kasarda (2013) investigated the impact that the increasing dependence upon air transport would have on urban form. Specifically, the study attempted to understand how the reliance on air transport would affect the intrametropolitan spatial pattern of employment; how the location of employment is affected by the use of airport transport; and how the use of air transport would affect the spatial structure of urban areas generally. The study used secondary information from various sources (with some of the data aggregated to zip code zones); and the employment surrounding airports was found to be substantial, though lower in comparison to the employment in central cities. Using radii of up to 16 km of airports, Appold and Kasarda discovered that the total employment is dominated by the following sectors, in the order here shown: manufacuturing; wholesale trade; transport and warehousing; information industries; finance and insurance; professional, scientific and technical services; management of companies and enterprises; administrative and support services; accommodation and food services. When investigating the 22 largest central cities that the 25 airports analysed serve, it was discovered that employment within 4 km of the airports was nearly 51% as large as that within 4 km of city centres. In explaining reasons for firms' location on and around airports, Appold & Kasarda

(2013) note that, inter alia, the location of firms with frequently flying personnel indicates that airport access is important in influencing the firm's location decisions. The authors note that, however, there are certain firms that locate close to airports for convenience of the business associates, even though such firms do not utilise the airport themselves.

Through the analyses of 51 metropolitan areas in the USA, which are served by 62 airports with scheduled passenger service, Appold (2015) measured the influence of airports on employment density. The study used secondary data on employment by sector by place of work for 34 214 census tracts, for the year 2000. The two key aspects considered in the analysis were: one, the employment density of each census tract; and two, distances (measured using GIS) between the centroid of each census tract and (a) the CBD of each metropolitan area, (b) the nearest airport, (c) the nearest highway, (d) the centroid of the census tract of the nearest large subcentre, which does not include a central business district (CBD) or airport, and (e) the centroid of the census tract with highest household income in 1970. The CBD was found to have a strong influence on the distribution of total employment density in almost every metropolitan area considered in the analyses; wherein employment declines with distance from the CBD. Airports were found to have a weaker impact on the distribution of employment density than other subcentres included in the analysis. In 24 of the metropolitan areas studied, the findings reflected that many airports have no overriding impact on metropolitan area structure. It was also discovered that particularly when the population of a metropolitan area is large, the airport has a weaker impact on employment distribution.

In a related study, McMillen & McDonald (1998) investigated the effects that access to transportation facilities have on employment density in the Chicago metropolitan area. Using the 1980 and 1990 census data on employment figures per quarter section, the variables investigated were distances to O'Hare Airport, the Chicago CBD, the nearest commuter station, and interchanges on the highways. The study identified twenty subcentres, of which two (Addison and O'Hare) are located adjacent to O'Hare Airport. In 1980, manufacturing and transportation, communications, utilities and warehousing activities (TCUW) dominated the mix of these two centres. McMillen & McDonald (1998) also conducted an econometric test to distinguish between the influence of internal scale economies and agglomeration economies on subcentre growth. As discussed later with the synthesis of limitations, it is important to note that McMillen & McDonald (1998) understood internal scale economic as not a component of agglomeration economies.

Through the use of secondary information, Struyk & James (1975) analysed the location patterns of manufacturing employment in Boston, Phoenix, Cleveland and Minneapolis-St Paul. Cleveland was categorised into 18 analysis zones, with the airport located within the zone of Berea. In 1965, Berea accommodated 6% of Cleveland's manufacturing employment, and increased by 28% in 1968, with Berea being one of the three zones that experienced the largest growth. Struyk & James (1975) are of the view that the presence of the airport combined with the effects of highways, may have accounted for the growth of industrial activity in this area. Minneapolis-St Paul was categorised into 25 analysis zones, and at least 8% of an industry's manufacturing employment was required for the industry to be regarded as concentrated in a particular zone. The area's airport was situated in the zone of Richfield International Airport, which did not have a concentration of manufacturing employment in 1965. The Phoenix area was divided into 14 analysis zones, with the airport located in the Southwest of central industrial district (I) zone, which had, in 1965, the second highest concentration of electrical machinery manufacturing employment. For Phoenix, about 15% of an industry's employment had to be located in a given zone for the industry to be understood as concentrated in that zone (Struyk & James 1975). While understanding the location and concentration of firms is important, the dissertation had to go beyond that, to investigate the linkages the firms have with the airports and other firms (see Chapter Six).

Conventz (2010) analysed the locational patterns of offices around Schiphol and Frankfurt airports. The study discovered that at Schiphol and surrounds, demand for office space is from the sectors of finance, information technology (IT), telecommunications, retail, community services, transportation and healthcare. The author describes the research as based upon a methodologically mixed approach that incorporated desk and field research. However, despite the mention of field research, it is evident from reading the work that the analyses did not include primary data collection but relied only on existing information.

Van Wijk (2007) analysed the economic and spatial characteristics of Schiphol International Airport (the Netherlands), Frankfurt International Airport (Germany), and Tokyo Haneda and Narita international airports (Japan). The study discovered that at the vicinity of Schiphol, investors mostly develop offices, resulting in the undersupply of industrial sites. At Narita Airport, offices exist only within airport buildings, where the distance to Tokyo is understood to limit the development of offices in the vicinity of the airport. Van Wijk (2007) discovered that although the Japanese government planned manufacturing sites in the vicinity of Narita Airport, it is mainly space for cargo handling that is in demand, not manufacturing facilities. This finding

shows that airport-centric developments do not necessarily develop in accordance with the plans of governments and other stakeholders. At Tokyo Haneda and surrounds, Van Wijk (2007) notes that the limited development (including manufacturing) close to the airport is perpetuated by the existence of older manufacturing sites in Kawasaki. The lack of development can also be attributed to the short distances to major urban centres as well as good connection of the airport with downtown Tokyo, Kawasaki and Yokohama, and the existence of other areas that are more attractive for development than Tokyo Haneda Airport and surrounds (Van Wijk 2007). Van Wijk's (2007) findings were informed by the quantitative and qualitative information, with the latter obtained from document analysis and interviews with selected stakeholders.

In South Africa, Swanepoel (2012) analysed the relationship between OR Tambo International Airport (ORTIA) and the concentration of air cargo-related businesses at the surrounding areas of Isando, Pomona, Aeroport, Anderbolt and New Era. The study used airport inclination factor, which maps business density in the two-kilometre to five-kilometre distance band from the airport, divided by the average business density for a specific business category. A factor of one shows a business density equal to the provincial average for a business category, while a factor less than one reflects a density lower that the average for the province. Therefore, the higher the airport inclination factor, the higher the impact of the airport on the locality of businesses. Similar to the use of location quotient, airport inclination method is an informative descriptive tool that however does not sufficiently explain the causes of the patterns discovered.

Swanepoel's (2012) study discovered that couriers, freight forwarding, container services and logistics firms have a high factors of between 12.06 and 15.22, implying they are 12 to 15 times more likely to locate near ORTIA, as at any other location within the province of Gauteng. Transport consultants, distribution firms and import agents have an inclination factor of between 4.36 and 5.83. Export agents and warehouse activities have the least factors of 2.51 and 3.08. This is a surprising finding: however, Swanepoel does not provide reasons to which this could be attributed. The results might have been skewed by the methods used in the study as follows: the business categories of couriers, freight forwarding, logistics; and transport consultants, distribution activities and warehouse activities are so intertwined. Some firms engage in all these activities and it would be difficult to assign accurately a unique economic activity to any of these categories, particularly when using secondary sources of information to classify the firms. In Swanepoel's work, it might be the case that firms engaged in warehouse activities were recorded under other related categories; resulting in a low representation and ultimately low airport inclination factor of export agents and warehouse activities. A lesson for the dissertation was not

to classify the firms in terms of potentially overlapping categories. Swanepoel also relied heavily on the use of Yellow Pages online database to record the firms. It is important to note that this method is limiting as it only includes firms that are willing (and able) to have their details available online. The dissertation therefore used various business databases, including Yellow Pages, to complement each other. These lessons are reflected in Chapter Four, with a discussion of research methods adopted in the dissertation.

Through a regression model covering 321 Metropolitan Statistical Areas (MSAs), and detailed investigations of Cincinnati-Northern Kentucky, Pittsburgh, Nashville and General Mitchell international airports, Button et al. (1999) examined the locational trends of high-technology employment in relation to the provision of scheduled air transport services. The study discovered that a city that has a hub airport attracts more high-technology employment than a comparable non-hub city. It was estimated that people involved in high-technology activities fly over 1.6 times as much as those in other industries.

With a focus on economic sectors similar to Button et al. (1999), Delaney (1988) investigated the development and growth of electronics multinational enterprises (MNEs) in Ireland. The focus of this study was Cork region (which accommodates Cock Airport) and Limerick/Shannon region, which accommodates Shannon International Airport. Based upon a survey of 39 electronics MNEs, the study discovered a concentration of high-technology electronics firms in the vicinity of Shannon International Airport.

Also using a regression model, Sohn (2004) investigated whether information technology (IT) influenced the concentration or dispersion of manufacturing activities in Washington-Baltimore, USA, between 1994 and 1997. The analyses focused on the manufacturing activities of printing and publishing; chemicals and allied products; electronics, electrical and computer equipment; and transportation equipment. The variables used in the study included distances to Baltimore-Washington international (BWI), Reagan Washington National (DCA), and Washington Dulles international (IAD) airports, so as to measure the significance of the location of airports to the location of manufacturing activities. The study discovered that the activities of printing and publishing; electronics, electrical and computer equipment activities concentrated close to IAD and BWI. BWI was also characterised by a concentration of activities of chemicals and allied products; while transportation equipment activities located in the vicinity of RWA (Sohn 2004).

Focusing on 103 Italian provinces in which 35 major airports are located, Percoco (2010) analysed the impact of airport services on the economic development in terms of local employment; wherein airport services was expressed by the number of passengers and movements. Primarily using the 2002 secondary data, the study used airline traffic as an index of airport importance and quality. Three categories of employment were used as dependent variables, namely total employment in the province, employment in the manufacturing sector and employment in the service industry. The hypothesis was that airport activity in terms of airline traffic has a larger impact on the service sector than on the other sectors, because that sector relies greatly on face-to-face interactions. The results of Percoco (2010) supported this hypothesis, and confirmed that the service industry is more sensitive to airline traffic in comparison to other sectors in the economy.

Towards understanding the development impact of Manchester Airport, Twomey & Tomkins (1995) used the 1991 employment census data to establish linkages between the two sectors (as defined by the SIC categories) of air transport, and air support services and the economy of the North West region. It is important to note that the use of SIC categories has limitations which necessitated the dissertation (in Chapter Four) to use alternative classification for analyses, instead of SIC categories. For instance, Twomey & Tomkins note that the linkage data central to their analyses combines support services for air transport with support services for inland transport, sea transport, and miscellaneous transport; which creates inaccuracies in the analyses of linkages. Further problems that can potentially emanate from the use of SIC classification are discussed in Chapter Four, Section 4.2.3.4. Twomey & Tomkins (1995) argue that their approach is different from standard impact analysis, since it examines the linkages between direct on-site employment and the broader economy; and does not estimate the total employment attributable to the airport as regards direct, indirect and induced jobs (see Section 2.2 below). The analyses were meant to estimate the number of jobs in the two aforementioned sectors supported by demand from other sectors. About 2316 jobs were classified as belonging to air transport, which are the jobs sustained by the North West industry through their purchases from the air transport sector, that is, air transport jobs directly supported by linkage with the North West industry. As regards the air transport services sector, the analysis discovered that 2778 support-jobs (constituting 75% of the regional's total) could be attributable to the linkage between the North West industry and the airport. Distribution, hotels and catering represent 35% of this total, with other significant contribution from transport and communication (23%) and business services (16%).

2.1.2 Factors that influence the choice of location

While the studies reviewed in Section 2.1.1 above are informative as regards the economic activity mix, and airport-centric developments as significant employment subcentres in the metropolitan areas; they do not provide insights on factors that influence the decisions of firms to locate on and around airports. Shukla & Waddell (1991) examined the location decisions of firms in Dallas-Fort Worth, with zip code zones used as location alternatives available to firms. The DFW Airport, the highways and the Dallas and Fort-Worth CBDs were analysed to understand their impact on the location of firms. The study found that manufacturing firms' value access to the airport, while finance, insurance and real estate (FIRE) activities were found mostly concentrated around the CBD. The analyses focused on establishments with under 50 workers for the sectors of manufacturing, construction, wholesale trade, retail trade, FIRE, and services.[17] The study used secondary information on the number and spatial distribution of establishments by employment size per zip code zone. With regard to another study in Dallas-Fort Worth, Fehribach, Rutherford & Eakin (1993) investigated factors that influence the sale prices of 228 industrial buildings; and discovered that distance from DFW Airport influences value and is therefore significant in explaining the sale prices. Distance from the DFW Airport was one of the variables used in Fehribach, Rutherford & Eakin's (1993) study.

Vahaly (1976) examined service and office activities that are dependent upon access factors in the Nashville-Davidson county, Tennessee, USA. Four variables were used to measure accessibility of a location (census tract), namely the metropolitan airport, Cumberland River, interstate highways, and the road network. The airport variable measured the importance of access to an airport and the associated transport facilities that reach beyond the Nashville-Davidson region, and it was discovered that federal government activities locate so as to be accessible to the airport, which reflects the need for quick travel by government officials to different parts of the county.[18] It was also discovered that musical services locate close to the airport (and the river), possibly for the convenience of travelling musicians. The Cumberland River and the interstate highways (not the airport) were found to be important for manufacturing offices (Vahaly 1976).

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[17] According to Shukla & Waddell (1991), this choice was made because these economic activities accounted for more than 90% of employment in Dallas-Fort Worth, while establishments under 50 employees constituted over 90% of firms in the area.

[18] It is also worth noting the locational demands of other levels of government. Contrary to the Federal government, State government-related activities locate more toward those areas which are close to the interstate highways and major arterial roads. The state offices are concerned with areas both outside Davidson county which can be reached via interstate, and inside the county accessible via the local road network. Metropolitan government, however, is located so that it is relatively most accessible to the county's population (Vahaly 1976).

The next study reviewed is of Daniels (1982), who examined the factors that influence the locational choices of offices at the Seattle CBD, Bellevue/Eastside, South Seattle (including the environs of Seattle-Tacoma International Airport) and Northgate, USA. In 1979, the CBD accommodated over 69% of the office space; the Bellevue/Eastside area was the most significant after the CBD with 2.7 million square metres. The other two markets, including the airport area, accommodated 1.4 million square metres between them (Coldwell 1980, cited in Daniels 1982). The study discovered that because some of the offices have their headquarters located in other parts of the country, Seattle-Tacoma Airport is a factor that influenced their location.

Hoare (1974) investigated the linkages that manufacturing and office firms have with London Heathrow International Airport, so as to determine the role of the airport in the geography of the said activities. Through survey interviews, the study found the airport to be insignificant in the growth of manufacturing activities, and rather an important location factor for offices. Of the 125 manufacturing firms interviewed, only four firms replied that Heathrow Airport had been an important locational factor when selecting their premises in 1969. These firms were located within 5 km of the airport (Hoare 1974). All office firms within 16 km of Heathrow mentioned that access to the airport was a major location choice determinant. The analysis also revealed that the offices attracted by the presence of Heathrow were mainly foreign-owned, as 54% of the respondent firms had overseas head offices. It is interesting to note that Hoare omitted airfreight agents from the study, instead of investigating the linkages such firms might have with manufacturing and office firms (refer to Chapter Six of the dissertation). From the findings above, Hoare (1974) questioned the view that airports can be regarded as growth poles, as a large number of firms in the vicinity of Heathrow Airport did not appear to benefit from its presence.

Also focussing on London, Keeble (1968) investigated the extent to which industrial areas around Heathrow Airport attract manufacturing firms oriented to exporting, and in particular those oriented to shipping through that airport. The study found that 6% of the sample used air transport as the main medium for exports, while the majority of exporting firms exported by sea through the port of London. Taking into consideration the use of Heathrow by exporting firms, the study estimated that between 50 and 100 North West London firms could have been influenced in their location, or been assisted in their growth, by proximity to Heathrow Airport. The focus of this study was an industrial zone located within 19 km of Heathrow Airport. Information on export sales in 1962 to 1963 was obtained from a stratified random sample of 124 medium-sized firms (that is, those employing between 10 and 999 production operatives),

and from the 29 large firms, those employing 1000 or more operatives. It is important to flag that this classification of firm sizes is different from Prosperi (2007; 2008).

In the Netherlands, Warffemius (2007) investigated the reasons European Distribution Centres (EDCs) locate around Schiphol Airport. The study discovered that 40% of the warehouses are non-Schiphol dependent,[19] showing that the use of air cargo services is not a conclusive factor that attracts EDCs to locate next to Schiphol Airport. Most EDCs noted the need for proximity to the former warehouse location as important in location decision-making. Warffemius (2007) therefore concludes that warehouses are attracted to the area by economies of agglomeration. This finding should be noted cautiously, given that the interpretation of agglomeration economies is not complete in Warffemius' work, as discussed later with the synthesis of limitations. The findings above were informed by a survey of EDCs located next to Schiphol Airport, and those located elsewhere in the Netherlands, with warehouses (instead of individual EDCs) that contained one or more EDCs used as sampling units and units of analysis. This approach is questionable, because one warehouse would accommodate two or more EDCs, and the dissertation therefore resorted to use individual firms as the units of analysis (see Chapter Four).

Reflecting a similar situation to Warffemius' findings, in an investigation of 85 airport-sensitive firms located in the area within 30 km of Schiphol Airport, Kramer (1988) discovered that even when there are economic linkages to Schiphol Airport, that relationship seldom requires a location in the vicinity of the airport. By implication, Kramer's (1988) findings, as is the case with Warffemius (2007), reflect that geographical proximity to an airport (or airport-relatedness) is not a conclusive factor that influences firms to locate on and around airports.

In Los Angeles, Sivitanidou (1996) investigated factors that attracted 812 warehouse and distribution (W&D) facilities, using the variables of distances to Los Angeles, Glendale-Burbank-Pasadena, and John Wayne airports; the closest seaport; and rail infrastructure. The findings yielded statistical significance of distance to airports, showing the importance of air transportation in the location choice processes of W&D facilities. As regards the airports' influence on small versus large W&D facilities, the study discovered that air-based (and road-based) transport infrastructure is important for the operation of large facilities, than for the small facilities.

[19] A Schiphol dependent EDC meets the following criteria: one, more that 20% (by weight or units) of its inbound goods is received through Schiphol Airport or two, more than 20% (by weight or units) of its outbound goods is shipped through Schiphol Airport (Warffemius 2007).

Using the secondary data on 143 counties in the USA, Bowen (2008) examined the degree to which warehousing establishments move towards locations with good accessibility to air, sea, rail, and highway transportation systems. The study discovered that the number of establishments in 2005, and the 1998 to 2005 growth in the number of establishments were significantly correlated with accessibility to air and highway networks. The results indicate that air transport is more important than rail and sea transport in influencing the location of warehousing firms. Air accessibility measure was however strongly correlated with the number of all warehousing establishments than with the number of large establishments. Bowen (2008) defines large warehousing as those with at least 250 employees, a categorisation which is different from Keeble (1968) and Prosperi (2007; 2008).

Moving from a focus on warehousing, Bowen & Leinbach (2003) examined the use of advanced producer services (provided by the air cargo industry) by manufacturers of electronics in Singapore, Malaysia and the Philippines. The study discovered that American and European-owned firms use these services than other firms, possibly because of the longer distances over which goods produced by American and European-owned firms are shipped. The findings were based on data collected through 126 survey interviews of firm executives in 2001. Learning from this work, the dissertation investigated the linkages between different firms and the couriers and freight carriers in Chapter Six.

In the next study reviewed, Rogerson (1998) examined factors that promote the emergence of high-technology manufacturing clusters around ORTIA and in Midrand. The study found access to ORTIA to be a major factor that influences the location of high technology manufacturing firms,[20] particularly for airfreight services. The study was based on information derived from the following sources: the 1989 and 1994 industrial registers, interviews with selected actors in the property sector, and 39 interviews with high-technology establishments around ORTIA.

Hoare (1975) tested the assumption that foreign firms in the United Kingdom (UK) locate at areas accessible to Heathrow International Airport. The study indeed discovered that the location of foreign firms is influenced by proximity to Heathrow Airport. This finding was informed by a field survey conducted to examine the relationship between Heathrow Airport and industrial firms, while investigating whether differences exist between foreign and British firms. Dunning

[20] It should be noted that for these activities, access to the highway system was also found as an important locational influence. 71% of the respondents regarded the highway as important for freight movement, and 43% valued the highway for personnel movement (Rogerson 1998).

& Norman (1987) had similar findings in their examination of the factors that influence the location choice of MNEs that have offices in the UK. The study discovered that regional offices[21] are strongly influenced in their location choice by accessibility to an international airport. Also in their early work, Dunning & Norman (1983) found that regional offices locate in areas with access to an international airport such as Heathrow.

In the last study reviewed, the Federal Aviation Administration (1967) examined whether communities economically benefit from the general aviation airports of Hereford Municipal Airport (Texas); Sumter Municipal Airport (South Carolina); Hayward Air Terminal (California); Frederick Municipal Airport (Maryland); and Fairmont Municipal Airport (Minnesota). The study discovered that the existence of an airport was a strong factor that attracts new industries, and retains the existing industrial firms. The study was based on the census information, from which economic and demographic profiles were developed to establish the community's economic position before and after the establishment of its airport. Following the profiling, field surveys were conducted to identify factors that would have caused the profiled economic growth at each community; and to identify the contributing effect of the airport's development (or improvement) to the factors identified (Federal Aviation Administration 1967).

2.2 METHODS USED TO MEASURE THE ECONOMIC IMPACT OF AIRPORTS

The current section reviews methods used to measure the economic impact of airports. Unlike the previous discussion, which is prefaced with a list of studies reviewed, this section does not list and review the studies individually.[22] This is because the studies employ similar methods, or close variants thereof. The analyses of economic impacts of airports are documented in the reports known as airport economic impact studies. According to Benell & Prentice (1993), these studies are conducted for three related objectives. The first is to improve awareness of the economic role fulfilled by airports. The second objective is to support future developments on the airport premises, by recognising airports as generators of economic activity. The third is to establish an economic foundation for future development initiatives on and around airports. By their nature, based on the aforementioned objectives, the airport economic impact studies are

[21] In Dunning & Norman (1987), the distinguishing feature of a regional office is that it is responsible for coordinating the activities of foreign affiliates of MNEs on behalf of the parent company, over a specified area.

[22] Comprehensive lists of airport economic impact studies are provided in the literature. For instance, in their excellent synthesis on how economic impact studies are conducted, Karlsson et al. (2008) provide a comprehensive list of studies conducted.

biased towards providing evidence for the presumed economic importance of airports. Worldwide, different approaches are used to identify and quantify the economic impact of airports, based on one of the three main methods of input-output analysis (IOA), econometric analysis and cost-benefit analysis (CBA). These methods (and their variations) differ in terms of the type and number of variables analysed, with the most widely used being employment statistics, payroll and taxes (Karlsson et al. 2008). The three methods are described in the sections below; and their limitations are covered in Section 2.4 with the synthesis of limitations of literature.

2.2.1 Input-output analysis

The most common approaches used to measure the economic benefit of airports employ the input-output method, and examine the direct, indirect and induced impacts (Karlsson et al. 2008). In input-output analyses, the airport's direct impact on the economy refers to the number of jobs and sales directly related to the airport operations, and of firms whose existence presumably depends on the airport, or utilise the airport in one way or another. These firms include airlines, tour operators, flight schools, airport administration, car hire companies, and other airport tenants (Weisbrod 1991; William Cheek & Associates 2006). Specifically as regards the impact on jobs, direct or basic employment is generated through the expenditure necessary to maintain the function of an airport. Such jobs are presumably dependent upon the presence of an airport and are supported by revenues produced by the airport operator, airlines, passengers and airfreight operators. Direct employment is typically categorised further into two groups, namely jobs which are on the airport site and those located outside the airport premises, though presumably directly associated with it (Banister & Berechman 2003; Lichfield 1973).

Indirect impact refers to the revenue that flows into the local economy from individuals and firms that are related to the airport's operations. As regards specifically job creation, indirect employment is understood to emanate from the airport-related purchases made by firms in the category of direct impact discussed above. There may therefore be additional rounds of expenditure from first level to subsequent levels of suppliers. Indirect employment is typically calculated with the use of multipliers (Banister & Berechman 2003; William Cheek & Associates 2006). Induced impacts refer to the downstream effects of both the airport operations and the firms understood to be dependent on the airport. This is based on the assumption that the direct and indirect impacts create additional jobs, increase spending power and therefore multiply the initial inputs. Induced employment is generated when further non-airport related purchases are made by those employed in the first two categories (Banister & Berechman 2003). To determine

the induced impacts, the direct and indirect impact figures are added, and thereafter a multiplier applied (William Cheek & Associates 2006).

A less common method, which can be classified under input-output analyses, examines the catalytic impact of airports. These are the gains from trade, which are presumably facilitated by aviation. The gains are connected to the products shipped by air, including tourism and business services (Appold & Kasarda 2010). Although some studies attempt to quantify catalytic impacts, their analysis can be complex as it is difficult to isolate what is attributable to an airport as opposed to other factors (ACI 2004).

2.2.2 Econometric analysis

According to Malina & Wollersheim (2009), while some studies employ econometrics to test the negative impact of airports on the surrounding areas, there are econometric studies used to determine the positive impacts. Regression analyses observe the relationship between one dependent variable and one (simple regression) or several (multiple regression) independent variables. When examining the economic impact of airports, the dependent variable is meant to show a good indicator for economic prosperity, which can be reflected by high employment levels, population growth or high Gross Domestic Product (GDP). Most studies test several of these dependent variables in consecutive analyses. Malina & Wollersheim (2009) note that there are limited examples of the use of regression analysis techniques in measuring the positive influence of airports on the economy. With the literature search, one study was found, that of Benell & Prentice (1993), who attempted to develop a method of updating the economic impact results of 44 Canadian airports. The study used a cross-sectional econometric analysis to estimate economic activity at these airports across Canada. The authors argue that the developed econometric equations and parameters provide a cheap method of updating the economic impact studies.

2.2.3 Cost-benefit analysis

Cost-benefit analysis (CBA) quantifies the net economic surplus, which is the difference between benefits and costs, particularly of publicly-funded projects (Malina & Wollersheim 2009). In airport economic impact studies, the CBA estimates the income to the residents presumed to result from developing, maintaining or upgrading an airport. This analysis is done in comparison to an opposite base case of not maintaining, not improving or not having the airport at all. CBA measure comprises of three calculations. Firstly, it analyses local income generated as a result of business expansion from increased user spending at the airport and in the

community, as well as from indirect and induced economic growth. Secondly, it focuses on income generated from additional jobs due to new business attraction, presumably made possible by the airport; and thirdly, the measure determines additional value of time and cost-saving benefits associated with non-business travel by local residents and visitors, who do not necessarily generate increases in their spending because of those additional user benefits (Weisbrod 1991). Cost-benefit analyses are also used to select an airport location amongst alternative sites; for instance, Higgins (1971) used the CBA to select the Montréal Airport site. For the Montréal Airport site selection process, the cost was calculated in terms of the funds required for site acquisition and construction of airport facilities. In terms of the benefits, analysis was, among others, undertaken on whether the total investment would differ per alternative site due to physical, social, political and economic characteristics in ways that could make the sites more attractive or less appealing to new firms (Higgins 1971).

As mentioned earlier, so as to avoid overlaps and repetition, the limitations of the methods are synthesised in Section 2.4, with the overall limitations of literature. There is one consideration that does not fit clearly in the methods above but still requires consideration. This is attracted employment, which exists when activities unrelated to the airport locate nearby to take advantage of increased accessibility or other opportunities. Because input levels of expenditure do not determine the attracted employment, it is analysed through qualitative interviews with firms located at and around airports (Banister & Berechman 2003).

2.3 SPATIAL PLANNING MODELS OF AIRPORT-DRIVEN DEVELOPMENT

The current section describes the models used by their proponents to propose the idealised spatial form and land use composition of development that is understood to originate from airports. Through hinging on, and generalising from existing trends of airport and surrounds, these models are based upon a common presumed premise of airports being catalyst to the firms located on and around airports (Freestone & Baker 2011). Hence with this assumption, the models use the phrases such as airport-led and airport-driven development, to refer to the concentration of firms around airports. This section of the chapter uses these phrases as they are utilised in the literature, and the subsequent synthesised critique in Section 2.4 problematises such phrases.

The proposals of ideal spatial form and land use composition of airport and surrounds are no new phenomena. Although it is difficult to pinpoint the foundations of such proposals, Meier (1974) had detailed thoughts on the spatial form of airport-led development, through what he referred to

as airport-based metropolitan central district. Meier (1974) argues that central districts develop to facilitate inter-metropolitan exchange of freight and people. Previously, harbours fulfilled this function, which resulted in markets and offices developing in the geographical proximity of harbours. According to Meier (1974), the space requirements for movement by air, together with the effects of the noise, force the terminal for passengers and high-valued shipments to peripheral sites within a given city. In these peripheral locations, hotels, conference rooms, communication facilities, and recreational services concentrate to handle the requirements of interfaces between producers and suppliers, parent firms and their subsidiaries, marketers and their distributors, consulting firms and their clients. Activities assumed to be attracted to this airport-based metropolitan central district are mainly express transshipment (Meier 1974). With the work of Meier (1974) as a backdrop, the following main models of airport-driven development are briefly described hereunder: airfront, decoplex, airport city, airport corridor, airport region, aerotropolis and airea. As with the previous two sections, the critique of these models is consolidated in Section 2.4, with the discussion of limitations of literature.

The concept of airfront was conceived by Blanton (2004) to refer to a concentration of commercial, industrial and transportation facilities and services that are linked to the airport. The land use mix of these airport fringe zones includes car rental facilities, hotels and meeting facilities, freight facilities, manufacturing and warehousing activities; all requiring air connections (Freestone & Barker 2011).

The decoplex is an integrated mixed-use concept, which is based upon the notion of ‘airport communities’, with the runway conceived as a main street. The decoplex accommodates industrial sites, offices and hotels, recreation areas, with core units having direct access to the taxiways and runways (Conway 1993). The decoplex ranges from small-scale airport business parks and fly-in residential and leisure communities through to larger developments, with all the characteristics of a small town and onto the futuristic jet city as an efficient centre of economic development (Conway 1980, cited in Freestone & Barker 2011).

The airport city concept refers to a concentration of airport-related development, the mix and scale of which is influenced by air connectivity, economic potential, the commercial position of the airport operator, and the supportiveness of the decision-makers (Peneda 2010, cited in Freestone & Barker 2011), such as the government. The ‘city’ label in the model denotes the potential diversity of land uses involved (Poungias 2009, cited in Freestone & Barker 2011). Conway (1993) asserts that airport city is a project planned to maximise the use of air transport

and to integrate it efficiently into the area served by the airport. Conway (1993) proposes five idealised categories of airport cities, which would be connected to one another and to other transport modes. This argument acknowledges that airport-centric developments do not exist in isolation with airport-centric developments elsewhere in a given country and beyond. Analyses in similar lines were conducted in Chapter Six, and influenced the contribution towards a theoretical framework in Chapter Seven.

The first category is five-star global airport cities, which are new airport cities that would connect the Pacific Rim, North America and Europe, the region where global air traffic is concentrated. The sites for these airport cities will be situated close to the coast and have direct connections to rail and highway systems. Each of the sites will measure not less than 10 000 hectares in extent. The number of five-star airport cities will be limited: potentially a maximum of three in each of the aforementioned areas. The first 10 projects to be built may potentially dominate the world airport industry for decades, and given few (if any) constraints on growth, these new five-star global airport cities will have unlimited capacity (Conway 1993). The second category is four-star international airport cities, which include airport cities that are important to one global region, such as the Pacific Rim, Europe or North America. This category includes a number of existing and new airport cities, which are mostly not planned from the onset as airport cities. These airport cities provide international passenger and freight services within a single region. They are restrained by limitations of airspace and land area, as well as noise, night operation and environmental concerns. The third category is three-star airport cities, which refers to facilities that provide scheduled jet services. They are oriented primarily for domestic flights but offer international services through transfers at a four-star or five-star facilities mentioned above. Two-star airport cities represent the fourth category, and are involved mainly in providing commuter services to larger airport cities. The last category is one-star airport cities, which provide services through non-scheduled general aviation. Within this category, there are several distinct groups, namely fly-in residential communities, fly-in resorts and fly-in frontier villages (Conway 1993). This is similar to the model of decoplex noted above.

John Kasarda coined the term aerotropolis, which, according to Freestone & Barker (2011), developed from his work in the 1990s on airline networks and employment growth, industrial location, logistics and economic development. The aerotropolis model consists of a core airport city at the centre of a metropolitan area and connected by dedicated road-based access (*aerolanes*) and high-speed rail links (*aerotrains*). This idealised form includes the outlying aviation-oriented business precincts such as business and logistic parks, retail complexes, hotels

and free trade zones. This footprint collects up time-sensitive goods processing and distribution facilities, especially those involved in shipping high value to weight products, firms dependent on frequent business travel, and other related economic activity. The aerotropolis label or model has been applied to a diversity of environments, planned and unplanned (Freestone & Barker 2011), as shown with the South African examples in Section 1.4.1.

Freestone & Barker (2011) note that the notion of airport corridor was conceived by Schaafsma (in 2008) to denote a link between the airport and city centre through a band of integrated road and rail infrastructure and urban development. The airport corridor concept seeks to spatially and economically transform the area between the airport and the city centre into an integrated zone (Freestone & Barker 2011) that emanates from the airport.

Schlaack (2010) introduced the concept of airea. Freestone & Barker (2011) regard it as a variation of the aerotropolis that is however framed more from a metropolitan perspective rather than an airport perspective. Schlaack (2010) however argues that the airea concept is neither limited by nor dependent on the airport city debates and it intends to introduce different perspectives for analysing airport-related development. It also has a more flexible spatial form, scale and complexity than the other models. In the airea, the airport's sphere of influence is disaggregated into fragmented islands of development, with varying linkages between each other and the airport (Freestone & Barker 2011). The concept proposes an approach to be adopted for analysing and describing processes of airport-related development. The elements of the airea approach are as follows. Firstly, there should be definition of areas in the metropolitan area that show some interaction with the airport. Research criteria used for this step involve analysing geographical proximity and accessibility to the airport, and investigating the development status and the marketing strategy pertaining to the airport. Secondly, the parts of the airea should be analysed by their physical form and stakeholder composition. This is done so as to reveal inherent characteristics of the parts in comparison to each other, to other case studies and to further characterise the overall airea. Thirdly, in order to characterise the different types of interaction within the airea, there should be analysis of the interaction of airea parts to the city and to the airport, between each other and to their immediate geographical vicinity. Finally, a typology should be developed of the interactions that exist between the airport and the city. Such interaction can be regarded as symbiotic, competitive, parasitic, or isolated (Schlaack 2010).

2.4 LIMITATIONS OF LITERATURE

The literature reviewed in this chapter provides insights into airport-centric developments' land use composition; factors that influence the choice of location; methods of measuring economic impacts of airports; and normative models of airport-led development. The purpose of the current section is to synthesise the limitations of literature; focusing particularly on limitations that would influence the methodologies and methods of analysing forces that drive the location and mix of airport-centric developments. The dissertation argues that the literature on airports and surrounds has the following interrelated limitations: one, sole reliance on secondary sources of information; two, limited explanation of forces that drive the location and mix of airport-centric developments; three, restricted scope of the investigations; and four, weak consideration of the concepts of linkages, agglomeration economies and clustering. Discussion below on each limitation covers four aspects, that is: stating the limitation identified, and providing argument of why the limitation deserves attention; listing the studies that are characterised by the limitation; suggesting approaches that could be appropriate to avoid or address the limitation; and where relevant, warning against the potential drawbacks of the approaches suggested.

2.4.1 Reliance on secondary sources of information

The majority of existing studies on airport-centric developments solely use secondary, and typically aggregated sources of information. In the literature, such information is applied to the techniques of location quotient, hierarchical analysis, iterative-partitioning, econometric analysis, and airport inclination. Before discussing further the limitations of literature as regards sources of information and analytical techniques used, two points should be noted. Firstly, the use of secondary information is not a limitation in itself. Rather, the dissertation advances an argument (given limitations of secondary information to be discussed) that the results obtained from the sole use of secondary information should not be regarded as conclusive in the analyses of forces that drive the location and mix of airport-centric developments. As much as possible, the empirical analyses should incorporate primary data as advanced later in the section. Secondly, it is not incorrect to employ mathematical and statistical techniques in the analyses of forces that drive the location and mix of airport-centric developments. It should however be noted that the measures of statistical or numerical associations do not, on their own, explain wholly the spatial and economic attributes of airport-centric developments. The dissertation is of the view that the numerical techniques are important, but their application should be informed by a clear conceptualisation of forces that drive the location and mix of airport-centric developments. Therefore, there should be a comprehensive understanding of the concepts of linkages, agglomeration economies and clustering to inform the application of numerical techniques. As

elaborated later in the section, research should not randomly apply statistical and mathematical techniques, but should find ways of conceptually and methodologically improving the explanatory aspect of research.

Given the clarification above, the section firstly mentions the studies that rely on secondary and aggregated information. This is followed by a discussion of the limitations that such studies have towards analysing forces that drive the location and mix of airport-centric developments. Studies that rely only on secondary information are Appold (2015); Appold & Kasarda (2013); Bowen (2008); Button et al. (1999); Conventz (2010); Daniels (1982); Fehribach, Rutherford & Eakin (1993); Giuliano & Small (1991; 1999); McMillen & McDonald (1998); Percoco (2010); Prosperi (2007; 2008); Shukla & Waddell (1991); Sivitanidou (1996); Sohn (2004); Struyk & James (1975); Swanepoel (2012); Twomey & Tomkins (1995); and Vahaly (1976). These studies comprise the majority (67%) of the empirical studies reviewed.

Due to their dependence on secondary sources of information, the aforementioned studies do not undertake analyses at the level of individual firms. This lack of micro focus is aggravated by the fact that the data used is often aggregated at specific areal units. As Smith (1977) notes, given the lack of individual observations in geographical analyses, there is often no choice but to use aggregate areal data. Areal classification entails breaking down geographical space into smaller areas, or alternatively combining individual observations for larger areas (Smith 1977). The secondary information used in the literature on airport-centric developments is aggregated at the following units: transportation analysis zones (Giuliano & Small 1991); quarter sections (McMillen & McDonald 1998); zip code zones (Appold & Kasarda 2013; Shukla & Waddell 1991; Sohn 2004; Prosperi 2008); metropolitan statistical areas (Button et al. 1999); and census tracts (Appold 2015).

The lack of the use of micro data implies that the findings obtained from the aggregated levels cannot be used to understand accurately the spatial and economic attributes of the individual firms located on and around airports. Steel & Holt (1996a) note that because of the ecological fallacy, analyses based on spatially aggregated data may be invalid if the intention were to understand the attributes of the individual firms. Ecological fallacy occurs when analyses based on areal unit (known as ecological analyses) yield results that are different from those that would be obtained from the analyses of unit level data. Holt et al. (1996) add that statistics calculated using the geographical areas are often different from those calculated from data on individuals. Furthermore, the results of the analyses of aggregated data may vary according to the boundaries

and number of areal units used: a condition known as the modifiable areal unit problem (MAUP). As advanced by Páez & Scott (2004) and Steel & Holt (1996b), the MAUP arises in urban analysis due to the fact that a number of zoning systems and any other areal units could be developed to categorise a city into smaller components. By implication, the data reported for areal units will differ between the areal units; and the results will vary for studies using the same analytical technique, but focusing on particular areal unit conditions (Duncan, Cuzzort & Duncan 1961; Páez & Scott 2004; Smith 1977). Smith (1977) also emphasises that geographical description is affected because areal units vary in size and shape; and as such, certain areal units may have a larger occurrence of a particular condition due to them having a larger geographical size or because of the shape of the unit. Sawicki (1973) adds that using regression and correlation techniques on aggregated data should be approached carefully, given that: (a) the levels of association or correlation are affected by the size of the analytical units used, with high correlations possibly resulting from the use of large units of analysis; and (b) as mentioned above, the results of correlations and regressions of areal data do not reflect the level of association between individual-level phenomena.

A lesson for research on forces that drive the location and mix of airport-centric developments is that the analyses should not rely only on the use of secondary and aggregated data. A potential solution to the MAUP and other problems of secondary information highlighted above is to use individual level data (Páez & Scott 2004). This can be achieved through the use of surveys, given their advantages over macro level studies using secondary and aggregated data (Barkley & McNamara 1994). Towards understanding forces that drive the location and mix of airport-centric developments, survey investigations can be undertaken directly with people who are part of the location decisions and overall running of a firm that is located on or around an airport. The use of surveys would therefore allow researchers to acquire necessary information directly, thus eliminating the need to rely only on inferences from the results of analyses based on secondary data (Barkley & McNamara 1994).

Surveys can however also have pitfalls that should be considered carefully in research on forces that drive the location and mix of airport-centric developments. Concerns on the usefulness of surveys centre on the accuracy of responses obtained from the survey investigations. There is a potential problem of respondents completing the survey by mentioning and describing (consciously or unconsciously) factors believed to be important in location decisions, but which were not important at the time of the location decision process of a respondent firm (Calzonetti & Walker 1991, cited in Barkley & McNamara 1994; Struyk & James 1975). As Dunn (2007)

adds, information that respondents' give on how they make decisions is often different from the ways those decisions are actually made; and the problem is more likely if the researcher is unable to identify and interview individuals who were involved in the location decision-making processes of a respondent firm. Respondents may also provide particular answers with the intention of influencing the outcome and ultimate use of the results (Barkley & McNamara 1994). Therefore, although surveys can be used to avoid the problems of sole reliance on secondary and aggregated data, the problems highlighted above that can potentially emanate from the use of surveys need to be considered carefully in the design of the survey questionnaire and data collection instruments. The approach adopted in the dissertation to limit such problems is outlined in Chapter Four.

2.4.2 Limited explanation

Closely related to the limitations discussed above, the majority of literature focus on describing the land use composition of airports and surrounds, economic impact of airports, and idealised form of airports and surrounds; without explaining forces that drive the location and mix of airport-centric developments. Thus, the literature is predominantly limited to revealing what land uses locate and should locate on and around airports, without investigating why the firms located there in the first instance, and why they remain on and around airports. In Table 2.1, it might appear that numerous studies attempt to explain reasons for the firms' choice of location on and around airports; however, those studies mainly rely on secondary sources of data with problems identified in Section 2.4.1 above. Although it is acknowledged that some of the studies reviewed focus on explaining the spatial and economic attributes of airport-centric developments through the use of surveys; such studies have limitations that are outlined in Section 2.4.3 below.

The lack of (or limited) explanation of forces that drive the location and mix of airport-centric developments is clear in the following work, among others. Giuliano & Small (1991) focus on identifying the employment subcentres, and analysing their sectoral economic composition. McMillen & McDonald (1998) investigate reasons for the existence of employment subcentres through the use of secondary data with no comprehensive explanation. Prosperi (2007) investigates whether airport-centric developments are spatial clusters, and relies heavily on the use of location quotient. Location quotient is a useful tool that identifies and describes the concentration of economic activities, but it does not explain the concentrations identified. Van Wijk (2007) focuses on describing the spatial-economic position of the airports within the broader areas but offers no explanations. Conventz (2010) only describes the patterns of the location of offices around airports. Swanepoel (2012) discusses the impact of ORTIA on

surrounding industrial areas through the use of airport-inclination factor. This technique, similar to location quotient, is good at mapping and describing the concentration of firms but does not explain the concentrations identified. Through regression modelling, Sohn (2004) determines the concentration of manufacturing activities in the physical vicinity of airports, without explaining the causes of such concentrations.

In addition to the empirical literature mentioned above, the models of airport-related development do not explain the reasons for airport-centric firms' choice of location. Such models are informed by the assumption that firms locate on and around airports due to their dependence upon the airport facilities and services. This assumption is not substantiated, as the models are not informed by the analyses of forces that drive the location and mix of airport-centric developments. It is also important to note that the literature (both empirical studies and models of airport-led development) contains a number of statements that are not substantiated. There is assertion that: one, the personnel involved in high-technology activities fly frequently than personnel in other economic sectors. Two, the executives of foreign owned firms fly more frequently than those of locally owned companies (see Hoare 1975). However, the literature does not analyse the economic spaces of firms whose personnel fly frequently.

Insufficient description and explanation of the spatial economic attributes of airport-centric developments is also evident in the methods of measuring economic impacts of airports. Such studies only focus on describing the economic impacts of airports without explaining the causes of the impacts identified. Malina & Wollersheim (2009) note that the assumptions and limitations of the different methods can result in inaccurate conclusions reached on the economic impact of airports. Methodologically, in the use of input-output approaches, an increase in demand leads to more value added, increased employment and income for the economy. Given that costs of the airport are treated as demand in the input-output approaches, the economic impacts resulting from the model are positive when costs of the airport increase. By implication, the higher the inefficiency of an airport, the higher the impact on the economy would be (Malina & Wollersheim 2009). Appold & Kasarda (2010) argue that the analyses of the impact of airports should be based upon the money saved by using airport facilities and services (that is, gains from trade), instead of basing the analyses on the costs of trade; money spent on aviation.

It should further be noted that input-output approaches do not incorporate all benefits, as they only account for expenditures of firms at the airport, and not for revenues (Malina & Wollersheim 2009). Benell & Prentice (1993) argue that the use of revenues poses the potential

pitfall of double-counting economic activities at the airport. The authors note that the sales of meals to an airline would initially be counted as an activity of the caterer, then potentially counted for the second time as revenue of the airlines obtained from the sales on the aircraft. Benell & Prentice (1993) are of the view that employment figures are not likely to be double-counted and as such, employment estimates are likely to provide a more accurate reflection of airport economic impact, than revenue-related estimates. Malina & Wollersheim (2009) further argue that in the input-output approaches, effects on the economy are measured only as buyer-supplier relationships, in which firms at the airport order goods and services from the supplier. Potential locational attractiveness of the airport cannot be integrated into the analysis.

Further, given the lack of common base, the use of multipliers in input-output approaches could result in the inaccurately perceived economic impact of airports. Andrew & Bailey (1996) note that given the use of different multipliers (such as 0.5, 1.0 and 1.7), research on different countries produce different results. For instance, American and European airports generally reflect higher figures for economic impact than United Kingdom studies. There is therefore a need to establish a common base of economic multipliers for airports economic impact analysis (Andrew & Bailey 1996). Another shortcoming pertains to the use of regression analyses in airport economic impact studies; wherein the direction of causality is not clear. Malina & Wollersheim (2009) note that while good airport service could arguably lead to economic success, economic success could lead to a good airport service and increased demand for airport services. By and large, the airport economic impact studies do not explain forces that drive the location and mix of airport-centric developments. Such studies only provide descriptions of the quantifiable economic impact, and are subject to a number of limitations as highlighted above.

To inform new research, borrowing principles from the work of Johnston (1989) on international trade; the objective of analysing the spatial economic attributes of airport-centric developments should not be just to describe the land use patterns, quantify the economic impact of airports, and advance the idealised form of airports and surrounds. Analyses should attempt to understand why and how the land use mix and patterns observed come about. To improve research, Johnston (1989) proposes that a theoretical framework that is not only descriptive but also explanatory in nature informs the analyses. It is therefore reiterated that the starting point of analysing forces that drive the location and mix of airport-centric developments should be a clear conceptualisation.

2.4.3 Restricted scope of investigations

This sub-section discusses the limitation of literature pertaining to two aspects: analyses which are restricted to pre-selected economic sectors and employment-size of firms; and analyses which are biased towards investigating the influence of pre-selected factors on airport-centric firms' choice of location. Firstly, the limitation of literature pertains to the scope of investigations as regards the economic sectors analysed. Both the descriptive and explanatory literature has a weakness of focusing the analyses on pre-selected economic sectors. The dissertation argues that because of the limited focus, the literature does not provide a comprehensive picture of the spatial-economic attributes of a wide range of airport-centric firms. The restricted analytical scope is evident in the following studies.

Although Warffemius (2007) provides useful insights as regards factors that influence the airport-centric firms' choice of location, the study focuses on one economic activity pertaining to the EDCs located around Schiphol Airport. A question that remains is whether the analyses of a range of economic activities located around this airport would yield similar results. Hoare (1974) sheds light on the influence of London Heathrow Airport on the location-choice decision-making; however, the study focuses only on manufacturing and office activities. The study of Rogerson (1998) yields insightful findings, but similar to Hoare (1974) and Warffemius (2007), the study does not provide a holistic picture of airport-centric firms as it focussed only on the high-technology manufacturing activities around ORTIA. As regards another study of ORTIA and surrounds, Swanepoel (2012) provides good descriptions and mapping, but focuses only on the presumed air cargo-related firms. Sohn's (2004) analyses are limited to the manufacturing sectors of printing and publishing; chemicals and allied products; electronics, and computer equipment; and transport equipment. Fehribach, Rutherford & Eakin (1993) analyse the influence of distance from Dallas-Fort Worth Airport on the location of industrial buildings only. Delaney's (1988) analyses are restricted to multinational electronics enterprises. Vahaly's (1976) model only describes the service and office activities. Sivitanidou's (1996) study is based only upon the warehouse and distribution facilities. Prosperi's (2007) analyses are restricted to firms employing more than 250 people. Bowen's (2008) investigations focus only on describing the location of warehousing activities.

There may be valid considerations that inform the limited terms of reference of the literature, and only a few studies advance reasons for focusing on selected economic sectors and firms. Shukla & Waddell (1991) focused on establishments with under 50 workers because such establishments accommodate the majority (more than 90%) of employment in the study area of

Dallas-Fort Worth. Sohn (2004) argues that the manufacturing activities of printing and publishing; chemicals and allied products; electronics, electrical and computer equipment; and transportation equipment have high degree of linkages (both among themselves and with other sectors) and therefore have high communication requirements. Hence, Sohn (2004) analysed only the aforementioned activities, as they are understood to have a high dependency on IT for communication purposes.

Although the studies above are useful in their own right, by and large they do not contribute towards a holistic understanding of forces that drive the location and mix of airport-centric developments. Given that different economic activities would presumably have varying spatial and economic attributes, it would be informative for analyses to be undertaken on a broad range of firms, involved in different activities. Studies on airport-centric developments' spatial-economic attributes should therefore consider undertaking analyses on heterogeneous firms in terms of economic activity and employment size. Depending on the outcome of the analyses of heterogeneous firms, detailed investigations can thereafter be focused on selected firms that warrant in-depth analyses. Barkley & McNamara (1994) make a plea that research should nonetheless consider carefully the conditions under which studies limited to narrow categories of firms are preferable over studies of heterogeneous populations. The disadvantages of applying data collection techniques on heterogeneous economic activities should also be considered in the research on forces that drive the location and mix of airport-centric developments.

Secondly, a related limitation of literature pertains to analyses that are based upon presumed and predetermined location choice factors. The following studies have this weakness. Rogerson's (1998) analyses focused only on the importance of infrastructure in the location of high technology airport-centric firms. In the study, analyses are restricted to the importance of access to ORTIA, highways and communications infrastructure. It cannot be concluded that airport-centric firms make location choice decisions only on the basis of infrastructure availability. Bowen (2008) focused on how areas with high accessibility (that is air, maritime, rail and highway transportation network) affect the location of warehousing.

As emphasised by Barkley & McNamara (1994), at best questionnaires may inadequately distinguish (for the respondent) between different location factors or at worst omit factors from the lists provided. As a result, in addition to limitations of surveys mentioned in Section 2.4.1, respondents may have no appropriate choice, and consequently select certain factors as important even though they were not important in the location selection process of a respondent firm. The

studies on forces that drive the location and mix of airport-centric developments should make allowance for different possible factors that influence the choice of location, without a bias towards a preselected list of factors. Once again, what is also required is conceptualisation and approach that does not just rely on tabulating responses to the question of whether airports are factors in the location choice decision-making.

2.4.4 Insufficient consideration of key concepts

The fourth limitation of the literature reviewed pertains to insufficient (or absent) analyses of the concepts of linkages, agglomeration economies and clustering. The airport economic impact studies (based upon the input-output, econometric and cost-benefit approaches) and the models of airport-led development (airfront, decoplex, airport city, aerotropolis, airport corridor and airea) do not analyse linkages that characterise airport-centric firms. Both sets of literature presume the existence of linkages between airport-centric firms and airports; without investigating the nature of the presumed linkages, and the role such linkages play in the location and mix of airport-centric developments. At a minimum, these studies do not analyse the flow of goods and/or information locally, nationally or internationally through airports. Upon this basis, the dissertation took a position that in its current form, the literature on airport economic impact studies, and models of airport-led development do not add value towards understanding the concepts of linkages, agglomeration economies and clustering, in so far as they relate to the spatial economic attributes of airport-centric developments. In particular, the models of airport-led development do not have clear theoretical bases, which arguably lead to this weak consideration of key concepts. This literature is therefore not useful in describing and explaining forces that drive the location and mix of airport-centric developments.

Although some of the empirical studies reviewed identify linkages that characterise airport-centric firms, such studies do not analyse sufficiently the concept of linkages as discussed further on in this section. In the analyses of airport-centric developments, the following studies investigate linkages. Hoare (1974) analyses the manufacturing and office firms' linkages with Heathrow Airport, so as to determine the growth pole effects of this airport; Hoare (1975) investigates linkages between foreign owned firms and Heathrow Airport; Warffemius (2007) identifies the EDCs linkages with Schiphol Airport through analysing the quantity (measured by weight and number of units) of EDCs goods that are received or shipped through Schiphol Airport.

The limitations of literature, as regards the analyses of linkages, need to be situated within the broader problems of linkages research. Taylor & Thrift (1982) argue that in analysing linkages, the relationships between firms are normally understood simplistically in terms of the flow of goods and information. By focussing on the relationships between firms and even focussing only on the geographical dimensions of those relationships, analyses of linkages do not consider sufficiently, and even ignore, the unequal power relationships between firms. The failure to analyse the business environment as comprising competing, controlling and complimentary firms' results in the inability to understand firms as unequal participants in economic relationships (Taylor & Thrift 1982). Such relationships need to be carefully considered towards comprehensively analysing forces that drive the location and mix of airport-centric developments (see Chapter Six).

In the aforementioned studies of Hoare (1974) and Warffemius (2007), analyses of linkages are narrowly limited to identifying linkages between airport-centric firms and airports. For comprehensive analyses of forces that drive the location and mix of airport-centric developments, there should, at a minimum be a careful consideration of various forms of linkages viz. linkages within airport-centric developments; linkages between airport-centric firms and airports; linkages between airport-centric firms and their metropolitan areas, and linkages with other locations nationally and internationally. Further and most critically, learning from the work of Taylor & Thrift (1982), the studies on airport-centric firms should go beyond tabulating input-output tables, computing material and information flows; but should also analyse the uneven power relationships influencing the linkages identified. There is therefore a need for a theoretical framework to be used to analyse the nature of linkages that characterise airport-centric firms.

With regard to the second concept, the literature's understanding of clustering is restricted to linkages of firms that are located in geographically neighbouring areas. Such focus provides only one dimension of the concept (that is, spatial clustering) as advanced in Chapter One of the dissertation. Limited analyses of linkages, resulting in a thin understanding of clustering is evident in the following literature. Prosperi (2007) identifies clusters without investigating linkages that exist among and between the firms analysed. Thus, in the dissertation's interpretation, what Prosperi (2007) refers to as a cluster of firms, denote firms that are part of concentrations in which they are located. The understanding of Giuliano & Small (1991) of what a cluster is, is also not informed by the analyses of linkages between firms. In that work, cluster analysis is based upon the hierarchical clustering and iterative partitioning method to analyse the

so-called clusters, solely based on secondary information. Similar to Prosperi, the clusters identified by Giuliano & Small (1991) are concentrations of firms involved in similar economic activities, whose linkages have not been established. Similarly, Warffemius' interpretation of clustering of EDCs around Schiphol Airport denotes EDCs that are part of the concentrations in which they are located. Rogerson (1998) loosely refers to the concentration of high-technology manufacturing activities around ORTIA as a cluster without analysing linkages between the high-technology firms.

Further, the literature is characterised by weak consideration of the concept of agglomeration economies. Chapter One provided the definition of agglomeration economies that are understood in terms of scale, scope and complexity. The following studies have a limited understanding of agglomeration economies: Warffemius (2007) regards agglomeration economies as one of the primary reasons EDCs decide to locate close to Schiphol Airport. This conclusion is based upon the EDC's desire to locate next to the former warehouse. It is simplistic to conclude that the need to locate to the former warehouse is representative of the influence of the complicated concept of agglomeration economies. Also, in Warffemius' work, there is no indication of whether the agglomeration economies noted are localisation, urbanisation or activity-complex economies. The concept is used in a vague way, as if agglomeration economies have one dimension. Giuliano & Small (1999) also reflect an understanding of the concept of agglomeration economies that is limited to economies that are external to the firm, namely location economies and urbanisation economies. Although at least noting the economies that are external to the firm, Giuliano & Small (1999) regard internal economies as not a component of agglomeration economies.

2.5 SUMMARY

The chapter reviewed the three sets of literature that deal with the spatial economic attributes of airport-centric developments, namely (one) empirical studies that attempt to describe and explain airport-centric developments' land use composition (including consideration of airport-centric firms as significant employment subcentres in the metropolitan areas) and factors that influence the firms' choice of location; (two) standard airport economic impact studies; and (three) models of airport-led development. Despite the insights provided by the literature, the review culminated in the synthesis of limitations that characterise the existing knowledge, and which had to be addressed in the study's imminent analyses of forces that drive the location and mix of airport-centric developments. Four interrelated limitations of literature were identified. One, reliance on secondary sources of information; two, limited description and explanation of forces that drive

the location and mix of airport-centric developments; three, restricted scope of the investigations; and four, limited consideration of the concepts of linkages, agglomeration economies and clustering. A recurrent theme that emanated from this chapter is a need for a well-considered theoretical framework to guide the analyses. The next chapter therefore identifies an existing theoretical framework that subsequently informed the dissertation's investigations.

3 THEORETICAL POINTS OF DEPARTURE

The preceding chapter reviewed literature on airport-centric developments' activity mix, factors that influence the choice of location, standard airport economic impact studies, and models of airport-led development. That chapter noted the absence of a well-considered theoretical framework in the literature of spatial economic attributes of airport-centric developments. The purpose of the current chapter is therefore to identify an existing theoretical framework that is appropriate to guide the conceptualisation of forces that drive the location and mix of airport-centric developments. The most appropriate theories identified hereunder are used in Chapter Seven of the study as bases for contribution towards a spatial economic theory of airport-centric developments and implications for practice, that can be improved upon. It must be noted that contrary to a popular position, the study regarded theory not as a rigid framework that is used to generate predictions and laws (see Wilson 1980). Rather, theory was understood as a framework that assists towards conceptualising the phenomenon being analysed (see, for instance, Sayer 1992), which is the spatial economic attributes of airport-centric firms and developments. The chapter is organised into three sections. The first section develops a relational interpretation of the concepts of space, proximity, scale, firm and pattern; framed on the backdrop of economic globalisation. Section 3.2 evaluates relevant theories against the relational view of the spatial economic processes. The purpose of this evaluation is to identify the theories that relationally interpret the aforementioned geographical concepts, and for that reason suitable towards investigating forces that drive the location and mix of airport-centric developments. The last section concludes the chapter.

3.1 RELATIONAL UNDERSTANDING OF SPACE, PROXIMITY, SCALE, FIRM AND PATTERN

This section advances a relational interpretation of concepts that are appropriate to the analyses of forces that drive the location and mix of airport-centric developments. These are the ambiguous concepts of economic space, proximity, scale, firm and pattern. In the subsequent Section 3.2, the relational interpretation of these concepts is used to assess the appropriateness of different theoretical fields to the analyses of spatial economic attributes of airport-centric developments. The relational interpretation is developed against the background of economic globalisation, insofar as it has relevance to the analyses of airport-centric developments. As airports are essential in the transfer of people and goods across the world, understanding globalisation becomes important to the analyses of airport-centric developments. Cidell (2006)

and Goetz & Rodrigue (1999) argue that globalisation cannot be fully understood without understanding the operations of airports, since they are important elements of the global economy. Similarly, the operations and impact of airports cannot be fully understood without appreciating the workings of globalisation.

Despite its wide use, the term globalisation is so loosely defined that it is sometimes close to meaningless (Dandekar 1998; Dicken 2004; Markusen 1999). Despite the lack of consensus on a single definition of the concept, there is nonetheless some acceptance that towards a definition of globalisation, an elementary distinction should be made between the processes of globalisation and those of internationalisation (Allen & Thompson 1997; Coe 2011; Dicken, Peck & Tickell 1997). Internationalisation denotes the physical extension of economic activities across national borders: which represents a quantitative change in the extent of economic activity. The word quantitative implies the volume of goods, information or monetary value that is exchanged across national borders, which can happen without structural connections of the firms involved.

Globalisation is however more complex than just economic transactions traversing national boundaries. It is understood as increase in the functional integration or interdependency of firms and other economic actors across the global space, and is therefore reflective of qualitative changes in the cross-national economic activities (Coe 2011). Qualitative in this regard goes beyond quantifying the volume or value of economic transactions, but focuses on the way the economic actors at various parts of the world depend on each other functionally and structurally. It should be noted that the qualitative and quantitative notions are not mutually exclusive and operate together. The discussion above shows that an economically integrated system has developed globally (and is still evolving) through the processes of internationalisation and globalisation (Coe 2011). It can therefore be argued that though economic actors and associated activities are getting dispersed geographically, their functional integration and linkages are increasing (Geyer 2006; Peet, Chatterjee & Hartwick 2011).

A word of caution regarding globalisation is appropriate at this point. Massey (1999b) notes that the processes of globalisation are not as simple as the discussion above might suggest. Over time, some cities and economic actors become dominant in the patterns of economic interconnections, while other cities and actors are sidelined. This situation is epitomised by the dominance of multinational firms in the global economic systems. This understanding of unequal, uneven business relationships is later in the chapter applied to the notion of propulsive economic elements. The processes of global economic systems are important in the analyses of

the spatial economic attributes of airport-centric developments, particularly as regards the position and role of airport-centric firms (and their cities) in the global, uneven economic space.

In the analyses of forces that drive the location and mix of airport-centric developments, the discussion boils down to a relational view of economic processes, which is best understood in contradistinction to the atomistic viewpoint. The analyses based on the atomistic viewpoint separate out different aspects of economic reality, treating the economic context as consisting of discrete objects without any relational interconnectivity and linkages. It consists of in-depth quantitative analyses, and the 'whole' from this perspective amounts to nothing more than the sum of the parts (Merrifield 1993). In contrast, the relational perspective postulates that economic elements do not exist independently of each other, and not in isolation of the processes, linkages, and relations that create or sustain them (Harvey 1996). This implies that forces that drive the location and mix of airport-centric developments cannot be understood comprehensively without their underlying processes, linkages, agglomeration and clustering.

Based upon the relational approach underpinned by globalisation, the following is a discussion of the concepts of space, proximity, scale, firm and pattern. As these concepts can be interpreted in different ways, the discussion briefly highlights different interpretations to determine their appropriateness, and subsequently takes a view informed by a relational approach.

3.1.1 Space

As a starting point, it can be argued that all economic activities exist in some form of space, hence the ambiguous concept of space is regarded as fundamental in geographical analysis (Barnes & Gregory 1997; Blaut 1972; Couclelis & Gale 1986; Gatrell 1983; Harvey 1969, 1996; Lovering 1999; Massey 1985; Werlen 1993). Accordingly, airport-centric firms operate in particular space(s) that should be investigated towards understanding forces that drive the firms' location and mix. A clear position on the concept of space is required, given the various meanings it can take, as it can be understood as absolute, relative or relational. These three interpretations of space are discussed below, including their potential implications to the analyses spatial-economic attributes of airport-centric developments. The outcome of this discussion on various interpretations is indication of the view that the dissertation associated with, in light of the relational position discussed above.

In absolute terms, space is understood as a fixed frame which may or may not contain objects (Gatrell 1983; Harvey 1969), specifically airport-centric firms in the context of the study. Such a

frame may be defined by territorial, cadastral and administrative boundaries. Applied to the analysis of spatial economic attributes of airport-centric developments, the absolute space would be strictly defined by (and limited to) the three levels of analysis of areas around the airport, on the airport's landside and within the terminals (see Chapter One, Section 1.5.3), and even the cities, regions and countries such developments are located within. The analysis, based on absolute understanding of space, would then investigate the linkages and clustering only within these predefined locations; without considering the linkages that extend beyond a given geographical location. As evident in the literature (Chapter Two), such analysis would yield a limited understanding, given the organisational clustering discussed in Chapter One. Thus, while absolute space is useful in terms of delineating study areas, it cannot on its own be used to analyse the economic linkages (Garretsen & Martin 2010) of airport-centric firms. Given the influence of globalisation and internationalisation, the extent of linkages and clustering cannot be restricted to fixed boundaries. The potential deficiency of analyses based on absolute space calls for consideration of alternative interpretations of space as discussed below.

While absolute space is understood to exist independently of the contents within its frame, relative space is understood through the relations between objects (Unwin 1992), specifically firms in the context of the dissertation. Under this conception, the understanding of locations defined by bounded territories (in absolute space) gives way to relative locations. The relative view thus understands space as characterised by flows and movements (Garretsen & Martin 2010). Friedmann & Alonso (1964) are of the view that because space is shaped by functional (as opposed to only geographical) interrelations, there are as many representations of space as there are fundamental linkages. Sayer (1985a) makes a good point that some advocates of the relative concept of space overlook the fact that while space is constituted by objects, it is not reducible to them. In analysing forces that drive the location and mix of airport-centric developments, the relative interpretation of space implies identifying inter-firm and intra-firm linkages, without being restricted by the geographical extent of the three levels of analysis of areas around the airport, on the airport premises and within the airport terminals, and even the metropolitan area, region and the country. This conception would offer more insights than restricting the analysis to a predefined frame. However, regardless of its appropriateness, the relative understanding would only identify the linkages between firms, without investigating the forces and processes that necessitate such linkages. This would render the investigations incomplete.

Finally, as regards the relational view, the understanding is that space does not exist outside the processes that characterise that particular space. This consideration addresses the shortfall of relative space identified above. Economic processes of airport-centric firms do not take place in fixed absolute space, but define their own frame, implying that space is embedded in or internal to economic processes. Massey (2005) advances an argument that space is a product of relationships, meaning that space does not exist without relationships and linkages. According to the author, space is never closed, it is always in the process of being made. The relationships that do not exist currently might exist in future, resulting in the expansion of a relational space. The relational understanding of space would allow for the analysis of processes that influence the linkages, agglomeration and clustering of airport-centric firms. In the relative and relational views, the 'space' that airport-centric firms are part of, cannot be understood independently of time: hence the conceptualisation should be about the connection between space and time (Garretsen & Martin 2010; Massey 2005). Blaut (1972) adds that space is always interconnected with time; the two forming a space-time manifold, or process.

According to Harvey (1969), the three conceptions of space discussed above may be appropriate for different purposes. It can therefore be argued that "space is neither absolute, relative nor relational in itself, but can become one or all simultaneously depending on the circumstances" (Harvey 2006: 125, cited in Garretsen & Martin 2010). Garretsen & Martin (2010) and Thrift (2009) note that a common way that geographers have come to view space involves looking beyond the absolute notions in favour of the relational conceptions. Using the backdrop of the relational approach, the dissertation adopted the relative and particularly the relational view of space as the primary[23] conceptualisation for the analysis of forces that drive the location and mix of airport-centric developments. Once again, this implied that the analyses could not be restricted to their immediate geographical surrounds, the cities and countries that airport-centric firms are located within, but the scope of analyses would be directed by the extent of functional and structural economic linkages. The conception of space adopted in the study is encapsulated well by, inter alios, Massey (1999a; 2005). As highlighted earlier, the author argues that space is not a closed system. Rather, it is open and continuously in the process of being made through accidental or planned relationships.

[23] The qualification 'primary' is used here to show that although the dissertation hinged upon the relative and relational understanding of space, the absolute conception was not completely discarded and therefore had to be included in the investigations of the dissertation. For instance, the absolute conception of space was used to focus the dissertation's levels of analysis in chapter one.

3.1.2 Proximity

The understanding of the relative and relational space (in as far as it relates to forces that drive the location and mix of airport-centric developments) cannot be fully achieved without the associated vague concept of distance. To emphasise the importance of distance, Watson (1955), as quoted by Garner (1967), goes as far as regarding geography as a discipline in distance. Nystuen (1996) who regards distance as a fundamental concept asserts that it has varying properties that impact on the understanding of geographical problems, that is, forces that drive the location and mix of airport-centric developments in the context of the dissertation. [24] Geyer (2002) adds that depending on circumstances, 'distance' can be assigned different meanings. With the analysis of economic, structural and functional linkages, the concept of distance can be equated to the notion of proximity.[25] Similarly, proximity has different connotations (van Geenhuizen & Nijkamp 2007), whereby a distinction can be made between geographical, organisational and institutional proximity (Boschma 2005). These various forms of proximity are discussed below, followed by the adoption of a conception that is appropriate for the analyses of spatial economic attributes of airport-centric developments.

The notion of geographical proximity is the most commonly used by human geographers, and denotes the physical distance between actors (firms in the context of the dissertation), characterised by standard measurements such as metres and kilometres. Olsson (1965) indicates that interaction and connectivity in spatial context (that is, absolute space) include movement between points separated by certain physical distances, or put another way, the overcoming of those distances. In the analysis of airport-centric developments, geographical proximity would imply putting emphasis on geographical distances between firms that have linkages with each other. Similar to absolute space, sole reliance on geographical proximity would yield a partial picture of forces that drive the location and mix of airport-centric developments. It should be noted that geographical distance might be necessary, but is not a prerequisite for economic linkages, and organisational clustering. As such, the farness and nearness of firms is not solely influenced by geographical distance. Using Shields' (1992) dualism of farness and nearness, firms that are close to each other geographically might not necessarily be economically proximate. This understanding questions Tobler's (1970) first law of geography that everything

[24] It should be noted that the remarks of Watson (1955) and Nystuen (1996) were made in relation to a particular view of geography of spatial science, which is discussed later in the chapter. As regards different properties of distance, Nystuen (1996) notes that, on the one hand, distance may be understood in terms of metrics; and on the other hand, distances between objects may, for instance, be understood as nearest, next nearest, far, without reference to metric units.

[25] While the dissertation equated distance with proximity, other scholars regard them as duality. For instance, Crevoisier (1996) argues that distance is a separating force, and proximity a linking force.

is related to everything else, but geographically near things are more related than distant ones. Hence, though not disregarding the relevancy of geographical distance, the analysis of forces that drive the location and mix of airport-centric development should not be limited to the influence of geographical proximity.

Using the classification of objective and subjective distance (see Geyer 2002), geographical proximity above can be regarded as objective, given that due to its reliance on metrics, it is construed similarly by different people. Alternative conceptions of proximity to follow can be regarded as subjective, since they are not interpreted in the same manner by various people. The second conception, of organisational proximity, goes beyond geography as it refers to the closeness of economic actors in organisational terms. Two categories of organisational proximity are identified. On the one hand, organisational proximity covers the extent to which actors share the same space of relations (that is, the way interaction and coordination between actors is organised) and not restricted by geographical distance. On the other, organisational proximity incorporates the extent to which actors share the same knowledge space, whereby a distinction is made between inter-organisational and intra-organisational relations. Given these two categories, organisational proximity denotes interdependencies within and between firms connected by relationships of economic dependence or interdependence. By implication, organisational proximity cannot be contained within (or restricted to) the absolute space (Boschma 2005) and, as highlighted earlier, it cannot be restricted by physical distance between the firms. This conception of proximity blends well with the notion of globalisation and implies analysing forces that drive the location and mix of airport-centric firms without limiting the investigations to linkages existent within geographically proximate areas. This understanding was particularly important towards addressing the third objective of the study regarding the airport-centric firms' linkages that extend beyond the country.

Thirdly, the notion of social proximity is based upon the premise that economic relations are embedded in a social context, whereby social relations influence economic operations and therefore affect economic linkages. Social proximity is understood in terms of the socially embedded relations between economic agents at the micro-level. Relations are socially embedded when they involve trust based on friendship, kinship and experience of working together, for instance. The understanding of social proximity excludes situations in which economic actors share sets of values, such as ethnic and religious values. Such can be regarded as cultural proximity, and is associated with the notion of institutional proximity (Boschma 2005) discussed below.

Whereas social proximity is defined in terms of socially embedded relations between economic actors at the micro-level, institutional proximity is associated with the institutional framework at the macro-level. This understanding is similar to North's (1990, 1996) distinction between the institutional environment at the macro-level (involving norms and values of conduct) and institutional arrangements at the micro-level, where the norms and values are embodied in specific relations. This latter aspect is part of the organisational and social proximity outlined above. As such, the social, organisational and institutional proximity may be closely interconnected, because the ways intra-organisational and inter-organisational relations are governed are embedded in institutional arrangements (Boschma 2005).

From the foregoing discussion of the different views of proximity, it is argued that for comprehensive analyses of economic systems and functional and structural linkages, it would be insufficient to understand distance and proximity only within a geographical dimension (Boschma 2005), given the dissertation's relational orientation. The dissertation therefore took a position that the analyses of forces that drive the location and mix of airport-centric developments be not restricted to geographical proximity, but other forms of proximity (specifically organisational) also be factored in the investigations. As such, the dissertation adopted organisational proximity as primary conception to analysing the spatial economic attributes of airport-centric developments. As with absolute space, it is noted that the influence of geographical proximity cannot be disregarded completely, as it is useful in understanding a spatially-based dimension of linkages and spatial clustering (refer to Chapter One, Section 1.2).

At this point, it is important to note a word of caution by Sayer (1985b) as regards the misconceptions about the significance of space, distance and proximity. A primary misconception is that as a result of the reduced transport costs and travel times, location is mistakenly considered unimportant. However, geographical proximity to markets in order to ensure good access is still important, especially for the sale of certain goods (Sayer 1985b). Similarly, with the digitisation of economic transactions, the deliveries of the products purchased still happen in physical space (Geyer 2007) that can be tracked by coordinates. The delivery of distance-sensitive products (Karlsson 2008) also relies on physical proximity between the source and destination. This reiterates the point that despite the dissertation's orientation towards relational space and organisational proximity, the influence of geography was not dismissed in the analyses of forces that drive the location and mix of airport-centric developments.

3.1.3 Scale

With the foregoing discussion, Howitt (1998) and McMaster & Sheppard (2004) regard scale as one of human geography's fundamental concepts, which according to Howitt (1998) has been less scrutinised compared to the concepts of space and distance. Sheppard (2002) notes that human geographers predominantly regard scale as a division of spatial organisation, differentiated by the notions such as urban, regional, national and global scales. According to Howitt (1998), there are three facets of scale in geography: scale as size, level and relation: the latter conception is underemphasised in the existing literature. This relational conception is based upon the premise that scale should be expressed relationally than hierarchically. According to this view, in addition to aspects of size and level, scale should be understood as also having an important aspect of relation. Scale is therefore understood as a factor in the construction of geographical totalities, rather than simply being a product of geographical relations (Howitt 1998). Bremner (2001) adds that the traditional notions of geographical scale as a fixed, bounded, and pre-given container are being replaced by emphasis on process. Given the relational position adopted towards conceptualising forces that drive the location and mix of airport-centric developments, the dissertation took a view that the conception of scale be not limited to scale and size, but should also consider the elements of scale as a relation.

3.1.4 Firm

The missing element thus far in the discussion of space, proximity and scale is the micro unit of analysis, the 'firm', which has been mentioned in passing above, and constituted an important part of the study in light of the concept of airport-centric 'firm'. Analyses of forces that drive the location and mix of airport-centric developments would be directionless without a clear understanding of the firm. As noted by Coase (1937), since there is trend towards starting analysis with the individual firms and not the industry, it is important that the word 'firm' is defined carefully. Despite being frequently mentioned in human geographical studies, the 'firm' remains a vague entity that is not clearly defined (Maskell 2001; Taylor & Asheim 2001). The concept is normally associated with various labels of transnational, headquarter, branch, subcontractor, without a clear interpretation. In contributing towards a better understanding of the firm in human geography, Taylor & Asheim (2001) categorise the perspectives on the conception of the firm into two sets: the rationalist and the socio-economic. These perspectives are discussed below, followed by clarification of the conceptualisation adopted in the dissertation.

The rationalist perspectives of the firm are encapsulated in the classical and neo-classical normative economics. Given the lack of focus on the structural workings of the firm, it is essentially reduced to the so-called black box, a pre-existing entity within which rational choices are made on the allocation of resources. In this conception, the firm's actions are rational and based on the availability of perfect information (Taylor & Asheim 2001). The firm converts price information from the market into the output without indication of the processes within and between firms. Considerations such as firms' strategies, managerial policies, organisational arrangements, networks and linkages are not accommodated in this conception (Maskell 2001). This limited understanding of the firm is reminiscent of what Richardson (1972) refers to as a misleading account of firms being islands of planned coordination in a sea of market relations. Due to a relational approach of the study, such an understanding would yield little insights on the linkages that characterise airport-centric firms.

The behavioural conception of the firm tampers with the foregoing rationalist views with notions of bounded rationality, and addresses issues of information or knowledge flows in the shaping of interactions. This conception came into existence as a challenge to the rational-choice assumptions that underlie the normative understanding of the firm. The behavioural approach is based on the view that there are differences between the processes of decision-making according to the rational-choice theory and the processes of decision-making in actual firms: maximising based on perfect knowledge in the former and satisficing involving imperfect information and uncertainty in the latter (Taylor & Asheim 2001).

Primarily as a reaction to the rationalist conceptualisation of the firm, alternative and interrelated views of what constitutes the firm have emerged and are currently developing: which can be organised under an umbrella of 'socio-economic' perspectives (Taylor & Asheim 2001). Taylor & Asheim (2001) further categorise these perspectives into a number of interrelated groups of views of the firm: institutionalist; networks and embeddedness; resource-based; relational; and temporary coalitions.

The institutionalist conception is based upon the premise that the function of the firm is not simply to maximise transactions while minimising costs, but to provide an institutional framework within which the very calculus of output-costs relationships is played out (Taylor & Asheim 2001). The institutionalist conception is extended by the networks and embeddedness view of the firm, whereby firms are seen as involved in networks of reciprocity, interdependence, and unequal power relations, which can be intra-firm and/or inter-firm (see, for

instance, Taylor 1996). The structural embeddedness relates to the manner in which the relationships of firms are articulated and incorporated into networks that act as templates channelling economic transactions. In this understanding, it is not only the individual firms that matter in the economic system, but the system of firms as inter-firm networks, in both local and global systems. The embeddedness perspective overlaps with the resource-based view of the firm (Foss 1997, cited in Taylor & Asheim 2001). Firms survive and thrive not because of external influences in the form of market size or industry characteristics, but because of the factors within the firm. The firm therefore is a generator and processor of knowledge, and its learning capabilities are embedded in the relations of its organisation (Taylor & Asheim 2001). A different perspective has been developing, which views the firm as relational. In this conceptualisation, the firm is an organisational unit that brings together diverse social relations in which actors are embedded. These may be personal, family or social ties (Yeung 2000). The final conceptualisation of the firm in the socio-economic perspective is the temporary coalitions' view of the firm, which is concerned primarily with agency of the groups rather than of individuals (Taylor & Asheim 2001).

For the conceptualisation and analyses of forces that drive the location and mix of airport-centric developments, the dissertation adopted the socio-economic perspective of the firm. It is not easy to isolate one view, but the networks and embededdness view is more aligned with the relational approach, given its focus on the networks and linkages that channel economic operations. Although the behavioural perspective also deals with flows, it is preoccupied with the use of imperfect information, and puts less focus on networks and linkages.

3.1.5 Pattern

The final concept that required clarification in the dissertation is 'pattern' of linkages, agglomeration and clustering of airport-centric firms, which arises from the interaction of the foregoing concepts of space, distance/proximity and scale. In human geography, pattern typically involves the specification of the relations of phenomena to summarise their distribution in absolute space. The main method of describing pattern is by reference to a shape approximated by the distribution of phenomena (Coffey 1981). Hudson & Fowler (1972) caution that pattern should not be confused with shape as they each represent separate geometrical or geographical properties. The types of geographical pattern include points, lines, and areas, and the measures of point patterns, nearest neighbour analysis and quadrant sampling are the most commonly employed. The former measure involves the calculation of the straight line distances separating each point and its nearest neighbour, and the comparison of these distances with those which

might be expected if the points were distributed in a random manner within the same area (Coffey 1981). Given the relational conception of space, understanding that goes beyond physical space, and analyses that are not restricted to scale as a level or hierarchy, the dissertation is of the position that forces that drive the location and mix of airport-centric developments are not necessarily reflected by an observable pattern. The pattern lies in the in-depth analyses of the linkages and clustering which are not limited to geographical space, and which might therefore not be observable and measured in metrics. This essentially meant that the typical geographical methods of analysis mentioned previously, such as the nearest neighbour, would not be useful in analysing the spatial economic attributes of airport-centric developments. As such, these methods did not form key part of Chapter Six of the study, as the nearest neighbour geographically is not necessarily the nearest neighbour economically.

3.2 IDENTIFYING AN EXISTING RELATIONAL THEORETICAL FRAMEWORK

On the background of the discussion above, this section evaluates a group of location theories to determine their appropriateness to the analyses of airport-centric developments. Rather than describing the theories comprehensively (as it has been done in multitudes of human geography studies and textbooks), the discussion below is guided strictly by the theories' relevance to the analyses of airport-centric firms and particularly their interpretation of the concepts of space, proximity, scale, firm and pattern. Given the dissertation's endeavour to analyse forces that drive the location and mix of airport-centric developments, the study was regarded as befitting human geography's locational school,[26] hence the discussion of location theory in this section. Location theory[27] proposes a framework to analyse the location of economic activities (Aoyama, Murphy

[26] The discipline of human geography has over time been interpreted in multiple ways (Haggett 1965): a diversity reflected in the saying that *geography is what geographers do*. The traditional interpretation was based upon the premise that geography's raison d'etre is to provide a description and interpretation of the earth's surface, with Hartshorne as the main exponent. In terms of this approach, the purpose of geographical scholarship is synthesis, an integration of various characteristics to provide a description of a region, which is a place identifiable by its unique combination of these characteristics (Johnston 1991). This conception was considered by most geographers around the 1950s to be the essence of the discipline (Soja 1989), and as Peet (1998) notes, the dominance of regionalisation extended from 1939 to 1953.
There are deviations from this traditional perspective, which can be categorised into three groups: one, the landscape school, which regards geography as the science of the earth's surface; two, the ecological school, which understands geography as the study of the relationship between man and the natural environment. This 'man/land' tradition sought associations between physical and human geographies on the visible landscape, either through the influences of the environment on behaviour and culture or through 'man's role in changing the earth' (Thomas 1956, cited in Soja 1989); and three, the locational school, which regards geography as the study of the location of phenomena (Haggett 1965). This conception defines the fields of economic, political, social, cultural, behavioural and psychological geography (Soja 1989). According to Soja (1989), the last conception of historical geography covers all other approaches by tracing the human geographies of the past as a temporal sequencing of areal differentiation and informed by the intellectual legitimacy and power of the historical imagination.

[27] The terms 'location' theory and 'locational' theory are used synonymously in the literature. Krumme (1970) indicates that location theory has been the umbrella for various theoretical directions, particularly in the fields of economic geography and spatial economics.

& Hanson 2011; Geyer 2002). It describes and explains why and where the elements of the economic systems locate, and how they are linked (Dicken & Llyod 1990; Ottaviano & Thisse 2005). For Beckmann (1968), location theory introduces the dimensions of 'where,' 'what,' 'for whom,' 'how,' and 'when,' to the analyses of economic systems. It should be noted that in the dissertation, the location theory's ability to address the questions of 'why' and 'how' was a key explanatory element required towards achieving the research objectives. This brief account shows the general relevance of location theory to the analyses of forces that drive the location and mix of airport-centric developments.

A discussion of location theories (to follow) would be incomplete without an overview of the term 'model', which is typically incorrectly used interchangeably with 'theory' (Pred 1967). The confusion of the two results in geographers equating theory to quantitative analysis. Location theory is not statistical analyses, as statistical analyses can where relevant, be used to develop or test a theory (Pred 1967). According to Harvey (1967) a model is the representation of a theory. 'Model' can be employed in three distinct ways: when used as a noun, it denotes a representation; as an adjective, it implies ideal; and in its use as a verb, to model means to demonstrate. Combining these three elements, a model is an idealised representation of reality in order to demonstrate its properties (Haggett 1965). A further distinction can be made between normative and descriptive models. The former describes what ought to be under certain conditions, while the latter focuses on the description of reality as it is observed (Haggett & Chorley 1967; Harvey 1966). The distinction between theory and model is discussed further in Chapter Seven, with contribution towards a theory and descriptive model of airport-centric developments.

In the literature, there are many classifications of location theories and associated models,[28] and the dissertation adopted a four-pronged classification. The antecedent group is classical[29] location theories of Von Thünen, Alfred Weber, Walter Christaller, August Lösch, Edgar Hoover

[28] The categories of the pioneers of location theory in the literature include the following: one, Von Thünen, Alfred Weber, Walter Christaller and August Lösch (Wilson 1980, Fujita, Krugman & Venables 2001; Essletzbichler 2011). Two, Von Thünen, Christaller and Zipf (Haggett 1967). Notably, Weber and Lösch are not included in Haggett's analysis. Three, Von Thünen, Weber, Predohl, Weigmann, Palander, Launhardt, and Lösch (Isard 1956). Four, with specific reference to locational analysis, the three schools are regarded as: the German location school; American spatial science; and geographical economics (Barnes 2003). Capello (2009) argues that locational theories differ according to hypotheses on the spatial structure of demand and supply which reflect the aims that the theories pursue. One, there are models whose aim is to interpret the location choices of firms. Two, there are theories which seek to identify production areas, that is, they seek to identify the economic logic whereby a physical territory is allocated among alternative types of production. Three, location theory analyses the economic and spatial mechanisms that regulate the size of agglomerations, their functional specialisation and their distribution.

[29] The term 'classical' is used here to denote that these theories represent the earliest efforts towards the development of location theory (Smith, Taaffe & King 1968).

and Hotelling, to name but a few. The second theory is regional science pioneered by Walter Isard; and the third is growth pole theory of Francois Perroux. As discussed further in Section 3.2.3, because the growth pole theory emerged as a reaction to the classical location theory (Lasuen 1969), it arguably falls within the umbrella of location theory. The fourth is the new economic geography spearheaded by Paul Krugman. Each of these theories would have some level of relevancy to the analyses of spatial economic attributes of airport-centric developments; but the most appropriate one is determined by its interpretation of the concepts of space, proximity, firm, scale and pattern. These groups of location theory are evaluated in the four sections below.

3.2.1 Classical location theory

The roots of location theory are attributed to the beginning of what was known as the German location school, which commenced with Von Thünen's work in 1826 (Aoyama, Murphy & Hanson 2011; Barnes 2003; Blaug 1979; Dickinson 1969; Fujita 2012; Haggett 1965; Isard 1956; Samuelson 1983). Any discussion of location theory would therefore be incomplete without a mention of Von Thünen; who analysed the mechanics of agglomeration and the formation of cities based upon economic interaction between the city as a market and the surrounding providers of resources (Von Thünen 1966).

While Von Thünen is hailed as the father of location theory generally, Alfred Weber is regarded as the father of the theory of industrial location (Aoyama, Murphy & Hanson 2011; Essletzbichler 2011; Isard 1956). Weber (1929) analysed factors that cause industrial activity to move from one place to another, by examining the role of among others the market and agglomeration economies on the location of industries. The theory would be relevant in understanding why manufacturing firms concentrate around airports, as evident in the trends uncovered in Chapter Two of the dissertation. However, the work of Weber has the following limitations as regards the interpretation of the key concepts. Firstly, it is concerned with the influence of (geographical) distance on the location of activities (Haggett 1965; Tidswell 1978). Secondly, it considers the location of industry at fixed points in space (McCann 2002) reflecting the absolute conception of space. Thirdly, it regards firms as rational economic actors that work towards the minimisation of movement and thus transportation costs, given that he believed the goal of entrepreneurs is to minimise costs (Chapman & Walker 1987; Essletzbichler 2011; Haggett 1965; Harrington & Warf 1995). Given the limited interpretation of space, proximity and firm, the theory of Weber was not appropriate to be the main framework for analysing the location and mix of airport-centric developments.

With the foregoing discussion of the theories of Von Thünen and Weber as example, Ullman (1941) notes that Bobeck[30] expressed concern that (German) geographical scholarship was focused mostly on the internal arrangement of cities, with the pattern of land use within urban limits, and not on the question of the location of cities. In a way addressing Bobeck's concern (but not necessarily responding to him), and building on the work of Weber and Von Thünen, Walter Christaller formulated the central place theory in 1933 to explain the varying sizes, number and distribution of towns (Christaller 1966, 1972), and was extended by Lösch (1954). With particular reference to the central place theory, Richardson (1973) notes that a main limitation of models that build up the spatial structure from nothing is that they result in a spatial distribution of economic activity that bears little relation to reality. To remedy this shortcoming, Richardson (1973) introduces the concept of locational constants, which are fixed locations that act as a focus for the agglomeration of economic activity. In the context of the dissertation, airports are such points which would have a role in shaping the spatial structure of the economy. Locational constants are usually responsible for the establishment of 'non-central' places (see Geyer 2007); and as such, the airport-centric developments (located around airports as locational constants) can be regarded as non-central places.

According to Isard (1969), one of the problems which long characterised location theorists is the question of interdependent location decisions. The notion of interdependent location decision would potentially be useful in analysing the role of airport as a force that pulls firms, given its role as a collection and delivery location for freight. Smith (1971) notes that the locational interdependence school includes, among others, Hoover (1948) and Hotelling (1929). Hoover (1948) argues that the economy of freight transfer favours locations at the material sources and markets. Regardless of this preference, Hoover argues that the intermediate points have special transfer advantages when they are transshipment points or junctions and the processing establishment draws from several sources or sells to several markets. The notion of transshipment point is similar to what Palander (1935) refererred to as transport point connected to other transport points by transport lines (see Smith 1971). Given the airfreight transportation role of airports, Hoover's work can be used to understand airports as locations that accommodate transshipment firms transporting freight to and from the airport, and also between a given airport and other transshipment locations. However, the usefulness of Hoover's work as the main theoretical framework in the dissertation needed to be determined by its interpretation of space, firm, proximity, scale and pattern. In Hoover's work, firms are rational economic actors that seek

[30] Bobeck H 1927. Grundfragen der Stadt Geographie. *Geographischer Anzeiger* 28: 213-224.

to reduce costs, by locating at a point with better access to materials, or moving to a point with better access to markets. Space in Hoover's work is therefore understood in its absolute form in that the material sources, markets and intermediate points are absolute locations and distances between them can be measured in metric units that are deducible to transfer costs. In this regard, in attempts to reduce transfer costs, the conception is limited to geographical proximity. Although relevant in understanding airports as transhipment locations, the theory was not considered as a main framework for analysing airport-centric developments due to its limited understanding of space, firm and proximity.

Hotelling (1929) developed an illustration that involves two competitive sellers of a homogenous product, each locating in a market uniformly distributed along a line, where location costs are assumed to be zero. In Hotelling's work, space is understood to be a line on which two firms or concentration of firms develop, at symmetrically placed locations which are equidistant from the end-points of the line. Space along the line is homogenous, meaning that the two locations of interest are identical in both site and situation characteristics (Sheppard 2000). To purchase supplies in bulk, the firms must locate at some single delivery location, which could be airports and surrounds in the context of the dissertation. Alternatively, one or both of the firms could travel from its location to the delivery point (airport) to pick up the supplies. However, the added cost of loading and transporting freight to a separate location (no matter how close it is to the airport, for instance), the customers lost during this time, and the general inconvenience outweigh the savings from quantity purchased (Isard 1969), resulting in the concentration of firms around the airport. This situation reflects Hotelling's reliance on geographical proximity that influences the location decisions of firms as rational economic actors that make decisions exclusively reduce costs and accordingly augment profits. Notwithstanding its relevance, Hotelling's work was not regarded as the main framework for the analyses of airport-centric developments because of its limited understanding of space, proximity and firm.

3.2.2 Regional science

Regional science attempted to synthesise the classical location theories of among others Von Thünen (1966), Weber (1929), Hoover (1948) and Lösch (1954) discussed above, and also formulated techniques of analysis (Isard 1960; 1975), which could be applied to various theoretical fields. As a method of analysis, regional science was closely associated with spatial science, which was based upon the mathematical and statistical form of enquiry (Barnes 2003; Paterson 1984), and directed towards spatial analysis, the modelling of spatial systems, and the geometric conceptualisation of the spatial structure. For geography to succeed in the search for

generalisations and scientific laws, the proponents of spatial science believed that a solution lies in the geometric conception of space (Barnes & Gregory 1997). Given its reliance on geometry, the conceptualisation of geography as spatial science was based upon an absolute view of space (Unwin 1992), and physical proximity that could be reduced to coordinates in space and distances measured in metric units.

As noted earlier, the aim of regional science was to develop a general theory of location and space-economy (Isard 1956) at a scale of a region. This reflected a limited understanding of scale as hierarchy. Given the dissatisfaction with the economists approach to understanding the economic system as a "wonderland of no spatial dimensions" (Isard 1956: 25), the intention was to formulate a hybrid discipline that combines economics with geography, while relating to the disciplines of political science, sociology and city and regional planning (Isard & Reiner 1966). Given its concern with space, the central objective of regional science was thus to rewrite neoclassical competitive equilibrium theory in terms of absolute spatial coordinates so that all demands, supplies and price variables could be expressed as an explicit function of location (Scott 2000).

Regional science brought together the various models of patterns and flows (Johnston 2009), and employed gravity models derived from the Newtonian physics (Isard 1971), making it possible to describe the distribution of activities in terms of potential of the particular mass. Such a potential measure represents the total influence at each point in space of all mass components, as the influence is lessened by a change in geographical distance. The values of such potentials at each location indicate its proximity to the system of locations, the interaction between the masses at a pair of points is inversely proportional to the distance. Isard (1971) notes that the experience of the use of gravity models was unsatisfactory, and as a result he began the use of relativity physics, reflecting a revised conception from absolute space towards relative space. Relational space was however not incorporated into regional science, making it less useful to the analyses of airport-centric firms.

In discussing the locational framework, Isard & Reiner (1966) note that points are seen to define location in bounded space. Although Isard & Reiner (1966) are of the view that distances can be expressed in many ways (such as physical, time and cost), they argue the various expressions can be translated into each other. This by implication means that all forms of distance can be linked back to geographical distance, and thus geographical proximity. As regards the conceptualisation of the firm, two approaches of regional science are noted, namely optimising models and non-

optimising models. The former are a dominant view and form part of the most successfully explored elements of regional science. As far as the optimising models are concerned, in line with traditional economies, the entrepreneur is seen as a decision-maker who wants to maximise returns over costs, where elements of both revenue and cost vary over space. These calculations are made for a known and fixed time period over which conditions do not change. The entrepreneur possesses complete information, and, in the formal model of the location decisions, he knows how to use it. The location decision essentially involves a calculated substitution among transportation and other costs (Isard & Reiner 1966). The conceptual legacy of spatial analysis and regional science ensured that geography tended to under-theorise the firm, which was often assumed to be an atomistic single plant entity (Leyshon 2011). Scott (2000) further argues that geographers' impoverished view of the role that firms play within processes of economic change was because of the strong influence that both spatial science and regional science exerted over the discipline.

Isard & Reiner (1966) reflect an alternative understanding of the firm by noting that the optimising models do not correctly depict the decision-making processes of entrepreneurs. The authors acknowledge that the entrepreneur operates under constraints of imperfect knowledge; and also reacts to non-economic factors. Further, the behaviour of one actor is seen to affect all other actors in the region, given that each actor has relationships with others inside and outside the region. The concept of interdependence stresses not only the economic interrelations of man, firms, and organisations over space, but also individuals in the social and political roles interacting with each other and with institutions (Isard & Reiner 1966). This consideration that reflects a relational interpretation of the firm has similarities with Pred's (1967) behavioural matrix. Pred (1967) argues that any pattern of land use and spatial interaction is an outcome of individual decisions made at the personal, group and/or firm level.

3.2.3 Growth pole theory

As noted by Lasuen (1969), the growth pole theory emerged as a reaction to the classical location theory discussed in Section 3.2.1 above. Francois Perroux reacted against the earlier work due to the predecessors' limited focus on explaining how economic activities are organised over the space. He was of the opinion that geography had been cast as a passive rigid container which conditions the economic forces. In Perroux's view, geography does not constrain the economic forces (Lasuen 1969) and therefore his analyses went beyond the absolute conception of space. Growth pole theory was formulated to describe and explain that economic development does not occur uniformly across space but tends to be concentrated in certain parts (Keeble 1967)

which could either be central places or non-central places (see Section 3.2.1 above). In the context of forces that drive the location and mix of airport-centric developments, the theory appears relevant to generally describe and explain why firms locate on and around airports, as opposed to other locations. The relevancy of this theory is assessed below on its interpretation of space, proximity, firm, scale and pattern.

In the literature, the term growth pole is used in various ways, there being almost as many meanings as authors writing about it (Darwent 1969). Perroux (1988) argues that the growth pole cannot be defined in isolation from the general economic theory that serves as its framework. To situate this general theory, Higgins (1988) compares Perroux's thoughts to those of other prominent 20th century economists, John Maynard Keynes and Josef Schumpeter. Higgins (1988) points out that Perroux's theory has minimal resemblance to that of Keynes, which was based on the neoclassical assumption of harmony of different social groups in a society. The assumption of Keynes was that once the economy is managed, the market brings welfare for all groups. Rather, Perroux was in general agreement with, and in a way influenced by Schumpeter (Lasuen 1973; Pred & Törnqvist 1973; Buttler 1975; Higgins 1988) and emphasised linkages as driving force in the economy (Higgins 1988). Schumpeter held a view that entrepreneurial ability does not occur evenly in all industries, and development is not spread evenly among regions (Leahy & McKee 1972). He also held a view that innovations do not appear independently of one another, but in clusters (Wolfson 1958) emphasising the importance of clustering in the economy.

Like Schumpeter, Perroux discarded the general equilibrium theory of the Walsarian type,[31] which is based on the notion that the law of price places and displaces the factors of production. In this context of equilibrium, the economic agents have no power to change the law of price (Perroux 1988). Rather, Perroux's economic thought was based on the theory of active units, which assumes that the economic actors have the capacity to change their environment. The theory of poles corresponds with the theory of economic spaces (discussed later in this section), which is part of the theory of active units. The active units create their own abstract spaces of operation, and it is possible to have elements that exercise propulsive effects that, in certain conditions, result in the development of the broader economy. The economic entity is therefore comprised of propelling units and propelled units, of active agents and less active (passive) agents. In this interpretation, the economic effects are exerted between simple units (firms) or between complex units (organised groups of firms), which expands the understanding from the growth-inducing units to the growth-inducing firms (Perroux 1988).

[31] Proposed by the French mathematical economist Léon Walras.

Perroux's original concept of the growth pole must be viewed against the background of his concepts regarding the various forms of space (Campbell 1974). It is therefore pertinent to discuss Perroux's concept of economic spaces, which he considered appropriate for analysing the workings of the economy (Higgins 1983). Perroux (1950a) made a distinction between what he called geonomic or banal space and economic space. The so-called banal space of the firm is that in which the material means and manpower of the firm are located, but Perroux held a view that the operations of the economy cannot be contained in a geographical location. The focus of Perroux was therefore on economic spaces. Reflecting a relational understanding of space, economic spaces are defined by the economic relations between economic actors, regardless of their geographical location, and these are categorised into three groups: (1) economic space defined by a plan; (2) economic space as a field of forces; and (3) economic space as a homogenous aggregate (Perroux 1950a). Within an economic space, polarisation is measured with respect to the intensity of inter-firm or inter-industry linkages (Parr 1999).

The plan of a firm refers to the relations which exist between the firm and the suppliers of input as well as the buyers of the firm's output. In this situation, the economic distance or proximity is measured in relational and monetary terms, implying that the economic space and distance escape geographical boundaries and distance. In a second consideration, the firm has a space defined as a field of forces, whereby the economic space consists of poles (or centres or foci) to which centrifugal forces emanate and to which centripetal forces are attracted. Each centre acts as a point of attraction and repulsion, and the firm attracts economic elements into the space of its plan or it removes them. Although the firm can be located in a particular area, its economic zone of influence defies geographical boundaries. The firm in a third aspect has a space defined as homogenous aggregate. The firm in this instance has, or has not, a structure more or less homogenous with those of other firms which are its neighbours geographically or economically. These firms are in the same economic space, regardless of their physical location (Perroux 1950a).

Having located Perroux's general theory above, which goes beyond the limits of geography, the discussion now shifts to the growth pole theory itself. According to Polenske (1988), albeit Perroux mentioned the word 'pole' in 1950 as evident in the discussion of space as a field of forces, he only discussed the concept explicitly in 1955. Growth pole doctrine is a theory of polarisation (Higgins 1988). According to Perroux (1988:29), "growth pole is a set that has the capacity to induce the growth of another set" informed by the discussion of active units discussed above. Perroux coined the concept of growth poles to explain the processes of

economic growth, and for him, the growth pole theory was not a basis for urban and regional planning but an explanation of how the market works. As presented by Perroux, the growth pole theory was too abstract to be used as a basis of planning (Higgins 1983) as was with questionable success done by the scholars such as Boudeville (1966).

As noted earlier, Perroux's theory of growth poles was one aspect of his struggle with the neo-classical economics which asserted that the market brings harmony in the distribution of economic activities in space: a pareto optimum of spatial equilibrium (Higgins 1983).[32] According to Higgins (1983), Perroux's main concern was to show that the operation of market forces does not guarantee a harmonious equilibrium in space. Perroux (1955) asserted that the tendency of the economic activity is towards polarisation, dominance and dependence (Higgins 1983; Higgins & Savoie 1997). As evident in the discussion of economic spaces, in Perroux's terms, growth poles are industries or firms, not geographic locations (Dicken & Lloyd 1990). In consequence, the growth pole theory serves to explain the conditions for the emergence of spatially polarised growth.

According to Higgins (1988), the propulsive elements tend to be clustered in particular spaces, and a constellation of propulsive elements is a growth pole. The growth poles generate spread effects, but there is no telling where the effects will be felt (Higgins 1988). Growth poles are therefore concentrations in space of propulsive industries, generating effects in the form of field of forces to a global economic space (Higgins 1988).

Buttler (1975) adds that growth pole denotes a group of industries strongly related through their input-output linkages and organised around a leading/propulsive industry. A leading industry has the following characteristics: (1) it is relatively large; (2) it is fast growing; (3) it has a high intensity of input-output linkages with other industries or firms; and (4) it is innovative (Boudeville 1966; Buttler 1975; Dicken & Lloyd 1990). Although Perroux's analyses are based on economic space, an indication that a pole grows faster when its elements are established in geographical proximity is evident in Perroux (1955), cited in Buttler (1975), where he notes that the high intensification of economic activities is recorded from poles which are geographically clustered. This shows that growth pole theory appreciates the relevancy of geographical proximity.

[32] Pareto optimality denotes a situation where improving ones welfare does not impact on other individuals.

3.2.4 New economic geography

The new economic geography (NEG) draws from the classical location theories (Section 3.2.1 above) and regional science (Section 3.2.2). For instance, one of the exponents of the NEG, Fujita (2012), indicates that the NEG is the first to unify the ideas of Von Thünen by utilising economic modelling. The NEG also draws from the growth pole theory (Section 3.2.3) as growth poles (either central places or non-central places) operate under agglomeration principles which are strongly related to the NEG. Subject to its interpretation of key concepts, the NEG could have some relevancy in analysing centripetal and centrifugal forces that result in the concentration of firms on and around airports.

The NEG's concern is to explain the emergence of a core-periphery structure at a regional, national or international scale. The understanding of scale is limited to the aforementioned partitioned levels, as according to Fujita & Mori (2005), the NEG abstracts from the internal working of agglomeration as a city is represented by a point in space. The NEG explains the formation of agglomeration of economic activities in space. It analyses the centripetal forces that pull economic activity together, and the centrifugal forces that push it apart, and explains how the geographical structure of an economy is shaped by the tension between the two (Fujita & Mori 2005; Krugman 1991; 1998; Fujita & Krugman 1995). According to Neary (2001), the key contribution of the NEG is a framework in which standard building blocks of economics (especially rational decision-making and simple general equilibrium models) are used to model the trade-off between the dispersal and agglomeration forces.

There are four key concepts that are associated with the NEG. The first is the general equilibrium modelling of the entire spatial economy. The second is increasing returns at the level of individual producer: increasing returns that lead to the market structure characterised by imperfect competition. The third is transport costs, and fourthly, the movement of production factors and consumers is considered a prerequisite for agglomeration. The NEG is characterised by what its proponents herald as unique modelling strategies associated with the slogan 'Dixit-Stiglitz, iceberg, evolution and the computer'. The iceberg transport-cost function was introduced by Samuelson (1954), based on the assumption that a portion of a product shipped melts in transit, so that transport costs are in effect incurred in the product shipped. The NEG assumes that melting takes place at a constant rate of 1% of the cargo per 1.6 km (Krugman 1998; Fujita & Krugman 2004). This shows the NEG's dependence on geographical distance, which, as noted by Fingleton & McCann (2007), is a key variable in NEG models. The reliance on geographical distance therefore equates to a restricted understanding of physical proximity.

The NEG is arguably based upon the absolute conception of space, given that the above discussion of iceberg refers to the movement of goods between two absolute points of supply and market, hence the distance and proximity between the two is purely geographical. Corpataux & Crevoisier (2007) further outline the following points relating to the NEG's limited conception of space. Firstly, in NEG's understanding, space and time are exogenous: they operate as neutral containers which are external to economic processes, with no influence over such processes. In the models used, the point representing a city remains a point, even if the city's economy grows. In NEG models, change can only occur as a result of an exogenous shock (Corpataux & Crevoisier 2007). Plummer & Sheppard (2007) note that in the tradition of classical location theory, the NEG conceptualises space as a homogenous platform within which a set of discrete entities are equally spaced on a line, circle or plane; an understanding which abstracts from relative or relational locations. Secondly, in the NEG absolute space is taken as given, and human actions cannot alter the space and its contents. Thirdly, this container and content framework is characterised by Euclidean geometric shapes. Fourthly, space and time are objective entities, given that they exist independently of observers (Corpataux & Crevoisier 2007).

The understanding of the firm in the NEG is based on a rationalist view. Information flows, networks and interactions between workers and between firms, are excluded from NEG modelling (Storper 2011). Economic agents are understood to have ability to calculate an optimal location from a vantage point which gives them knowledge of all possible situations. According to Plummer & Sheppard (2007), spatial patterns, which constitute a general equilibrium, are derivable from these rational actions. The assumptions of free entry of firms at all locations allows no role for strategic interaction between firms, and outsourcing or cross-border mergers in response to changes in trade policy, technology, or market size are not allowed in NEG. The absence of these considerations makes the NEG less relevant to current debates on industrial location (Neary 2001), and specifically to forces that drive the location and mix of airport-centric developments (refer to Section 3.2.5 below).

3.2.5 Synthesis

This section synthesises the foregoing review of theories, by summarising their interpretation of space, proximity, firm, scale and pattern. Confirmation is then provided of the theoretical position adopted as the primary framework used in subsequent chapters to inform the analyses of forces that drive the location and mix of airport-centric developments. The classical location theory's assumption of a uniform surface implies that geographical distance and the cost of

traversing such distance are interchangeable (Gatrell 1983). Given that the purpose of the theory is to understand the impact of distance between producers and suppliers of goods and the market and consumers, classical location theory is restricted to the analyses of geographical proximity. Regional science has similarities with its predecessors in its conception of geographical proximity. As regards the NEG, the limited conception of proximity is evident in the use of the iceberg cost function that resembles the influence of physical distance and thus geographical proximity. The growth pole theory analyses are not restricted to geographical proximity, given that the linkages between firms in the same economic space are not restricted by physical distance. Thus, the theory reflects alternative forms of proximity, while notably not disregarding the potential usefulness of geographical proximity in economic linkages.

With regard to understanding the concept of space, there is similarity between the classical location theories as they all understand space in its absolute form. In these theories, the analysed attributes are understood as either absolute points in physical space or regular patterns that can be reduced to spatial coordinates. Similarly, regional science is based upon the absolute conception of space evident in the gravity models influenced by Newtonian physics, although in the later works, Isard makes reference to the aspects of relativity. The NEG, which is informed by the classical location theory and regional science, continues the tradition of relying on absolute space. The growth pole theory is based upon an alternative conception of space which is not equivalent to absolute space, but rather informed by economic space that transcends geographical boundaries. Contrary to the critique typically posed to economists for disregarding (absolute) space, growth pole theory acknowledges that absolute space is the location where the economic activities are organised, but the economic operations and linkages are not restricted to such locations.

As regards the ‘firm’, the classical location theory, regional science and NEG share a similar conception of ‘rational’ operations of the firm, whose sole motive is to reduce costs and increase profits. This rational economic behaviour generates the patterns of land use, settlements and economic centres on an absolute landscape. For NEG (and regional science), the resultant patterns constitute a general economic equilibrium (Plummer & Sheppard 2007). It must be noted, however, that overtime regional science attempted to address the limitation through the concept of firms’ interdependence. In the conceptualisation of the firm in growth pole theory, the plan of the firm and economic space as homogenous aggregate reflect a relational understanding of the firm, given that the focus is on the relations between the firm and buyers and suppliers, and relations with other firms in the same economic space. In this conception, the growth pole

theory is not restricted to understanding the attempts of the firm to minimise costs and maximise profits.

Von Thünen's and Weber's work is focused on analysing the distribution of land use within the pre-given urban limits, depicting the restricted conception of scale as a container. The work of Christaller and Lösch extended beyond urban limits and analysed the hierarchy of settlements (towns and cities) and economic nodes within a region or country, which shows a limited conception of scale as a container. Similarly, the analyses of regional science are restricted to the scale of a region. The NEG's analyses focus on the pre-given levels of national-wide or international scale. Given that the economic actions are restricted to these fixed levels, the analysis of the agglomeration within cities does not feature in NEG modelling. Growth pole theory is not based upon the notion of scale as a container. Given its relational conception, scale only exists due to the relations between economic actors and not restricted by the aspects of size or level: thus economic relations can be local or global. The understanding of local and global can be equated to Dicken (2004) who understands the two notions not as fixed scales, but as extreme points of a continuum of linkages.

From the synthesis above, it is concluded that the growth pole theory offers the most relational and relative perspective of the associated concepts of space, proximity, firm, scale and pattern. The dissertation therefore adopted the growth pole theory as the main framework for analysing forces that drive the location and mix of airport-centric developments of Cape Town and OR Tambo airports, while incorporating elements of antecedent and subsequent theories as follows. Cape Town and OR Tambo airports were understood as locational constants in the manner of Richardson (1973) making them non-central places (see Geyer 2007) that the growth poles develop around. Special characteristics of airports as locational constants is in terms of their role in transferring incoming and outgoing freight, making them transshipment locations in the manner of Hoover (1948) that function as intermediary delivery points in the style of Hotelling (1929). Towards understanding forces that influence agglomeration of firms at transshipment or interdependent locations, investigations were necessary pertaining to the forces of attraction of airports in the manner of the NEG (which incorporates elements of classical locational theory, regional science and growth pole theory). It is important to note that though the NEG incorporates some elements of all the theories discussed in this chapter, it was not regarded as a main theoretical framework in the dissertation because of its interpretation of space, proximity, firm, scale and pattern.

3.3 SUMMARY

The purpose of the chapter was to identify an existing theoretical framework that is most appropriate for conceptualising forces that drive the location and mix of Cape Town and Johannesburg airport-centric developments. As the various location theories have some relevancy, based upon the notion of globalisation, the chapter developed a relational interpretation of the concepts of space, proximity, scale, firm and pattern; all which are important in understanding agglomeration economies, linkages, clustering and propulsive economic characteristics. Against the relational interpretation of the aforementioned concepts, the chapter evaluated the classical location theories, growth pole theory, regional science and NEG. From the assessment, the growth pole theory emerged as the framework most compatible with the relational view of the key concepts. The growth pole theory was therefore adopted as a primary theoretical framework to guide the dissertation's conceptualisation towards analysing forces that drive the location and mix of airport-centric developments, while also incorporating the various elements of the antecedent and subsequent theories. The next chapter discusses the research methodology and methods adopted towards achieving the aim and objectives of the study.

4 RESEARCH METHODOLOGY AND METHODS

Towards describing and explaining forces that drive the location and mix of airport-centric developments of the Cape Town and OR Tambo airports, the previous chapter presented a relational interpretation of the concepts of space, proximity, scale, firm and pattern. The chapter adopted the growth pole theory (particularly its concepts of propulsive firm, agglomeration economies, linkages and clustering) as the main framework appropriate to guide the conceptualisation of the spatial economic attributes of the Cape Town and Johannesburg airport-centric firms. The current chapter ties up that theoretical orientation with the rest of the study by outlining the methodology and methods used in the investigations. The chapter is structured into four sections. Section 4.1 provides a motivation for using case study research, and advances reasons for focusing on the case studies of Cape Town and Johannesburg airport-centric developments. Informed by the research design outlined in Chapter One, Section 4.2 presents the research methods used for the collection of data. Section 4.3 outlines the strategy that was used to analyse the data collected. The last section summarises the chapter.

4.1 RESEARCH SETTING

4.1.1 Case study approach

The dissertation was based upon a case study approach, which is broadly defined as research in which analyses are undertaken on a phenomenon that is bounded by activity (Leedy & Ormrod 2010) as described hereunder. In the dissertation, the topic investigated was forces that drive the location and mix of airport-centric developments in South Africa, tested against the general trends of airports and surrounds reviewed in Chapter Two. Airport-centric development is a phenomenon defined by virtue of being located in the geographical proximity of airports,[33] although the forces investigated extend beyond the geographical limits. This attribute of proximity to airports made a case study approach appropriate towards addressing the objectives of the study.

[33] A definition of airport-centric developments is provided in Chapter One, Section 1.2.1. It is important to avoid contradictions between the dissertation's reliance on relational and relative conceptions of space (as outlined in Chapter Three) and physical proximity stressed here. When discussing the boundary problem, Savage & Duncan (1990) note that empirical research depends on the definition of boundaries, because without them it would be impossible to delineate a precise object of interest. The reliance on physical proximity to airports was therefore informed by the need to identify the dissertation's levels and units of analysis as described in Chapter One.

4.1.2 Rationale for the case study selection

Cape Town and Johannesburg airport-centric developments were selected as principal focus areas because of their appropriateness towards addressing the aim of the study, due to the following two main reasons. Firstly, CTIA and ORTIA are the only airports in South Africa that are geographically surrounded by 'substantial and diverse' concentrations of economic activity. In the study, substantial concentration was taken to refer to the physical extent covered by the development in the terminals, and particularly on the landside and around the airports. The height of buildings was not factored in the consideration of substantial concentration of economic activities, given that airports and surrounds are typically characterised by low-rise buildings due to height and obstacle limitations prescribed for aviation safety purposes. It was also not possible to calculate the densities (number of firms per hectare, for instance) because of the lack of information required for such calculations. As noted by Fainstein (2005), the notion of diversity has various meanings in urban studies;[34] and in the dissertation, it was understood to refer to heterogeneity of land use on and around the airports, understood in contrast to a homogenous composition of activities. The notion of diversity is particularly important towards understanding certain forms of economies external to the firm (refer to Chapter One, Section 1.2.2.2) and as historically noted by Jacobs (1969), diversity is one of the reasons cities (or employment subcentres) develop and grow. An example is necessary to clarify this two-pronged criterion adopted to select the case study areas. Upington International Airport accommodates aircraft parking facilities that cover tens of hectares on the landside. Such development could appropriately be understood as substantial, in terms of the extent of land area covered. However, such development is not diverse, and the Upington airport-centric development does not meet the two-pronged criterion of substantial and diverse development, and accordingly did not qualify as a case study.

Through the use of the latest aerial photography obtained from the national geo-spatial information (NGI), and the researcher's familiarity with airports in South Africa, the assessment of substantial concentration and diversity of economic activities focused on the following international and national airports in South Africa: international airports (OR Tambo, Cape Town, King Shaka, Bram Fischer, Port Elizabeth, Upington, Lanseria, Polokwane, Pilanesberg, Kruger Mpumalanga), and national airports (Kimberley, George, East London). Although it could be argued that development on the landside of King Shaka International Airport (KSIA) is marginally substantial and diverse, it is important to note that at the inception of the study, the

[34] The term 'diversity' could refer to varied building types, mixed uses, heterogeneity in social groups, and so on (Fainstein 2005).

development at KSIA was still at an infancy stage; hence it was not selected as a case study. There were nonetheless desires in early 2015 to incorporate KSIA into the study, but the investigations at CTIA and ORTIA were already at an advanced stage. The late inclusion of KSIA could have therefore greatly delayed the completion of the dissertation.

Secondly, the two cases studied showed the highest potential of yielding insights into the linkages of airport-centric firms in South Africa and beyond, because of the cities and broader regions they are located in. As discussed further in Chapter Five, ORTIA can be regarded as gateway to Ekurhuleni, Johannesburg and the broader Gauteng city-region; and CTIA gateway to the Cape Town functional region.[35] Johannesburg and Cape Town are the only South African cities that feature prominently in the interactions between cities worldwide (that is, inter-city relations at a global scale). According to Taylor (2009), in 2000, both cities were part of 123 cities with at least one-fifth of the highest recorded connectivity with other cities worldwide. Though the connectivity of sub-Saharan African cities declined from 2000 to 2004, Johannesburg and Cape Town were, in 2004, part of the 109 cities with city network connectivity similar to the 2000 levels (Taylor 2009).

Because of the characteristics noted above (of diverse and substantial concentrations of economic activity, and high connectivity levels) the Cape Town and Johannesburg airport-centric developments were well suited to address the research aim, spelt out in Chapter One, Section 1.4.1. The concentrations identified on and around CTIA and ORTIA therefore provided a good platform for analysing forces that drive the location and mix of a variety of airport-centric firms, hence the selection of the two airports as case studies. To close the discussion on case study selection processes, it is crucial to note that the case studies were restricted to South Africa purely because of the limited funds available to undertake the study. It is hoped that in future, the work would be extended to other airports and surrounds in different contexts (see Chapter Seven, Section 7.3.2 regarding potential areas for further research).

4.2 RESEARCH METHODS

Informed by the research design in Chapter One, the current section discusses the dissertation's research methods, that is, techniques that were used to collect and analyse data (Creswell & Clark 2007). In light of the two-pronged extensive and intensive design described in Chapter

[35] The term gateways is used here in the context of Bird (1983), who regards gateway functions as those that link a particular location to other areas in the country and other parts of world, through international transport; such as CTIA and ORTIA in the context of the dissertation.

One, Section 1.5.2, the dissertation deployed mixed research methods that encompassed qualitative and quantitative approaches;[36] and based upon a combination of primary and secondary sources of information. Qualitative methods are associated with the intensive design (Dwyer & Limb 2001) while quantitative methods are associated with the extensive design. The empirical investigations commenced with a descriptive survey as outlined later in the chapter, through which sub-samples were identified for in-depth qualitative engagements (Dwyer & Limb 2001) to investigate further the patterns uncovered.

In association with the mixed method approaches, the dissertation used multiple sources of information: a technique that is considered appropriate for a case study approach (Yin 2009). The main sources of information used were secondary information; business databases; descriptive survey; and qualitative interviews. Identical approaches were used for the two cases studied, as outlined below.

4.2.1 Review of secondary information and mapping

The review and mapping was undertaken to achieve the following goals: one, to inform the case study selection process (Section 4.1.2 above); and two, to address the research question pertaining to the evolution of the form of the Cape Town and Johannesburg airport-centric developments over time. The review covered the following aspects as mainly presented in Chapter Five.

- Information was sought from ACSA on the volume of passengers and cargo handled at the Cape Town and OR Tambo airports.
- To capture the evolution of the spatial form of the Cape Town and Johannesburg airport-centric developments, historical aerial photographs and maps were obtained from the City of Cape Town municipality and the national geo-spatial information (NGI). The latest aerial photography from the NGI was also used for the case study selection process (Section 4.1.2).

[36] The notion of mixed methods research is ambiguous and there is no consensus on its meaning (Small 2011). In the dissertation, the conception of mixed methods was informed directly by the extensive and intensive research design. In the literature, the notion of mixed methods is associated and even used synonymously with the concept of triangulation, an ambiguity that demands clarity on the relationship of the two terms. Triangulation is a type of mixed methods, as Creswell & Clark (2007) point out that there are four types of mixed method approaches: triangulation, embedded, explanatory and exploratory methods. Triangulation is, according to Neuman (2000) a concept borrowed from land surveying, based upon the notion that observing phenomena from different perspectives yields a more comprehensive view.

- Land use information was obtained from the City of Cape Town and Ekurhuleni municipalities, to map the land use of the environs of Cape Town and OR Tambo airports, relative to their broader metropolitan areas.

The letter of introduction (attached as Appendix A) was presented to the NGI and the aforementioned municipalities to access the sets of information noted above.

4.2.2 Firm database collation

The firm database-collation exercise was undertaken for two purposes. Firstly, to record the number of Cape Town and Johannesburg airport-centric firms and accordingly uncover the developments' economic activity mix; and secondly, to prepare for the descriptive surveys discussed in Section 4.2.3. Attempts were made to confirm the firm's name, physical address, main economic activity conducted, and telephone number. A description of how this information was compiled across the three levels of analysis per case study is provided below.

Before outlining the methods, two considerations should be noted. One, residential uses were excluded from the database collation exercise and the entire study, because they would not assist towards addressing the research objectives. Although the indicative study areas (See Figures 1.3 and 1.4) may inadvertently contain pockets of residential areas, it is reiterated that those areas did not form part of the study's investigations. Two, for sampling purposes, the firms were categorised in terms of the relevant South African standard industrial classification of economic activities (SIC) sections. According to Statistics South Africa (2012a), the SIC provides a standardised framework for the collection, tabulation, analysis and presentation of statistical data on economic establishments. The 2012 SIC comprises 21 sections as follows: (1) agriculture, forestry and fishing; (2) mining and quarrying; (3) manufacturing; (4) electricity, gas, steam and air conditioning supply; (5) water supply; sewerage, waste management and remediation activities; (6) construction; (7) wholesale and retail trade; repair of motor vehicles and motorcycles; (8) transportation and storage; (9) accommodation and food service activities; (10) Information and communication; (11) financial and insurance activities; (12) real estate activities; (13) professional, scientific and technical activities; (14) administrative and support service activities; (15) public administration and defence; compulsory social security; (16) education; (17) human health and social work activities; (18) arts, entertainment and recreation; (19) Other service activities; (20) activities of households as employers; undifferentiated goods- and services-producing activities of households for own use; and (21) activities of extraterritorial organisations and bodies, not economically active people, unemployed people (Statistics South Africa 2012a).

4.2.2.1 Cape Town airport-centric firms

Used on a trial-and-error basis, six main approaches were adopted to record firms that are located around CTIA, and those on the landside. Through triangulation, different sources were used so as to reduce coverage error. According to Dillman (2007), coverage error occurs when the sampling frame does not include all elements in the population, resulting in elements of the population not having equal chance of being selected to be part of the sample. The various sources were complementary, given the gaps and inaccuracies in each. These are outlined below, followed by an approach pertaining to firms located within CTIA terminals.

Firstly, the land use information (dated 2010)[37] was obtained from the City of Cape Town municipality in geographical information system (GIS) shapefile format, covering the entire municipal area. Through the use of GIS intersect tool, and based upon an indicative study boundary, the area around CTIA was isolated into a separate shapefile. Afterwards, the properties located within the study boundary were converted to excel spreadsheet to allow for cleaning of the data. The information on the database included land use per property, company name, and recorded individual buildings on each property. As a result, some firms had duplicate entries relating to different functions of the same firm at the same premises. An example is a firm that contained entries in manufacturing, storage, office, and sales; with each of these duplicates assigned a different SIC code. It should also be noted that these SIC codes were out-dated, because they were based on the 1990 classifications (see Statistics South Africa 1990).

A number of steps were undertaken to clean, update and make this data useable for the descriptive surveys and to understand accurately the economic activity mix. The first problem encountered was that the municipal information did not contain the firms' contact details. To find the details, each record on the database was checked against the hard copy of the 2013/2014 Cape Peninsula telephone book (Trudon 2012a), the 2013/2014 Yellow Pages (Trudon 2012b) and through searching the firms on Google internet search engine. The principal information searched was the street address and telephone numbers per firm. The street addresses were checked against property number and street address on the City of Cape Town information, to

[37] It is acknowledged that the 2010 information is too old to be used to record the airport-centric firms in 2013 and 2014. There are particular reasons why this database was used. The City of Cape Town, like other municipalities, update land use information regularly for town planning purposes, typically on an annual basis. However, such information aggregates land use at a property level. This means that for a single property that accommodates different land uses, and even firms, the most dominant use is identified and assigned to the entire property. This information does not acknowledge the heterogeneity within the properties, and would have been useless for the purposes of the firm collation exercise. Further, as it is not used on regular municipal planning exercises, in 2013/2014, the 2010 database was the latest known information that disaggregates land use per property. Enquiries were made to the municipality in 2015 regarding the updated information, and it was confirmed that the above is the latest.

ensure that the location of each establishment is accurate. Since the entries in the Yellow Pages and phone book were not arranged alphabetically, but rather per use category, each category was perused using keywords of 'airport' and 'airport industria'. The search did however not confirm the addresses and contact details of all firms on the municipal database. When checking this information, there were establishments discovered through other means described hereunder, but not available on the municipal database. This was potentially because the municipality inadvertently omitted the firms, new firms might have moved into the area, and others possibly moved out.

The second source used was Google Earth street view. This was used to check the business details on the signage on the properties, and update the details on the spreadsheet built from the City of Cape Town database. Given that Google Earth street view was dated 2010 and therefore relatively old, the information obtained through this method was considered partial. It would have not included firms that moved into the area after 2010, and still reflected those that might have relocated. It was also crucial to clean the municipal database given the duplicate entries (in hindsight this should have been the first step). In the spreadsheet, property numbers were used to order the entries, and all records with the same property number were colour coded so that they could be distinguished clearly. The following items per property were then deleted right away from the database: guard house, open space, parking, automated teller machine (ATM) and electrical substation. The duplicate entries relating to the various functions of the same firm on the same premises/buildings were also deleted to avoid double counts, and only the primary use of each firm was kept on the database. Following the cleaning, the database still could not be completely updated as it had gaps as regards business contact details, and as noted earlier, some establishments discovered through Google Earth, telephone book and Yellow Pages were not part of the City of Cape Town's database.

Though it failed, a third method was tried to update the database. An attempt was made to conduct a land use survey through walking around the area and recording the business details from the signage on the premises and making enquiries of the business activities. After recording a few properties, the researcher was approached by the Airport Industria City Improvement District (CID) security personnel patrolling Airport Industria. The security noted that due to high burglaries in the area, recording of businesses and photographing of the establishments/signage was not allowed, particularly on weekends. This land use survey failure, and particularly information acquired from the security as regards the leadership of Airport Industria CID, led to other sources below.

Given that there was no way of confirming which businesses were still at the area due to the potential relocations that might have occurred post the compilation of the municipal database, the fourth source of information was used. For an area to the west of CTIA, known as Airport Industria, the information of the establishments was obtained from the Airport Industria CID website (Airport Industria CID 2013). The availability of this website link was learnt from the CID manager, after being contacted for permission to walk the area and record the firms. These sources seemed to be more reliable, relatively accurate and up-to-date compared to the municipal database. The information included the category of business conducted for each establishment, business name, business street address and telephone number. The business details were transcribed from the website on the excel spreadsheet, and consolidated with the developing database. The problem with the CID information was its partiality, given that it only encompassed areas under the jurisdiction of the CID, and not the neighbouring areas like Airport City.

The fifth main source, although it yielded a limited number of firms, was the online company directory on the Cape Town Chamber of Commerce (2014). The online database was searched using the keywords of Airport City, Airport Industria and Cape Town International Airport. The sixth method of using Google Maps was discovered late in the process. It included clicking and viewing the details of the companies listed on Google Maps. The majority of listed business had websites, which assisted towards verifying and confirming the information of Google Maps, as well as other methods discussed above. The Google Maps search exercise proved particularly useful in identifying properties on the landside that were not discovered satisfactorily through the other methods.

Across the various methods above, a principal and more reliable approach followed to verify the information was to find, where available, the firms' websites, and source the information directly. The abovementioned sets of information were verified against each other and consolidated into one business database. Ultimately, the total number of firms recorded at the two levels was 373, comprising 309 firms around CTIA and 64 on the landside.

For the establishments within the CTIA terminals, the business information/tenant database was obtained from ACSA (see Thethiwe 2013, pers com). The database contained the business name, contact person, email address, telephone number, fax number and cell phone number per establishment. The information was obtained in two sets, one, airside tenants, which are firms located beyond the airside (check-in) gates, and two, landside, which in this case referred to

firms which are located before the airside gates, but still within the terminal. The two sets were combined to allow for the cleaning of the database. The first pattern noticed was that some firms had different offices and stores/outlets within the terminals. To confirm that such firms were part of a single store, those that had the same contact person and contact details were noted. Multiple entries and kiosks of the same firm were then deleted, and only one entry per firm remained on the database. The database also contained entries of the car rental companies. Given that car rental companies were classified under the landside, this information was integrated with the landside database and omitted from the terminal database. Finally, to assess the correctness of the information, the terminal database was checked against company information available on ACSA's website (ACSA 2014b). After cleaning the database, the total number of firms recorded within the CTIA terminals was 88.

The overall population encompassing the three levels was 461 Cape Town airport-centric firms. Each firm was assigned a category in terms of the major SIC sections, subsequently used as bases for the sampling process discussed in Section 4.2.3.1. As shown in Table 4.1, the mix of Cape Town airport-centric development is dominated by firms involved in wholesale and trade activities; followed by transportation and storage firms.

Table 4.1 Mix of Cape Town airport-centric development

			Level of analysis			
			Around CTIA	CTIA Landside	CTIA Terminals	Total
SIC Category	Manufacturing	Count	50	3	0	53
		% of Total	10.8%	0.7%	0.0%	11.5%
	Water supply, sewerage, waste management and remediation activities	Count	4	0	0	4
		% of Total	0.9%	0.0%	0.0%	0.9%
	Construction	Count	9	0	0	9
		% of Total	2.0%	0.0%	0.0%	2.0%
	Wholesale and retail trade; repair of motor vehicles and motorcycles	Count	82	41	46	169
		% of Total	17.8%	8.9%	10.0%	36.7%
	Transportation and storage	Count	106	1	24	131
		% of Total	23.0%	0.2%	5.2%	28.4%
	Accommodation and food service activities	Count	9	2	12	23
		% of Total	2.0%	0.4%	2.6%	5.0%
	Information and communication	Count	7	0	0	7
		% of Total	1.5%	0.0%	0.0%	1.5%
	Financial and insurance activities	Count	1	0	4	5
		% of Total	0.2%	0.0%	0.9%	1.1%
	Professional, scientific and technical activities	Count	8	14	0	22
		% of Total	1.7%	3.0%	0.0%	4.8%
	Administrative and support service activities	Count	27	1	2	30
		% of Total	5.9%	0.2%	0.4%	6.5%
	Public administration and defence; compulsory social security	Count	0	2	0	2
		% of Total	0.0%	0.4%	0.0%	0.4%
	Education	Count	6	0	0	6
		% of Total	1.3%	0.0%	0.0%	1.3%
Total		**Count**	**309**	**64**	**88**	**461**
		% of Total	**67.0%**	**13.9%**	**19.1%**	**100.0%**

4.2.2.2 Johannesburg airport-centric firms

Five approaches outlined below were used to record the firms that are located around ORTIA and those located on the landside. An attempt was made to source the land use information from the Ekurhuleni municipality, and was obtained in GIS shapefile format in 2013. However, the only information available was aggregated at the property level, did not contain any firm details, and therefore not useful for the firm database collation exercise.

As a starting point, the businesses were searched on online business database of www.yellowpages.co.za (Trudon 2013). The categories (as noted on the website) of industrial, commercial, offices, manufacture, laboratories, logistics and courier were used as search words for business located at areas around CTIA. These are Jet Park, Isando, Aeroport, Meadowdale, Rhodesfield and Spartan. Some of the firms located on the airport's landside formed part of the results of the search from the keywords mentioned above, and they were identifiable by the address of OR Tambo Airport. The information compiled included business name, category of business activity conducted, physical address, and telephone number per establishment. The information was typed on excel spreadsheet and used as a basis for developing the database. The apparent limitation of the information obtained through this method is that it is biased towards reflecting businesses that are willing and have the means to register their details on the aforementioned website. Not all firms do this. Related to this approach, the online business database of www.brabys.com was also checked, particularly with the objective of uncovering the company websites, and sourcing information directly.

Secondly, though it yielded a few firms, a business database was obtained from the Ekurhuleni municipality's town planning department, which had been compiled by the municipality as part of the aerotropolis initiative at ORTIA and surrounds (see Engar 2013, pers com). The municipality had placed an advert on its website requesting that businesses interested to be part of the aerotropolis planning submit their business names and contact details to the municipality. As the database contained businesses within the broader municipal area, the keywords of Jet Park, Isando, Aeroport, Meadowdale, Rhodesfield and Spartan were used to identify establishments that are located in the vicinity of ORTIA. The database included company name, name of establishment's representative, contact number, email address, postal address, physical address, industry type, and organisation size in terms of number of people employed at each establishment. The limitation of this information is that it only recorded businesses that had interest in the aerotropolis initiative. Only 4 firms were discovered through this method.

The third source was discovered late in the business collation exercise, in April 2014. This is a link on the website of East Rand Chamber of Commerce (2014) known as datadex. Businesses that are members of the chamber are granted opportunity to register their businesses and contact details on the datadex. Using the keywords of Spartan and Jet Park, the datadex was used to check and update the information compiled from the other sources of information. The limitation of this information is that it depicted only businesses that are members of the East Rand Chamber of Commerce and Industry. Further, although it yielded limited companies, the website of www.kemptalk.com was also searched (see Van Wyk 2013).

Drawing lessons from the Cape Town case study, the fourth data method included the use of Google Maps. Google Maps has a facility that shows the spatial location of businesses that when clicked, it reflects the business name, physical address, company contact details and websites. This method was particularly useful for identifying the websites of airport-centric firms, and obtaining the information from there.

After noticing the low number of firms recorded on the landside, the fifth opportunistic method was used and proved to be useful. The keyword of 'new agents building' was used to search Google. This 10-storey building is situated at ORTIA, and accommodates multitudes of firms, mainly those involved in freight clearance, forwarding and logistics in general. Google search revealed many company websites that were used to confirm the contact details.

The results of the five business collation methods were checked against each other, cleaned and consolidated into one dataset. The total number of firms recorded at the two levels was 1471 (comprising 1408 firms around ORTIA and 63 on the landside). A limitation of the information of establishments around ORTIA is that property numbers did not form part of the information collected. Nonetheless, this was not regarded as a major problem as it did not negatively impact the survey preparations.

As regards the establishments located within the three ORTIA's terminals, the business information was obtained from ACSA (see Flayser 2013, pers com). The information reflected the business name, location, telephone number, name of management's representative, email address, and cell phone number. The duplicate entries within and between the different sections of the terminals were deleted and only one entry per firm left on the database. The car rental information was also omitted from this information and integrated into the landside database. Finally, to check the correctness of the information, the database was checked against company

information available on ACSA's website (ACSA 2014c). The number of firms recorded within the ORTIA terminals was 162.

The overall population of across the three levels of analysis was 1633 Johannesburg airport-centric firms. These firms were each assigned a category in terms of the major SIC sections, so as to permit the sampling process discussed below. Similar to the Cape Town case study, Table 4.2 shows that the mix of Johannesburg airport-centric development is dominated by firms involved in wholesale and retail trade, and repair of motor vehicles and motorcycles.

Table 4.2 Mix of Johannesburg airport-centric development

			Level of analysis			
			Around ORTIA	ORTIA Landside	ORTIA Terminals	Total
SIC Category	Manufacturing	Count	347	1	0	348
		% of Total	21.3%	0.1%	0.0%	21.4%
	Electricity, gas, steam and air conditioning supply	Count	1	0	0	1
		% of Total	0.1%	0.0%	0.0%	0.1%
	Water supply, sewerage, waste management and remediation activities	Count	4	0	0	4
		% of Total	0.2%	0.0%	0.0%	0.2%
	Construction	Count	25	0	0	25
		% of Total	1.5%	0.0%	0.0%	1.5%
	Wholesale and retail trade; repair of motor vehicles and motorcycles	Count	479	4	76	559
		% of Total	29.4%	0.2%	4.7%	34.3%
	Transportation and storage	Count	327	56	46	429
		% of Total	20.1%	3.4%	2.8%	26.3%
	Accommodation and food service activities	Count	48	3	23	74
		% of Total	2.9%	0.2%	1.4%	4.5%
	Information and communication	Count	8	1	0	9
		% of Total	0.5%	0.1%	0.0%	0.6%
	Financial and insurance activities	Count	8	2	10	20
		% of Total	0.5%	0.1%	0.6%	1.2%
	Real estate activities	Count	3	0	0	3
		% of Total	0.2%	0.0%	0.0%	0.2%
	Professional, scientific and technical activities	Count	51	0	1	52
		% of Total	3.1%	0.0%	0.1%	3.2%
	Administrative and support service activities	Count	44	18	0	62
		% of Total	2.7%	1.1%	0.0%	3.8%
	Public administration and defence; compulsory social security	Count	0	1	0	1
		% of Total	0.0%	0.1%	0.0%	0.1%
	Education	Count	19	0	0	19
		% of Total	1.2%	0.0%	0.0%	1.2%
	Human health and social work activities	Count	11	0	0	11
		% of Total	0.7%	0.0%	0.0%	0.7%
	Arts, entertainment and recreation	Count	2	0	0	2
		% of Total	0.1%	0.0%	0.0%	0.1%
	Other service activities	Count	10	0	0	10
		% of Total	0.6%	0.0%	0.0%	0.6%
Total		**Count**	**1387**	**86**	**156**	**1629**
		% of Total	**85.1%**	**5.3%**	**9.6%**	**100.0%**

4.2.3 Descriptive survey

Informed by the extensive research design, the dissertation was based upon a descriptive survey method. Descriptive survey is one of the four main types of quantitative research, with the other

three being observation, correlation and developmental studies (Leedy & Ormrod 2010).[38] Babbie (2001) points out that surveys are used primarily in studies that have individuals as the units of analysis, which in the context of the dissertation were the individual airport-centric firms. It is common knowledge, as emphasised by Leedy & Ormrod (2010) that the aim of a survey is to learn about a population by investigating its sample. As such, the units of analysis (the representatives of the firms) served as survey respondents, so as to gain insights into the spatial economic attributes of the broader Cape Town and Johannesburg airport-centric developments.

There are two types of survey research, namely cross-sectional surveys and longitudinal surveys. A cross-sectional study involves observations of a sample that are made at one point in time. In contrast, a longitudinal study permits observations of the same phenomenon over an extended period, so as to identify its change or development (Babbie 2001; Leedy & Ormrod 2010; Neuman 2000). The dissertation adopted a cross-sectional survey due to two interrelated factors. Firstly, given that the study was undertaken as part of the Stellenbosch University's dissertation, which has a limited time frame of three years that it had to be completed within, a longitudinal survey was not feasible. Secondly, the funds available to undertake the study could not cover the cost of a longitudinal study. It should however be noted that although the design of the survey was cross-sectional, attempts were made to capture the airport-centric developments' trends through the questions asked to respondents, and through mapping the evolution of airport-centric developments' spatial form (see Chapter Five). It would have been informative to investigate in detail the changing mix of the airport-centric firms through comparing business databases over the years. This was not achieved successfully due to the lack of business records, which proved to be challenge even for the current situation as evident in Section 4.2.2. Given the outline above of the cross-sectional descriptive survey adopted to investigate the Cape Town and Johannesburg airport-centric developments, three surveys were conducted per case study, that is, one survey per the level of analysis as discussed later in the chapter.

4.2.3.1 Sampling

The business databases compiled through processes outlined in Section 4.2.2 served as sampling frame, that is, list of elements from which a sample was drawn. A key consideration in survey

[38] The other types of quantitative research can be summarised as follows. One, observation studies entail a detailed recording through the use of field notes or video recordings to capture the ways in which people act. Two, in correlation studies, a research process involves the collection of data about two or more attributes for particular units of analysis. These studies examine the extent to which differences in one characteristic are associated with differences in one or more other characteristics or variables. Three, developmental designs focus on how a particular characteristic changes, as people grow older (Leedy & Ormrod 2010).

research is internal validity, which denotes the extent to which the research approach used allows the researcher to draw accurate conclusions (Leedy & Ormrod 2010) on forces that drive the location and mix of airport-centric developments. To improve the internal validity of the survey, the study utilised a probability sampling technique of stratified random sampling (also known as stratified sampling with a random start). This was done to ensure equal representation of the heterogeneous units of analysis, in accordance with the varying SIC sections. The stratified sampling method was considered the most appropriate because it decreases sampling error[39] (Neuman 2000), as sampling was conducted on homogenous subsets, with heterogeneity between subsets (Babbie 2001). In the study, stratified sampling strategy controlled the relative size of each stratum (SIC section) and attempted representativeness by fixing the proportion of different strata within the sample (Neuman 2000).

After categorising the airport-centric firms at the two case studies in terms of the SIC sections, stratified random sampling was used to determine a sample. This pertained more to firms that are located around airports, wherein a random sample of fixed size was selected in each stratum (defined by the SIC category), with the selection in each stratum undertaken independently of the selection in other strata (Ardilly & Tillé 2006). Firms within each stratum were listed and assigned numbers (starting from 1 onwards) in Microsoft Excel program. On a parallel column for each stratum; random numbers were generated between the first entry and the last, using 'randbetween' function in the program's formula builder. To limit the random numbers generated, the assigned numbers were used as bottom and top limits, meaning that the random numbers generated were between those limits. From the first random number generated, subsequent numbers that matched the fixed listing were manually selected, accordingly skipping duplicates, until the desired sample size was reached. This exercise was repeated for all the strata as regards the 'around the airport' level of analysis for the Cape Town and Johannesburg airport-centric firms.

For the two cases studied, a strategy of oversampling was used, wherein the sample drawn was larger than needed (de Vaus 1995). This was done to reduce nonresponse error, which occurs when a significant number of respondents do not participate in the survey and probably have different characteristics from those who respond, particularly when such characteristics are important to the study (Dillman 2007).

[39] Sampling error occurs when a sample deviates from being representative of the population (Neuman 2000).

Sampling was not conducted for the 'terminal' and 'landside' levels of analysis. Given the relatively low number of firms at these two levels of analysis (see Section 4.2.2), the approach adopted was to survey all firms so as to increase the response rate. The strategy was considered equivalent to oversampling appropriate in larger populations. This surveying of the total landside and terminal populations was attempted while noting the minimum number required to obtain the 95% confidence level, and the relative representation of the different SIC categories. To acknowledge the relative representation and heterogeneity, the terminal and landside populations were still classified in terms of the SIC sections, and a minimum response rate ascertained per stratum as noted hereunder.

Sample sizes for the Cape Town airport-centric development were determined as follows. From the population of 309 firms located around the airport, at least 171 firms were required to attain 95% confidence level, at 5% interval. In attempting to improve the response rate, the sample size was increased by 23% to 221 firms. It was hoped that the responses attained would not be less than 171 firms. Because the population of firms on CTIA's landside was only 64 firms, a sampling was not conducted. Rather, the intention was to survey all firms with the hope that the responses obtained would not be less than 55 firms, which represented 95% confidence level, at 5% interval. Similarly, for firms located within CTIA terminals, the goal was to survey all 88 firms, with the hope that the responses would at least reach 95% confidence level represented by 72 firms.

Following principles similar to the above, sample sizes for the Johannesburg airport-centric development were determined as follows. For firms located around ORTIA, a sample of 302 firms was required to attain a 95% confidence level, at 5% interval. To improve the response rate, the sample size was increased by 25% to 378 firms, with the hope that the response rate would not be less than the required 302 firms. With regard to firms located on the airport landside, an attempt was made to survey all 63 firms. Similarly with firms located within the terminals, attempt was made to survey all 162 firms. For both cases studies, the survey did not work out as anticipated, and changes that were subsequently adopted are discussed in Section 4.2.3.4.

4.2.3.2 Questionnaire formulation

The strategy for the questionnaire compilation was informed by the two sets of concepts of economic space, geographical and organisational proximity and relational firm; and linkages, agglomeration economies, clustering and propulsive economic element. A copy of the

questionnaire is attached as Appendix B. The questions asked to the respondents were carefully considered to answer the research questions through the aforementioned concepts. The questionnaire formulated was based upon both the open and closed-ended questions with a view to capturing the qualitative and quantitative data. As regards open-ended questions, respondents were granted opportunity to provide answers without being guided with alternative potential answers. For closed-ended questions, respondents were asked to select answers from a list provided on the questionnaire (Babbie 2001). Closed-ended questions provide a greater uniformity of responses, and the responses are easily processed. The limitation of such questions lies in the researcher's structuring of responses, as some potential responses may be overlooked and unintentionally omitted (Babbie 2001). So as not to create an impression that the purpose of the survey was to speak positively about the airport and to avoid any bias towards the airport, the open-ended questions were used, with the word airport only explicitly mentioned towards the end of the questionnaire. The same questionnaire was tailored for the two cases studied and the associated three levels of analysis.

4.2.3.3 Survey data collection technique

In investigations of the two case studies, survey data were collected through telephone interviews. According to Babbie (2001) and Leedy & Ormrod (2010), there are three main methods of administering survey questionnaires to a sample, which would be appropriate towards the analysis of forces that drive the location and mix of airport-centric developments. The first mode of interviewing is through self-administered questionnaires, whereby respondents are asked to read the instructions on a questionnaire and record the answers themselves. Secondly, surveys can be administered by interviews in face-to-face encounters; and thirdly, surveys can be conducted through the telephone. These methods have varying advantages and disadvantages as summarised briefly below to motivate for the study's choice of telephone interviews. It will be apparent that the discussion below is very concise in focusing on main points, and the literature cited can be visited for detailed discussions of the three main methods of survey data collection.

Face-to-face interviews represent the traditional form of survey research (Backstrom & Hursh-César 1981), whose main advantages include high response rate, and also the possibility of conducting long interviews (Sheskin 1985). Self-administered questionnaires are cheaper than face-to-face interviews, although respondents do not always return the questionnaires, resulting in low response rates. Although the response rates can be improved by sending non-respondents' reminder letters, this exercise can add to the survey cost and time. Telephone surveys have many

advantages as they are flexible and offer most of the strengths of face-to-face interviews. Telephone surveys generally produce fewer incomplete questionnaires and achieve higher rates than self-administered questionnaires. The main advantages of telephone surveys over face-to-face surveys relate to time and money. For face-to-face interviews, the training, travel, supervision and personnel costs for interviewers can be high. On the contrary, telephone interviews are cheaper and can be executed quickly (Babbie 2001; Neuman 2000). Further to these standard advantages, the telephone interview method was preferred because some of the firms' premises are high security areas, which would be difficult to access to conduct face-to-face interviews (see a similar argument raised by Backstrom & Hursh-César 1981).

The questionnaire was piloted on 10 Cape Town airport-centric firms between 01 September and 05 September 2014. When piloting the surveys, some firms preferred the questionnaire to be emailed. In an attempt to improve the survey response rate and accommodate the needs of the respondents, this necessitated a change of data collection technique to mixed mode surveys. Mixed mode survey happens when responses from some members of the sample are collected by one method, and different methods used for other members (Dillman 2007). A challenge in implementing this method in the study related to changing the questions to be understandable to the respondents to read on their own. It also meant changing the questionnaire to a version with fill-in properties that would allow the respondents to record their answers. However, before the revised questionnaire could be emailed, there was a valuable lesson learned wherein some respondents asked the formal requests for interviews to be emailed to them, but did not respond to those. It appeared that some respondents demanded emails so as to avoid the interview completely. It was then decided that a mixed mode would not only be time consuming but would potentially be fruitless.

Given the above, a decision was taken to proceed strictly on the basis of telephone interviews with representatives of the firms that formed part of sample. The representative details were obtained from the business database collation process, and where such guidance was not available, telephone calls were made to the businesses, the objectives of the study introduced and enquiries made regarding the relevant person to respond to the questionnaire. In some cases, the respondents were keen to participate but not available at the time, as such a suitable date and time was arranged. Each interview lasted a maximum of five minutes, which could be regarded as a short interview. It is important to note that a telephone interview can possibly be longer than the five minutes used in the study. For instance, Backstrom & Hursh-César (1981) regard a long interview as the one that lasts 20 minutes; while a 30-minute telephone interview is not feasible.

However, a lesson from conducting survey interviews in the study is that longer interviews would have potentially not succeeded, ultimately resulting in low response rates. For instance, when respondents were informed that the interview would last about five minutes, most of them were reluctant to participate; understandably because of the busy work schedules.

The researcher conducted all interviews, with no intermediaries used. As Backstrom & Hursh-César (1981) observe, one challenge of telephone (and face-to-face) interviews is that, typically, the researcher does not collect data, and is rather assisted by the interviewers. In such cases, it requires additional care to protect the quality of the data collected from any personal biases of the interviewers. The interviewers can also possibly not understand the objectives of the study in the same way as the researcher sees them, and possibly not conduct the interview in the same way and passion as the researcher (Backstrom & Hursh-César 1981). Though it was a fatiguing process, it was decided, primarily due to the reasons above, that the researcher would personally conduct all the interviews, and in the process ensure that all relevant ethics of research are adhered to (see Section 4.2.5 below).

4.2.3.4 Survey response rates

At the inception of the study, as shown in Section 4.2.3.1, the goal was to obtain the response at 95% confidence level, at 5% interval for each level of analysis. However, given the lower than anticipated response rate, this goal could not be attained. Even oversampling could not yield the targeted response rates. This necessitated a change in the strategy, and meant that the confidence level had to be recalculated for the overall case study. The findings of the survey (in Chapter Six) could therefore only be confidently generalised at the broader case study, instead of the individual levels of analysis. This matter is discussed further below with the presentation of response rates attained at the two cases studied.

As noted in Section 4.2.3.1, the sampling was conducted on the SIC categories. Smith (1977) highlights two main problems that would potentially emanate from the use of SIC categories in geographical analyses. Firstly, the classification used in a particular country may change over time (for instance, see differences between Statistics South Africa 1990 and 2012a), making accurate comparisons between the years difficult. Secondly, international comparisons may be inaccurate given that countries may use different classifications (Smith 1977); notwithstanding attempts by countries to align their classifications (refer to Statistics South Africa 2012a for overview of attempts towards comparable statistical data at international level). Twomey & Tomkins (1995) also raise a concern regarding the way certain economic activities are grouped

together, while they should ideally be distinct so as to permit particular analyses (refer to Chapter Two, Section 2.1).

Because of the long list of SIC categories and, most importantly, to avoid the potential overlaps between the categories,[40] and to circumvent the problems highlighted by Smith (1977) and Twomey & Tomkins (1995), the airport-centric firms were classified into six categories, listed hereunder, for purposes of analyses.

1. Manufacturing, which comprises, inter alia, production, fabrication, processing, and assembly activities.
2. Transportation, storage and related activities. In the subsequent parts of the dissertation, these firms are also referred to as 'transport-oriented', and comprise mainly the couriers, freight consolidation, clearing, forwarding and storage firms, and airlines. It should be noted that some components of these firms are not airfreight-oriented, and this is typical of storage and trucking firms that are not associated with airfreight logistics chain.
3. Wholesale, retail and supply of goods. These firms include shops, retail stores, restaurants and petrol/service stations. In the study, importers and exporters of goods were regarded as retailers and therefore formed part of this group.
4. Accommodation and catering.
5. Car repair, tyre dealer, testing and maintenance of machinery.
6. Other. This group accommodated different firms that are not part of the categories above, such as accountants and construction companies.

The confirmation of these categories per firm was included in the questionnaire, and therefore obtained directly from the respondents instead of relying solely on secondary information.

A total of 212 Cape Town airport-centric firms participated in the descriptive survey. Given the population of 461, this response represented 95% confidence level, at 5% interval. The distribution of these firms, across the three levels of analysis, and per economic sector is shown in Table 4.3. The majority are located around CTIA, at the areas known as Airport City and Airport Industria; followed by those on the landside, and finally the terminals.

[40] The overlaps would possibly skew the results, as noted with the review of Swanepoel's (2012) work in Chapter Two. It should be noted that Swanepoel did not use SIC categories; however, similar problem would result from the use of any standard classification.

Table 4.3 Cape Town survey response rate

			Level of analysis			
			Around CTIA	CTIA landside	CTIA terminals	Total
Type of firm	Manufacturing	Count	26	1	0	27
		% of Total	12.3%	0.5%	0.0%	12.7%
	Transport, storage and related activities	Count	48	30	5	83
		% of Total	22.6%	14.2%	2.4%	39.2%
	Wholesale and retail	Count	25	6	23	54
		% of Total	11.8%	2.8%	10.8%	25.5%
	Accommodation and catering	Count	4	0	0	4
		% of Total	1.9%	0.0%	0.0%	1.9%
	Car repair, tyre dealer, testing and repair of machinery	Count	11	0	0	11
		% of Total	5.2%	0.0%	0.0%	5.2%
	Other	Count	23	4	6	33
		% of Total	10.8%	1.9%	2.8%	15.6%
Total		**Count**	**137**	**41**	**34**	**212**
		% of Total	**64.6%**	**19.3%**	**16.0%**	**100.0%**

At the Johannesburg airport-centric development, 311 firms participated in the survey. With the overall population of 1633, this response rate represented 95% confidence level, at 5% interval. Table 4.4 provides a distribution of these firms per economic activity, across the levels of analysis. Over three-quarters of these firms are located around ORTIA, particularly at the areas of Spartan, Jet Park, Isando, Meadowdale, Pomona, Bartlett and Elandsfontein.

Table 4.4 Johannesburg survey response rate

			Level of analysis			
			Around ORTIA	ORTIA landside	ORTIA terminals	Total
Type of firm	Manufacturing	Count	81	0	0	81
		% of Total	26.0%	0.0%	0.0%	26.0%
	Transport, storage and related activities	Count	53	31	4	88
		% of Total	17.0%	10.0%	1.3%	28.3%
	Wholesale and retail	Count	72	3	16	91
		% of Total	23.2%	1.0%	5.1%	29.3%
	Accommodation and catering	Count	6	3	0	9
		% of Total	1.9%	1.0%	0.0%	2.9%
	Car repair, tyre dealer, testing and repair of machinery	Count	15	0	0	15
		% of Total	4.8%	0.0%	0.0%	4.8%
	Other	Count	22	2	3	27
		% of Total	7.1%	0.6%	1.0%	8.7%
Total		**Count**	**249**	**39**	**23**	**311**
		% of Total	**80.1%**	**12.5%**	**7.4%**	**100.0%**

4.2.4 Qualitative interviews

The purpose of conducting in-depth interviews was to complement information obtained from the survey. The qualitative interviews were conducted with a selected number of firms, as the intention was not to deploy the interviews to a representative sample, but to interview the typical firms. The interviews were mainly conducted through face-to-face engagements, arranged in advance through telephone calls and e-mails. Similar to the telephone interviews for the survey (Section 4.2.3.3 above), all qualitative interviews were personally conducted by the researcher,

wherein each interview lasted a maximum of 20 minutes. The letter of introduction (attached as Appendix A) was presented to the respondents as part of the researcher's introduction. Unlike the descriptive survey that was based on a fixed questionnaire, qualitative interviews were guided by the probing of the investigator.

The number of qualitative interviews conducted was influenced by the willingness and availability of firms to participate. A total of nine interviews were conducted: seven at the Johannesburg case study and two at the Cape Town case study. The firms were selected mainly to: (a) gather details on the operations of airports as transshipment locations, particularly for manufacturing firms; (b) investigate the linkages of transport-oriented firms (typified by couriers and freight carriers); and (c) to explore the operations of firms that do not ship through the airport, but instead utilise sea-based and road-based modes of transport. It is acknowledged that a total of nine interviews conducted seem low. As noted earlier, some of the firms approached declined due to time constraints and the representatives not being able to spend further time with the researcher. Nonetheless, given that the qualitative interviews were not used for generalisation of findings (in Chapter Six), the outcome of the study was not adversely affected. It is also important to note that, at the two cases studied, the respondents gave permission that their details could be listed as part of personal communications, but they requested that the presentation of results (in Chapter Six) should not make specific reference to them and/or their firms.

4.2.4.1 Johannesburg qualitative interviews

Interviews were conducted with seven firms on 11, 12 and 13 August 2015. The firms comprised three manufacturing firms, two transport-oriented firms, one accommodation and catering firm, and one firm involved in information technology. Six interviews were conducted face-to-face (at the firms' premises) and one conducted through the telephone.

4.2.4.2 Cape Town qualitative interviews

Two firms, one manufacturing and the other transport-oriented (freight forwarder) participated in the interviews on 17 and 19 August 2015. One interview was conducted face-to-face and the other conducted through the phone. Other firms approached were unable to participate.

4.2.5 Ethical considerations

Stellenbosch University's research ethics committee approved the research before the surveys and qualitative interviews were conducted. In conducting the study, ethical issues were considered at three levels. Firstly, the preparation of the study required access to business

databases that contained the details of the firms, as discussed in the preceding section. Since some of the information obtained is not in the public domain (particularly the tenant lists obtained from ACSA as outlined in Section 4.2.2), it had to be handled with confidentiality.

Secondly, for undertaking the survey and qualitative interviews, two considerations were taken into account, namely informed consent and right to privacy (Leedy & Ormrod 2010). The respondents were informed of the nature of the study, and granted the choice of either participating or not participating. They were also informed that if they agreed to participate in the study, they could choose not to answer certain questions, and withdraw at any time should they choose to do so. However, because the surveys were conducted through the telephone, the respondents could not sign the informed consent, so the acceptance to participate was considered as informed consent. For the qualitative interviews, two hard copies of consent to participate were signed by both the participants (firms' representatives) and the investigator. One copy was given to the participant.

The final ethical issue that was considered is honesty with professional colleagues (Leedy & Ormrod 2010). As the researcher is a town planner previously involved with the landside planning of Bram Fischer and Kimberley airports, the findings of the study had to be reported in an honest manner. Further, the work (analytical or otherwise) contained in the dissertation was not conducted before, for ACSA or any other client.

4.3 ANALYTICAL STRATEGY AND TECHNIQUES

As regards the overarching analytical strategy, the study used the interconnected concepts of economic space, geographical and organisational proximity, relational firm, scale and pattern; and linkages, agglomeration economies, clustering, and propulsive economic qualities. As summarised in Table 4.5, these concepts were considered in so far as they addressed the research objectives and questions, particularly the first three questions. This strategy was relevant for analyses of data from the surveys. The information obtained from the qualitative interviews was transcribed from a voice recorder and used to supplement the findings of survey interviews.

The data collected from the surveys were organised at two complementary stages. Firstly, after the interviews were conducted, the data were captured from the hard copy questionnaire into Microsoft Excel program. For each case studied, three separate spreadsheets were created, representing the three levels of analysis. On each spreadsheet, the firms were numbered from '1' onwards. The firms on the landside were Assigned 'A' before the numbers, landside 'B' and

terminal 'C'. Though the names of firms were not required for the presentation of results, the names were recorded to ensure that the information was assigned to the correct firm. Preliminary basic statistical analyses (frequency distributions) were conducted in excel. Excel was used at the inception because it allowed for the insertion of comments on the data. At a later stage of the study, once the accuracy of the capturing was checked, the data were transferred from Excel into the IBM statistical package for social sciences (SPSS) for further analyses, using the same coding as in above. SPSS allowed for cross-tabulations and for calculation of correlations.

Table 4.5 Analytical strategy

	Growth pole's interpretation of economic space, relational firm, geographical and organisational proximity, relational scale, and pattern; was used to explore the interconnections with the following concepts.			
Concept / **Research question**	Linkages	Agglomeration economies	Clustering	Propulsive economic characteristics
Which kinds of activities are located around the Cape Town and OR Tambo airports and why do they locate there?				
What are the propulsive economic elements found around the Cape Town and OR Tambo airports, and what linkages do they have with the airport-centric developments on the one hand and the airports on the other?				
What are the spatial, structural and economic linkages within the airport-centric developments of the Cape Town and OR Tambo airports, as well as the airport-centric developments linkages with the two airports, the metropolitan areas they are located in, and with other regional, national and international airport-centric developments and locations?				
What changes have occurred in the form and composition of the airport-centric developments of the Cape Town and OR Tambo airports over time?				

4.4 SUMMARY

The dissertation adopted case study research to investigate forces that drive the location and mix of airport-centric developments; revolving around the two South African case studies of Cape Town and Johannesburg airport-centric developments. For sampling purposes, the firms located within the three levels of analysis were categorised in terms of the SIC sections. However, following the survey interviews, the firms were categorised into a smaller number of groups, accordingly used in the subsequent chapters of the dissertation for presentation of the findings. The primary investigations were undertaken through a combination of descriptive surveys and qualitative interviews. The latter refer to interviews conducted with a smaller number of respondent firms to investigate further the patterns discovered through the survey, and also to gather certain explanatory aspects that could not be achieved through the survey instruments.

The survey response rates were achieved at a confidence level of 95%, at 5% interval for each case studied, allowing for the findings to be generalised to the respective populations. In preparation for presentation of the findings, the next chapter introduces CTIA and ORTIA, and provides an overview of the evolution of development at the two cases studied.

5 RESEARCH CONTEXT AND EVOLUTION OF THE JOHANNESBURG AND CAPE TOWN AIRPORT-CENTRIC DEVELOPMENTS

The previous chapter outlined the methodology and methods used to investigate forces that drive the location and mix of the airport-centric developments of Cape Town and OR Tambo airports. Prior to presenting the empirical findings (in Chapter Six), the current chapter introduces the two airports, it describes the current form of the Cape Town and Johannesburg airport-centric developments, and shows how the form has evolved over time. The chapter is organised into four sections. Section 5.1 describes briefly the spheres of government in South Africa, and overviews the management of the country's principal airports (which include ORTIA and CTIA); so as to put the subsequent discussions in context. Section 5.2 provides an overview of ORTIA and CTIA, and describes broadly the type of land use found on and around the two airports. It must be noted that a detailed description of the economic activity mix of these airport-centric developments is provided elsewhere in the dissertation (see Chapters Four and Six). Section 5.3 presents the evolution of the Cape Town and Johannesburg airport-centric developments since the opening of CTIA and ORTIA. The last section summarises and concludes the chapter.

5.1 SPHERES OF GOVERNMENT, AND MANAGEMENT OF AIRPORTS

South African government consists of the national, provincial and local spheres. Below the national level, the country is classified into nine provinces, namely the Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West and Western Cape (South Africa 1996a) (see Figure 5.1). The local sphere of government comprises municipalities of three types: metropolitan, district and local municipalities. As CTIA and ORTIA are located in metropolitan municipalities (MMs), it is important to note that the following MMs administer areas that accommodate the country's largest cities: Buffalo City, City of Cape Town, City of Johannesburg, City of Tshwane, Ekurhuleni, eThekwini, Mangaung and Nelson Mandela Bay. The rest of South Africa is under the jurisdiction of district municipalities (DMs), with each DM categorised into smaller local municipalities (LMs).

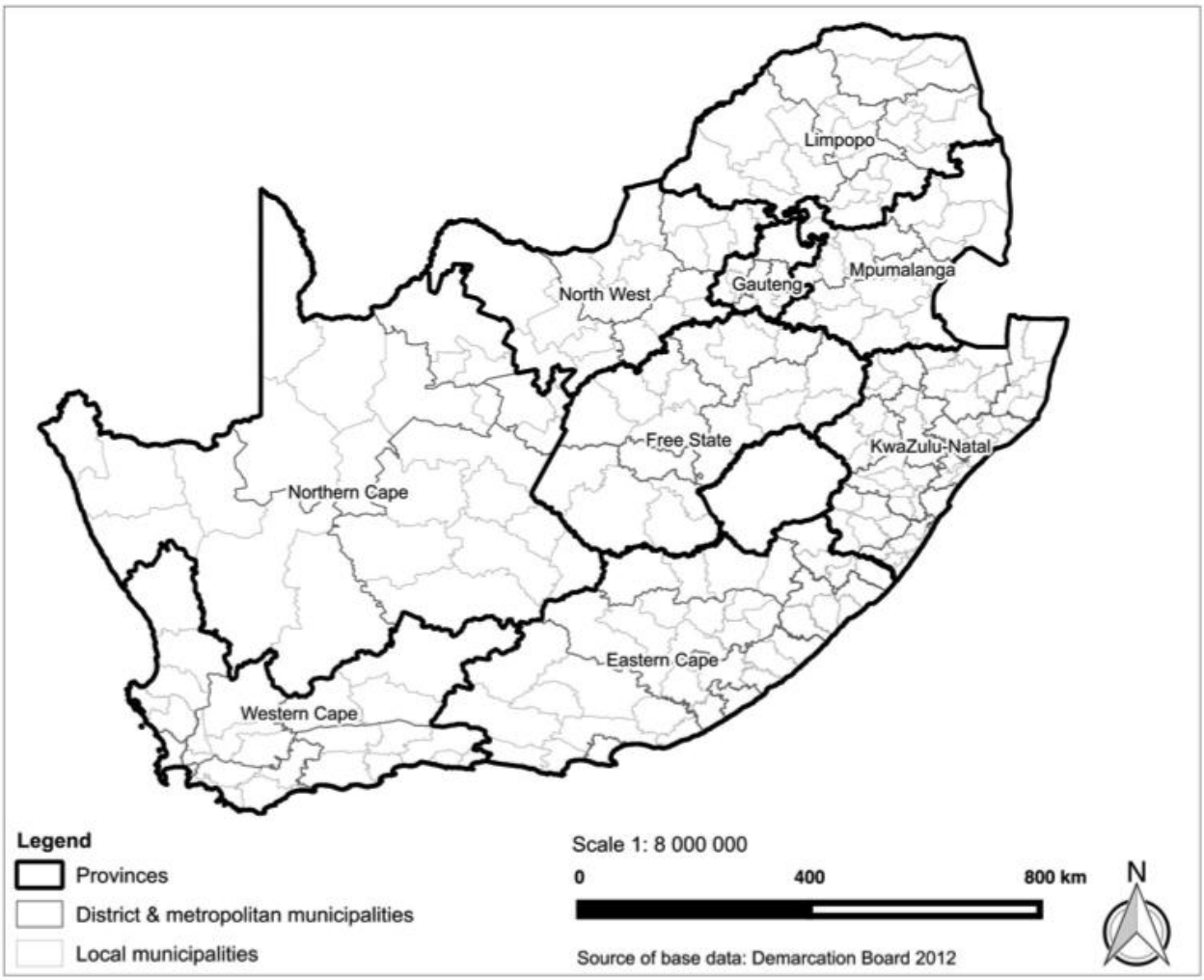

Figure 5.1 Provinces and municipalities of South Africa

According to South Africa (2015b), there are 135 licensed airports in South Africa (of which 10 are international airports) distributed across the different provinces. Nine principal airports in the country (including ORTIA and CTIA) are managed and operated by the Airports Company South Africa (ACSA);[41] which was established in 1993 with the authority to acquire, establish, develop, maintain, manage or operate airports (South Africa 1993). Beyond the borders of South Africa, ACSA is involved in the maintenance and operation of Guarulhos International Airport (Brazil) and Mumbai International Airport (India) (ACSA 2015).

ACSA is majority owned (74.6%) by the South African government, and is accountable to the Minister of Transport (ACSA 2014a).[42] It is important to note that the revenue of ACSA is

[41] Other airports managed by ACSA in South Africa are King Shaka, East London, Port Elizabeth, George, Bram Fischer, Kimberley and Upington.

[42] ACSA is thus legally known as a state-owned company (refer to South Africa 2008 for a detailed definition of 'state-owned company').

derived from two principal sources. This consideration is important as it influences the development on the landside of airports, which was one of the levels of analysis in the study (refer to Chapter One, Section 1.5.3). On the one hand, according to ACSA (2014a), aeronautical revenue is obtained from aircraft landing, parking and passenger service fees. On the other, non-aeronautical revenue is derived from retailers on airport premises, car rental firms, advertising, car parking, property development, and property leases on airports premises. To reflect its significance, non-aeronautical revenue contributed 36% of ACSA's total revenue in 2013 (ACSA 2014a), and to further enhance the non-aeronautical revenue, ACSA promotes development on the landside through leases, instead of disposing of the land (refer to Chapter One, Section 1.4.1 for overview of ACSA's attempts to promote landside development at its airports). As the focus of the dissertation is on ORTIA and CTIA, in light of the background above regarding spheres of government and mandate of ACSA, the next section provides an overview of the two airports.

5.2 OVERVIEW OF THE OR TAMBO AND CAPE TOWN INTERNATIONAL AIRPORTS

5.2.1 OR Tambo International Airport

OR Tambo International Airport (ORTIA) was opened in 1953, known then as the Jan Smuts Airport.[43] The airport was envisaged to be of the highest international standards in the country, and the criteria for selecting its location included good road and rail connections, particularly to the capital city, Pretoria (de Freitas 1968). ORTIA is served by about 45 passenger airlines with various destinations in South Africa, and destinations in the continents of Africa, Europe, Asia, North America, South America and Australia. ORTIA has annual passenger handling capacity of 28 million (ACSA 2014a), and it handled 19.1 million (19 135 093) passengers in the 2014/2015 financial year (Makhetha 2015, pers com). This figure represents 54% of total passengers handled at all ACSA-operated South African airports in 2014/2015.

ORTIA handled a total of 389 174 tons of cargo in 2014, with 351 145 tons (90%) transported internationally, and 38 030 tons (10%) transported within South Africa (Makhetha 2015, pers com). At this airport, airfreight is carried by a combination of cargo airlines and bellies of passenger aircraft. It is important to note that all ACSA-operated South African airports handled

[43] The name of OR Tambo International Airport (ORTIA) was used throughout the dissertation regardless of the timeframe under discussion. At the time of its opening, the airport was known as the Jan Smuts Airport, named after the then South African Prime Minister, Jan Christiaan Smuts. The name was changed to Johannesburg International Airport in 1994, and in 2006, there was a renaming to the present name of ORTIA, named after Oliver Reginald Tambo, the former president of the African National Congress.

475 518 tons of cargo in 2014, of which a large share above (representing 82%, and confirmed by ACSA 2015) was handled at ORTIA. As a reflection of the growth in freight volumes at ORTIA, British Airways World Cargo started operating the Boeing 747-8 Freighter in 2011 (ACSA 2012). Thirty percent of total cargo volume handled at ORTIA in 2014 was transported by the freighter aircraft (Makhetha 2015, pers com). It is also important to note that ORTIA, together with Cairo International Airport (Egypt) and Jomo Kenyatta International Airport (Kenya), handled 48% of Africa's total air cargo in 2013 (Tounsi 2014). The figures above mark ORTIA as Africa's busiest airport in terms of passengers and freight handled (ACSA 2014a).

ORTIA is located approximately 23 km north-east of the Johannesburg central business district (CBD). The airport is located in the jurisdiction of the Ekurhuleni metropolitan municipality (MM), Gauteng province. While the airport is located in Ekurhuleni, it serves a larger area comprising the neighbouring municipalities of the City of Johannesburg MM, City of Tshwane MM and the surrounding local municipalities. Tshwane, the administrative capital of South Africa, is located approximately 40 km to the north of ORTIA, and Midrand is approximately 25 km from the airport. Sandton, in the City of Johannesburg, is located approximately 23 km to the north-west of ORTIA (see Figure 5.2). Sandton is typically regarded as the new main centre of the multi-nodal Johannesburg MM, which resulted in the migration of firms from the Johannesburg CBD from the 1970s. To reflect the magnitude of its influence, Sandton constitutes the largest concentration of retail and office space in Africa, making it a top-tier business district on the African continent (Beavon & Larsen 2014).

Besides the good road-based connections, Gautrain (the first rapid rail in South Africa) connects ORTIA with the major centres of Johannesburg CBD, Sandton and Pretoria, overviewed above and shown in Figure 5.2.

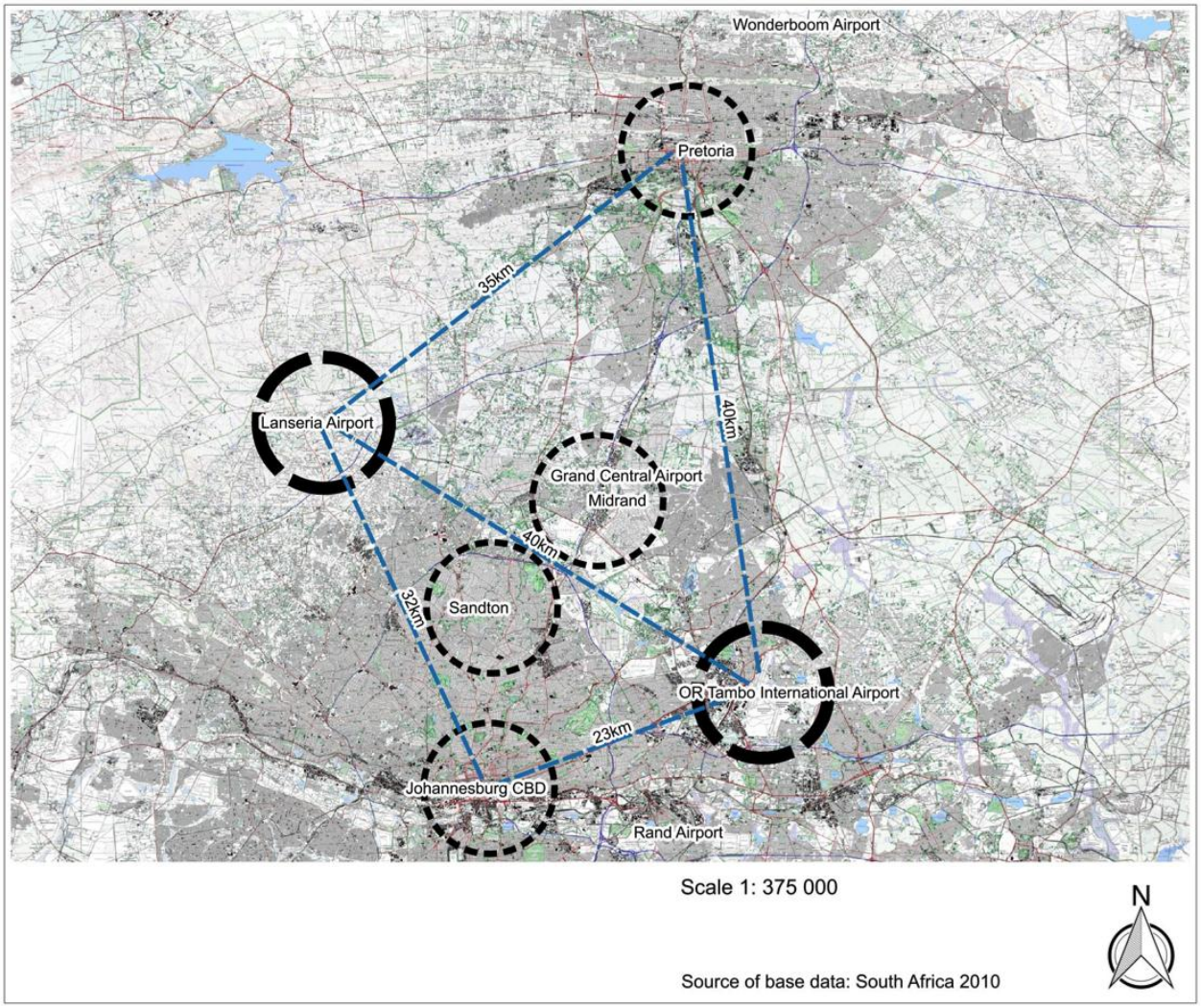

Figure 5.2 Location of OR Tambo International Airport

It is important to highlight briefly the population and economic attributes of the main (metropolitan) municipalities that are served by ORTIA. The City of Johannesburg MM is the most populated municipality in South Africa with a population of 4.4 million (4 434 827) people in 2011. Ekurhuleni MM is the fourth most populated, with a population of 3.1 million (3 178 470) in 2011. City of Tshwane MM had a population of 2.9 million (2 921 488) people in 2011 (Statistics South Africa 2012b). Besides the surrounding municipalities, these figures show that ORTIA has a population catchment of over 10 million that is serves, together with Lanseria International Airport, and smaller airports that accommodate unscheduled flights such as Rand and Grand central. Wonderboom Airport only resumed scheduled flights to Cape Town on 16 August 2015 (see Cape Times 2015). ORTIA and the aforementioned airports (shown in Figure 5.2) constitute a commercial multi-airport system (MAS).

In 2011, the gross value added (GVA)[44] of the three metropolitan municipalities in Gauteng was as follows: City of Johannesburg MM had the highest GVA in the country at R437 billion; Tshwane MM, R262 billion; and Ekurhuleni MM, R170 billion (South African Cities Network 2013). This brief population and economic overview shows that ORTIA serves important economic and administrative centres, the majority of which are located outside the municipality that the airport is located within. This system of urban centres is typically referred to as the Gauteng functional city-region, which, according to OECD (2011) is largely aligned with the administrative borders of the Gauteng province. The City of Johannesburg contributes the most in all sectors (that is, towards the economy of the city-region), followed by Tshwane and Ekurhuleni. In 2007, the largest contribution of Ekurhuleni, at 26% of the city-region's total, was in the secondary sector driven by manufacturing. Exports from the province are also concentrated in the City of Johannesburg and Ekurhuleni, and between 1995 and 2008, the two municipalities contributed approximately 80% to the total provincial exports (OECD 2011).

In addition to population and economic attributes, the prominence of Johannesburg is also reflected by the inter-city relations at a global scale. According to Taylor (2009), in 2000, Johannesburg was part of the 123 cities with at least one-fifth of the highest recorded connectivity with other cities worldwide. In 2004, Johannesburg was part of the 109 cities with city network connectivity similar to the 2000 levels (Taylor 2009).

Given the manufacturing contribution above, it should be noted that industry in Ekurhuleni is focussed on the metals, chemicals and machinery, as well as plastic products; reflecting its origins as a support for mining activities in the broader province. Other important sectors in the Ekurhuleni's economy are finance, commercial services, trade and transport. The primary sectors of agriculture and mining play a very minimal role in the economy of Ekurhuleni. Although the manufacturing sector has declined relative to other sectors in Ekurhuleni, the economy is still concentrated on this sector (Ekurhuleni Municipality 2005). As shown in Chapter One, Section 1.4.1, it is important to note that ORTIA is one of the four Industrial Development Zones (IDZs) designated in the country between 2001 and 2010 (Nel & Rogerson 2013). ORTIA IDZ, known then as the Johannesburg International Airport IDZ was designated in 2002 (see South Africa 2002), but has had minimal success to date with respect to implementation. As highlighted in Chapter One, Section 1.4.1, from about 2011, Ekurhuleni MM, Gauteng provincial government, ACSA and other stakeholders have been promoting ORTIA and surrounds as the so-called aerotropolis.

[44] GVA is based on the calculation of difference between output and consumption in the economy.

ORTIA is surrounded by a diverse and substantial concentration of economic activities,[45] which emerged long before the aerotropolis initiative. The industrial areas around ORTIA were, among other locations, promoted for industrial development from the 1940s to drive the economy when gold mining declined (Fair 1956) (refer to evolution of the development in Section 5.3). The economic activities are located on the landside of ORTIA, and mainly at the areas of Isando, Jet Park, Spartan, Meadowdale, Elandsfontein and Pomona, which are contiguous with the airport (see Figure 1.3, in Chapter One). Notably, ORTIA and its environs represent one of the main concentrations of industrial activity in the Ekurhuleni MM. Other main industrial concentrations in the municipality are in Boksburg, Germiston, Wadeville and Alberton (Figure 5.3).

[45] A discussion of what was, in the dissertation, regarded as 'diverse and substantial' is provided in Chapter Four, Section 4.1.2.

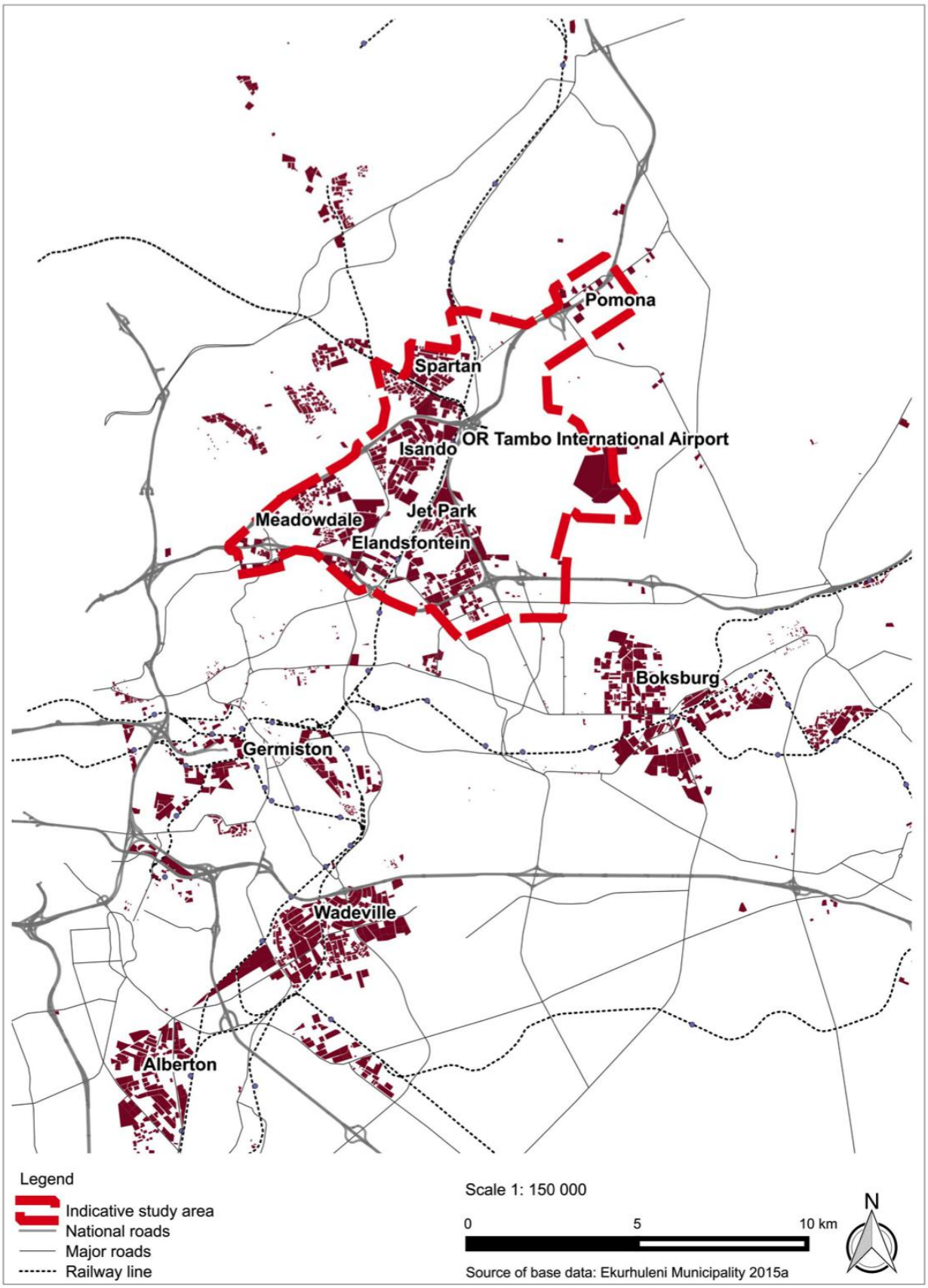

Figure 5.3 Concentrations of industrial activity in Ekurhuleni

5.2.2 Cape Town International Airport

Cape Town International Airport (CTIA) was opened in 1954, known then as the DF Malan Airport.[46] The airport was envisaged to be of lower international standard relative to ORTIA (de Freitas 1968). CTIA is served by about 21 passenger airlines with various intra-country and international destinations; and with annual passenger handling capacity of 14 million (ACSA 2014a), the airport accommodated over 8.7 million (8 755 872) passengers in the 2014/2015 financial year (Makhetha 2015, pers com), representing 25% of total passengers handled at all South African ACSA airports. It is important to observe that the handling capacity and the actual passenger numbers handled at CTIA is about half of ORTIA's. In 2014, CTIA handled 64 266 tons of cargo carried in cargo aircraft and bellies of passenger aircraft. Approximately 38 149 tons (59%) were transported internationally and 26 177 tons (41%) transported intra-country (Makhetha 2015, pers com).

In terms of passengers and cargo handled as highlighted above, CTIA is the second busiest airport in South Africa after ORTIA. As noted by Pirie (2010), unlike ORTIA which functions as a hub at a relatively central position in the country; due to being in a geographically isolated location at the bottom of the African continent, CTIA operates as a terminal.

CTIA is located approximately 19 km east of the Cape Town CBD, in the jurisdiction of the City of Cape Town metropolitan municipality (MM), in the Western Cape province. As a multi-nodal metropolitan area, Bellville, one of the main nodes in the City of Cape Town, is located 8 km to the north of the airport. Like Johannesburg MM, discussed in Section 5.2.1 above, Cape Town was in 2000 part of the 123 cities with at least one-fifth of the highest recorded connectivity with other cities worldwide (Taylor 2009). Because CTIA serves a larger catchment that extends beyond the municipal boundaries, the spatial economic characteristics of CTIA and Cape Town cannot be viewed in isolation of the surrounding towns and municipalities. Donaldson, Ferreira & Spocter (2012) use the term 'Cape Town hinterland functional region' to denote the main towns that are located in the geographical proximity of Cape Town.[47] These are Betty's Bay, Franschoek, Jamestown, Kalbaskraal, Klapmuts, Kylemore, Malmesbury, Paarl, Pniel, Pringle Bay, Stellenbosch and Wellington. Among these, the biggest are Stellenbosch, located in the

[46] The name of Cape Town International Airport (CTIA) was used throughout the study regardless of the time frame under discussion. At the time of its opening, CTIA was known as the DF Malan Airport, named after the then South African Prime Minister, Daniel Francois Malan. The current name of CTIA was used from the 1990s after the inauguration of the country's first democratic government.

[47] Other authors use the term 'Cape Town city-region' (see, for instance, OECD 2008).

Stellenbosch local municipality (LM), and Paarl in the Drakenstein LM. The town of Stellenbosch is located approximately 30 km east of CTIA. Paarl is located north of Stellenbosch, about 49 km from CTIA (see Figure 5.4).

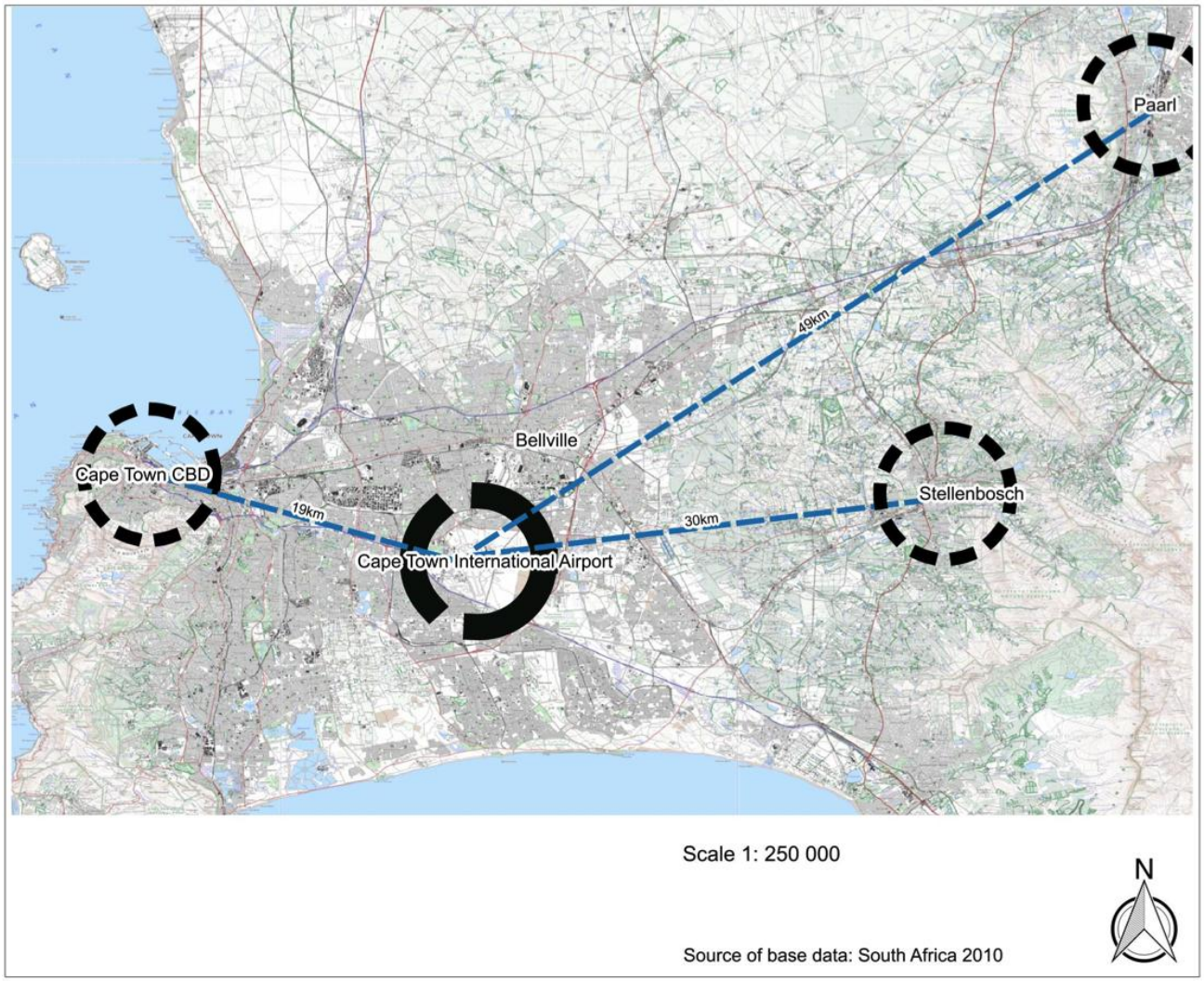

Figure 5.4 Location of Cape Town International Airport

It is crucial to overview the population figures of Cape Town functional region, so as to understand the extent of the catchment served by CTIA. The City of Cape Town MM is the second most populated municipality in South Africa, which had an estimated population of about 3.7 million (3 740 026) people in 2011. The Drakenstein LM, which Paarl and Wellington are located within, had a population of approximately 251 262 in 2011. Stellenbosch LM (which accommodates Stellenbosch, Franschoek and Pniel) had a population of 155 733 in 2011 (Statistics South Africa 2012b). Although not to the extent served by ORTIA (Section 5.2.1 above), CTIA serves a large population catchment. It should however be noted that the population figures highlighted above are modest because CTIA can be regarded as gateway to the entire Western Cape province: given that the other fully operational passenger airport (which

however does not offer international flights) is located in the town of George, approximately 430 km from Cape Town. Thus, unlike in the Gauteng city-region, there is no commercial multi-airport system (MAS) in the Cape Town functional region. In their evaluation of potential introduction of a second airport in the City of Cape Town, Zietsman & Vanderschuren (2014) conclude that the establishment of a MAS should not be considered in the medium term, accordingly recommending that commercial airport operations be concentrated at CTIA.

As regards the broader economic context, in 2011, the City of Cape Town GVA was estimated at R292 billion (South African Cities Network 2013), the second highest after the City of Johannesburg MM. In 2012, the sectoral contribution to the City of Cape Town GVA was dominated by finance and business services at 36.1%. Manufacturing followed at 16.4%; trade (15.8%); community services (14.9%); transport (11.0%); construction (4.0%); electricity (1.1%); agriculture (0.7%); and mining had a minimal contribution of 0.1% to the GVA (City of Cape Town Municipality 2014).

In 2011, the value of the City of Cape Town exports increased by 8.75% from R35.5 billion recorded in 2010 to R38.5 billion, while the value of imports increased by 33% from R100.6 billion to R133.7 billion (Wesgro 2013). It is evident from these figures that Cape Town imports far outweigh the exports. In 2010, the Netherlands was the top destination for the City of Cape Town exports; with European countries dominating the top ten export destinations. The Netherlands, United Kingdom, Germany, Unites States and China were strong markets for the City of Cape Town exports. In 2010, a 51% decline in exports to China resulted in that country dropping out of the top ten export markets; however, exports to China returned to ninth place in 2011 (Wesgro 2013).

In 2010, the City of Cape Town imports were primarily crude petroleum from Saudi Arabia, Iran, Nigeria and Angola (Wesgro 2013). It should be noted that given the trade sanctions on Iran, which were followed by South Africa stopping the importation of oil from Iran, this trend might have changed.[48] Wesgro (2013) further indicates that among the top ten import source markets, mineral fuels were the leading products for seven of the ten import source markets. Other imports included bituminous products, distillates, liqueur, spirits and under-natured ethyl alcohol, and medicaments. A year later in 2011, the fastest growing imports were oils petroleum, bituminous products and distillates, which grew by 80.27%. As regards exports, in 2010, top

[48] At the time of completion of the dissertation, the United Nations had just lifted the sanctions against Iran; but it was unclear if (and when) South Africa would resume importing oil from Iran.

exports from Cape Town were citrus fruit, centrifuges and filtering/purifying machines, followed by apples, pears and quinces. This indicates that agribusiness products dominated the top exports, which was also the case in 2011 (Wesgro 2013). CTIA handles 8% of the Western Cape imports value, and 17% of the total exports value. Approximately 8% of Cape Town imports are imported through CTIA (ACSA 2011). The airfreight volumes handled at CTIA are presented earlier in the section.

The discussion of imports and exports in the City of Cape Town cannot be complete without the mention of the seaport, which is located approximately 20 km to the west of CTIA. In comparing the two cases studied, it is important to note that while Cape Town does not have a commercial MAS (unlike the Gauteng city-region), it is endowed with a seaport. In their general discussion of seaports, White & Senior (1983) argue that seaports and airports have similar functions. They are places of maintenance and refuelling; and represent the interchange between different modes of transport: that is, air and surface (in the context of airports), and water and surface transport, in the context of seaports (White & Senior 1983). Cape Town's multi-purpose container terminal port was expanded in 2012 to double its cargo handling capacity to over 1.4 million containers per annum; and the products imported and exported through the port include oil, vehicles, chemical products, grains, and fruit (Central City Improvement District & Cape Town Partnership 2012). Furthermore, although located geographically far (about 130 km from Cape Town), the new Cape Saldanha Bay Industrial Development Zone (IDZ) cannot be disregarded. The IDZ was designated in 2013 at the Port of Saldanha Bay, and is envisaged to accommodate a variety of industrial activities.

In concluding the overview of CTIA, it is important to note that the airport is surrounded by a diverse and substantial concentration of economic activities, though not covering the land area to the extent of ORTIA and surrounds.[49] Firms accommodating various activities are located on CTIA landside and mainly at the areas of Airport Industria and Airport City that are contiguous to CTIA (refer to Figure 1.4, in Chapter One). Similar to ORTIA and surrounds, CTIA environs (Airport Industria and Airport City) are typically classified as an industrial area by the authorities, and considered to be one of the recognisable industrial nodes in the City of Cape Town. Other concentrations of industrial activity (the majority of which are larger than CTIA environs) are, among others, at the areas of Epping, Parow, Bellville, Brackenfell, Montague Gardens, Stikland, Blackheath, Paarden Eiland, Woodstock and Ottery (see Figure 5.5).

[49] Refer to Chapter Four, Section 4.1.2, for a discussion of what was, in the dissertation, regarded as 'diverse and substantial' concentration of economic activities.

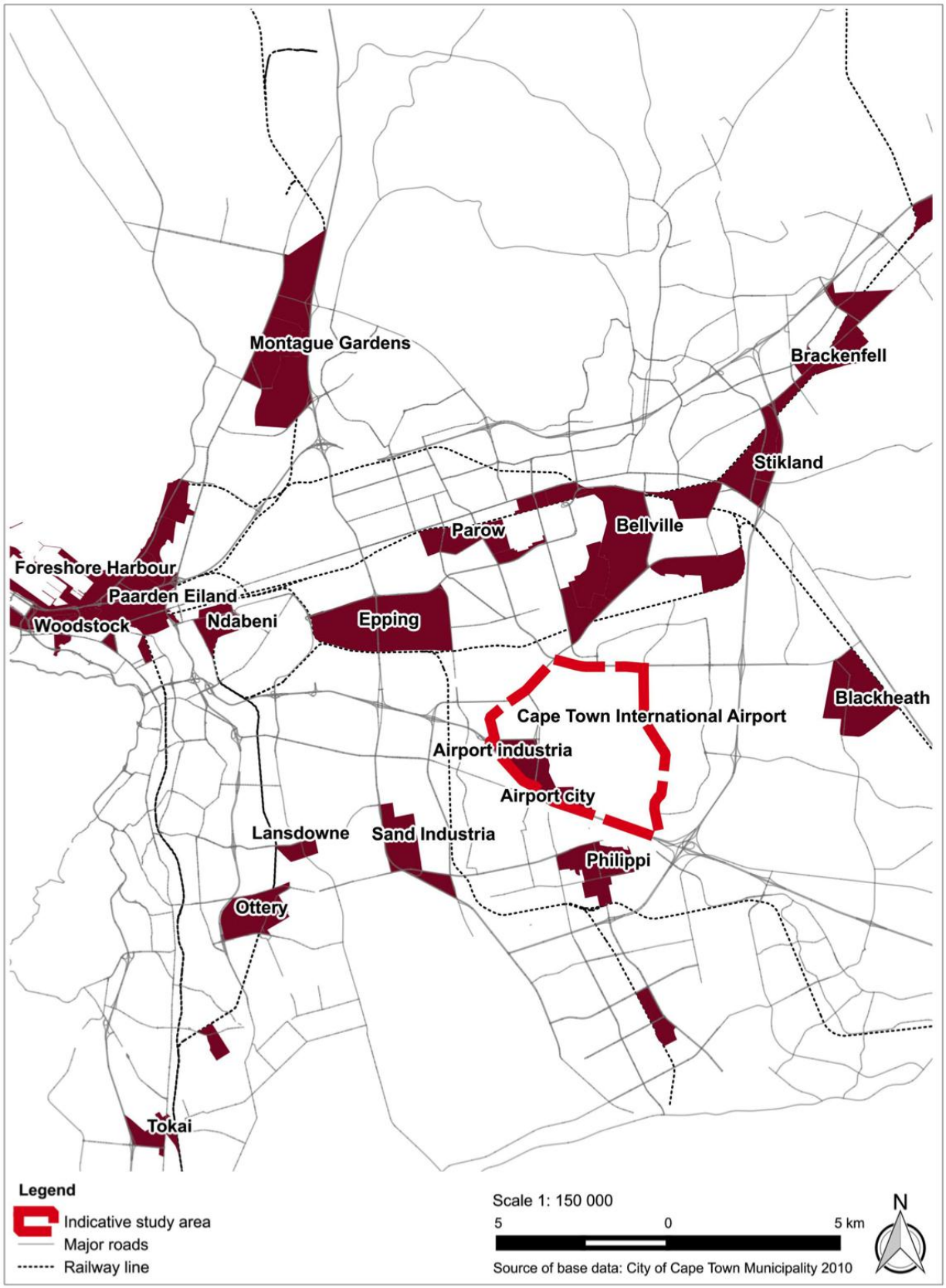

Figure 5.5 Concentrations of industrial activity in the City of Cape Town

5.3 EVOLUTION OF THE AIRPORT-CENTRIC DEVELOPMENTS OF THE CAPE TOWN AND OR TAMBO AIRPORTS

In light of a short description above of the type of land uses found around CTIA and ORTIA relative to the broader metropolitan areas, the current section presents a snapshot of the evolution of the two airport-centric developments. For each case study, the evolution is presented for six decades, namely the 1950s, 1960s, 1970s, 1980s, 1990s and 2000s. The section mainly uses maps, and in two instances where maps are not available, aerial photography is used. It should however be noted that the quality and clarity of the historical aerial photographs used might be questionable. This is because the photography was obtained as scans, instead of original digital photographs. An approach used to trace the evolution of the location of economic activities on the maps is through the identification of large buildings. Large buildings on the maps (in terms of extent of land area covered) represent non-residential activities, with community facilities specifically indicated with symbols such as P (for post office), PS (for police station), S (for school), and so on. Thus, buildings with no symbols are understood to accommodate commercial activities. Because the nature of activities accommodated in the buildings cannot be identified on the maps, other secondary sources of information are used to supplement the historical maps.

5.3.1 Cape Town and Johannesburg airport-centric developments in 1950-1959

In 1954, two years after the opening of ORTIA, the airport environs did not accommodate any substantial urban development; though urban layouts existed west of the airport, at Isando and Spartan (see Figure 5.6). At the time, there were already attempts to promote the airport environs (and other selected areas of the municipality) as industrial areas; as Swanepoel (2012) indicates that Isando was proclaimed as industrial township back in 1948. Fair (1956) explains that in certain areas of the then East Rand (now Ekurhuleni MM), there was a shortage of land proclaimed for industrial development. Because of the government's concern with the anticipated decline and demise of the mining industry, there was a need to identify a secondary industry to replace mining as a driver of the economy. As a result, from before 1948, local authorities introduced various inducements to attract industrial development (Fair 1956).

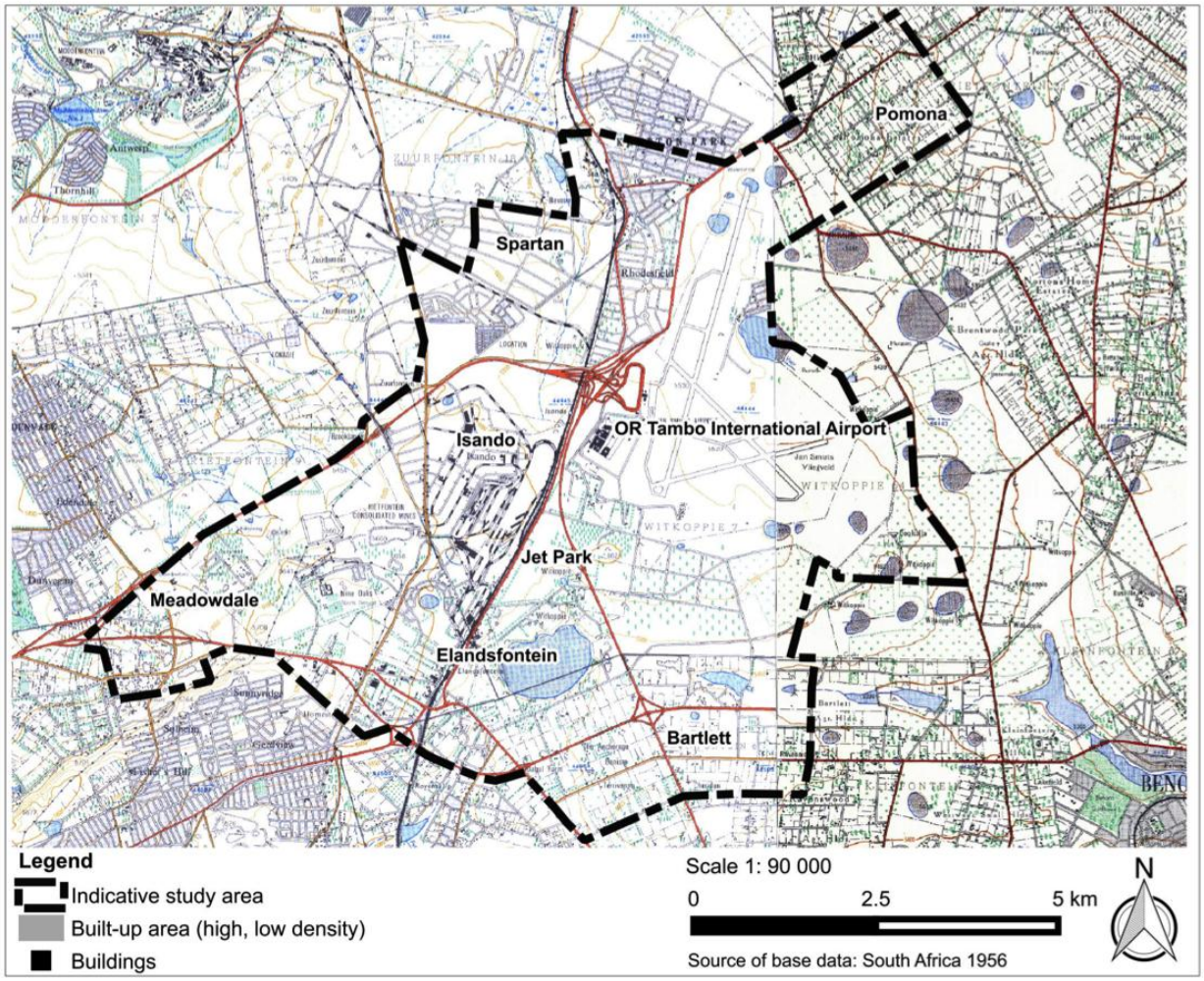

Figure 5.6 OR Tambo International Airport and surrounds in 1954

Figure 5.7 shows CTIA and surrounds in 1958, four years after the opening of the airport. At the time, there was no urban development on and around the CTIA, as the airport itself was established on a farmland.

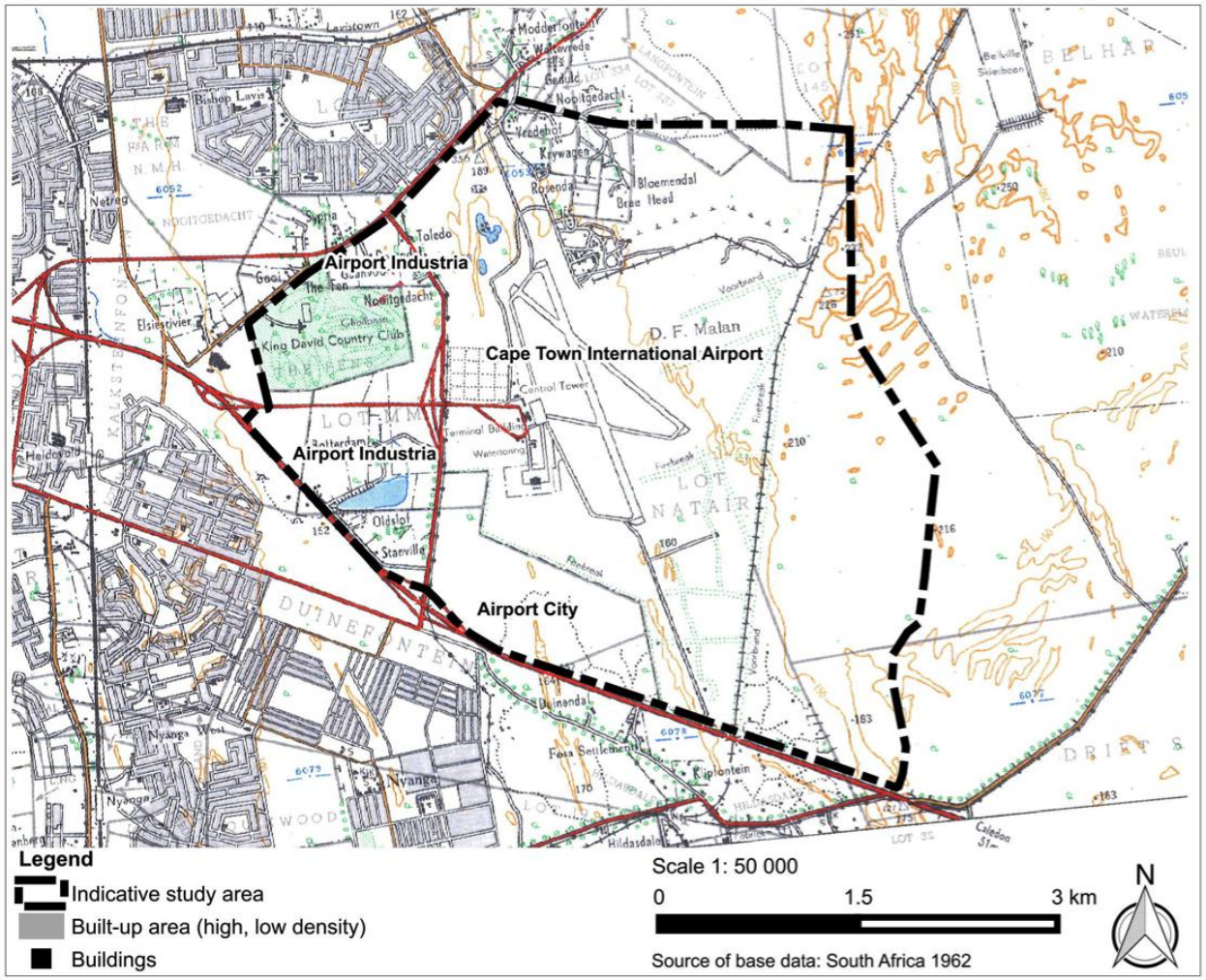

Figure 5.7 Cape Town International Airport and surrounds in 1958

5.3.2 Cape Town and Johannesburg airport-centric developments in 1960-1969

Figure 5.8 shows the environs of ORTIA in 1961, about nine years after the opening of the airport. At the time, the area was still predominantly agricultural and characterised by sparse urban activities. The area to the west (Isando) accommodated agricultural smallholdings in transition towards urban development. CDE (1997) notes that particularly in the early 1960s, municipalities in the former East Rand promoted industrial development by rezoning unused mining and agricultural land and establishing infrastructure and services for industrial townships. This land, typically situated along main roads and railway lines, was then sold to developers at cheap prices. In this way, the government implemented a business strategy to attract industrial activity for the economy to be sustainable in case gold mining faltered (CDE 1997), as noted by Fair (1956). It is important to note that in the 1960s, ORTIA was already a significant transportation hub that, according to de Freitas (1968), handled 476 626 passengers in the 1965/1966 financial year, and increased to over half a million (556 904) passengers in 1966/1967.

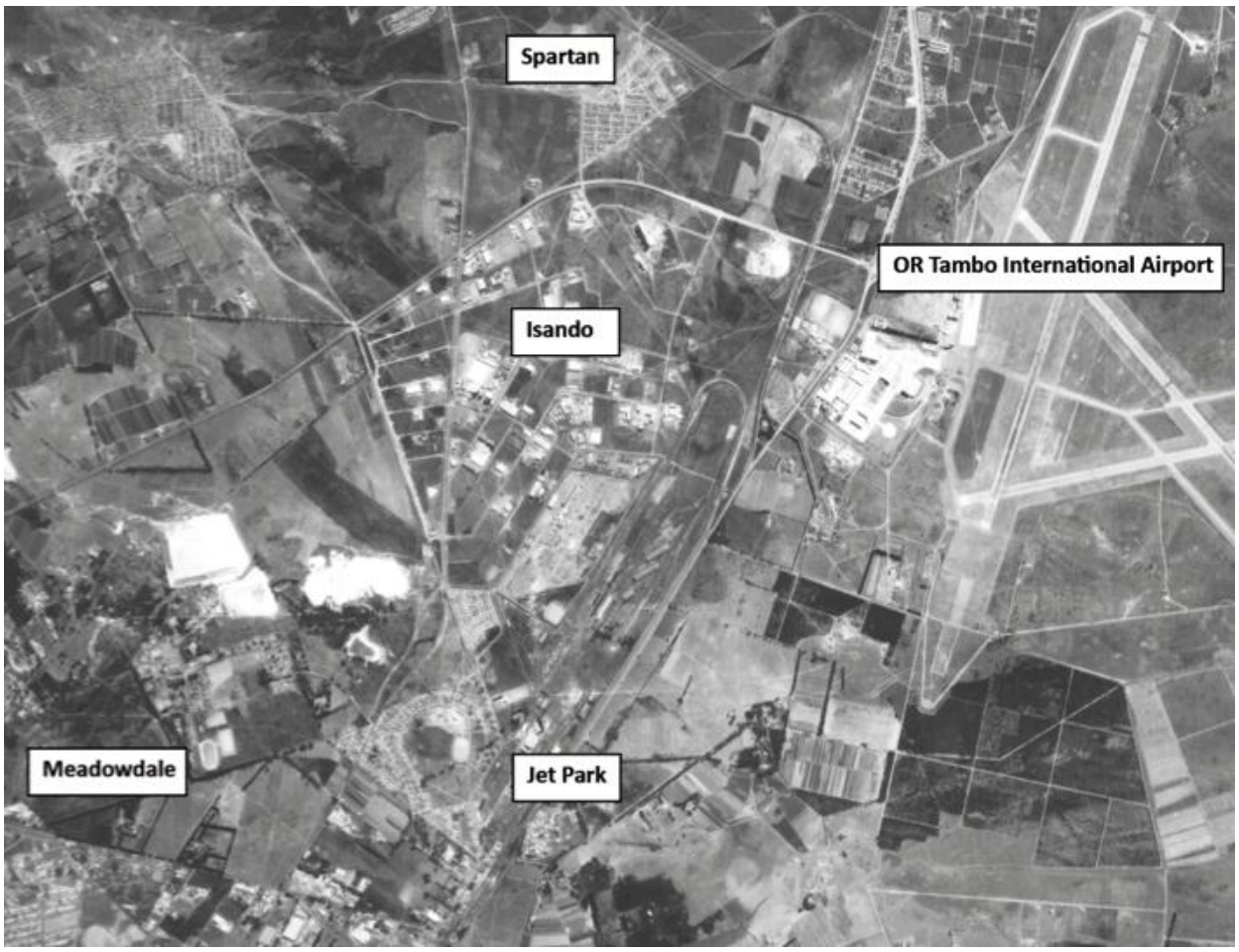

Figure 5.8 OR Tambo International Airport and surrounds in 1961 Source: South Africa 1961

In the 1965/1966 financial year, CTIA handled 294 905 passengers, and the numbers increased to 344 112 in 1966/1967 (de Freitas 1968). Figure 5.9 below shows CTIA and surrounds in 1966, when the airport had been operational for about 12 years. At the time, the area around CTIA was still undeveloped.

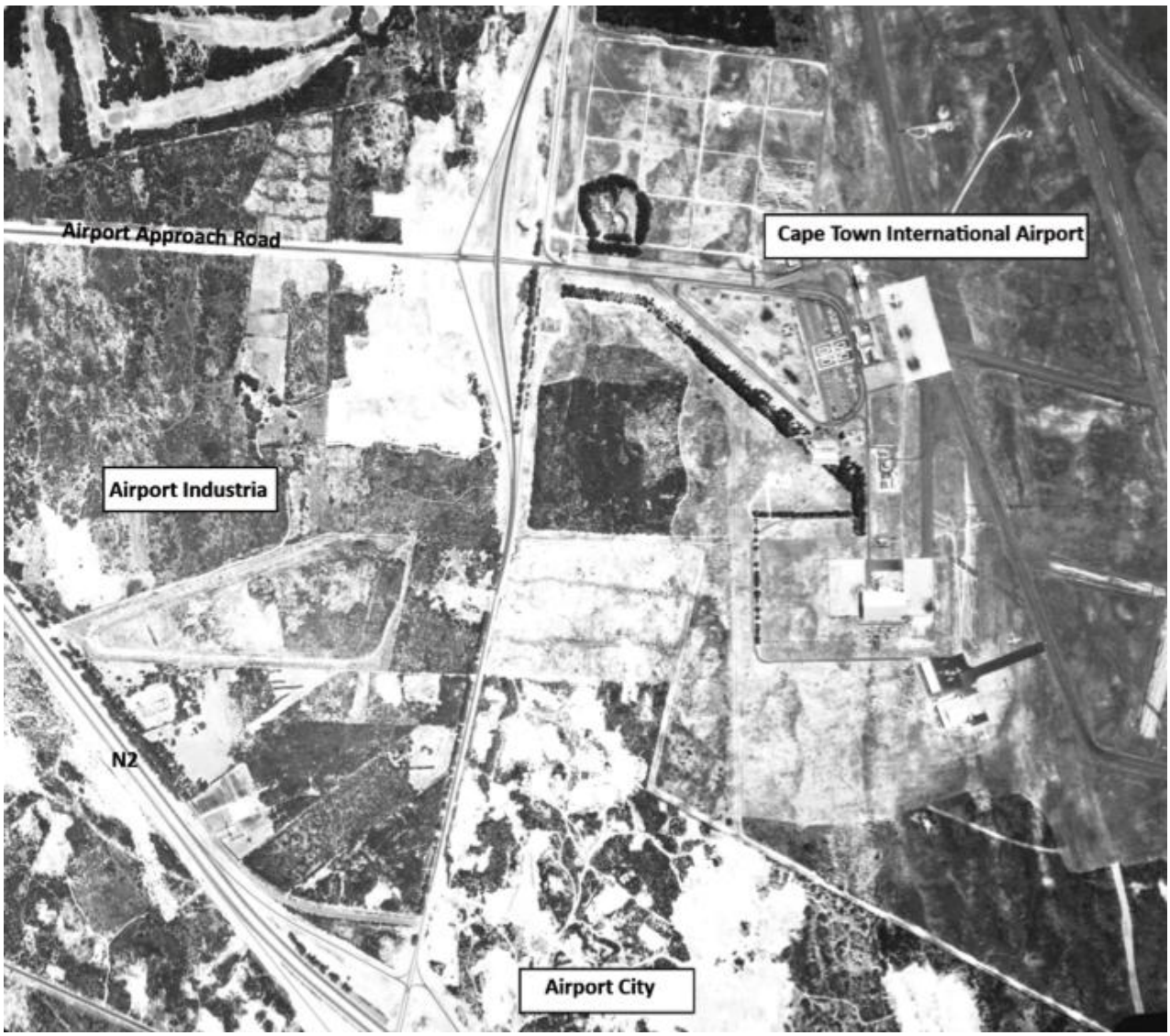

Figure 5.9 Cape Town International Airport and surrounds in 1966 Source: South Africa 1966

5.3.3 Cape Town and Johannesburg airport-centric developments in 1970-1979

In 1975 (about 24 years after the opening of ORTIA), Isando had transformed considerably to accommodate a substantial concentration of industrial activities. In addition to the initial proclamation in 1949 of Isando as industrial township, Swanepoel (2012) notes that Isando extensions 2, 3 and 4 were proclaimed in 1976 (following the proclamation of extension 1 in 1954). These proclamations would have allowed the increasing physical extent of industrial development visible in Figure 5.10 below. A concentration of economic activities had also emerged at Elandsfontein, to the south west of ORTIA. CDE (1997) indicates that around that time, there was a new concentration of firms particularly involved in storage, transport, communications and wholesaling along the railway lines, freeways, and close to ORTIA. Also, in the broader metropolitan context, producer service activities were developing to support the East Rand's manufacturing plants. Despite these changes, Meadowdale was largely undeveloped, and the urban development in Jet Park was sparse.

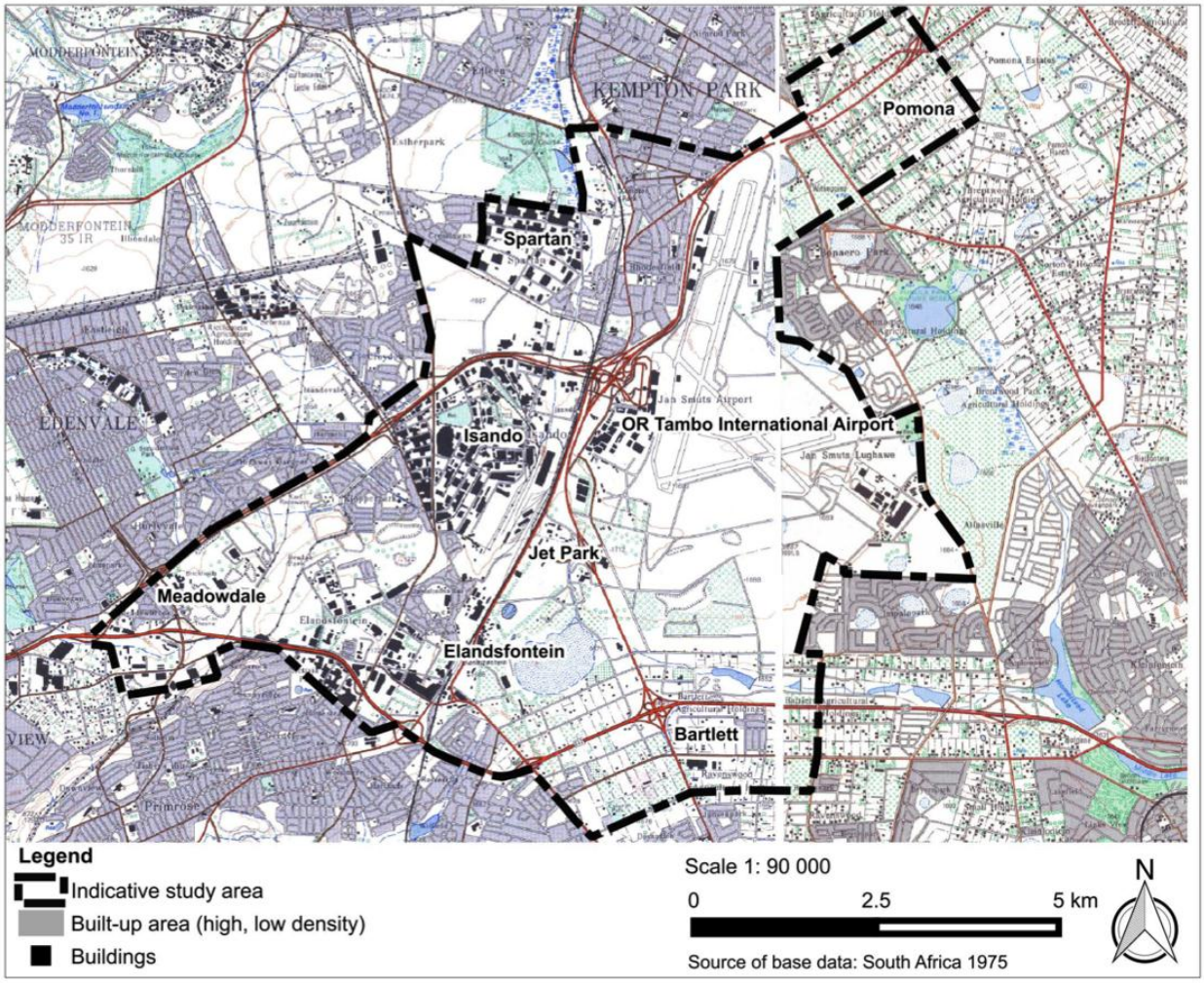

Figure 5.10 OR Tambo International Airport and surrounds in 1975

While Johannesburg airport-centric development was developing at a relatively quick pace, the emergence of development around CTIA was slow. A mapping exercise undertaken by Schuman (1975), pertaining to the extent of urban development in Cape Town, reflects that the environs of CTIA did not accommodate any urban development in 1974. As shown in Figure 5.11 below, towards end of the decade in 1979, the area around CTIA was still largely undeveloped (also see Cape Metropolitan Planning Committee 1980).

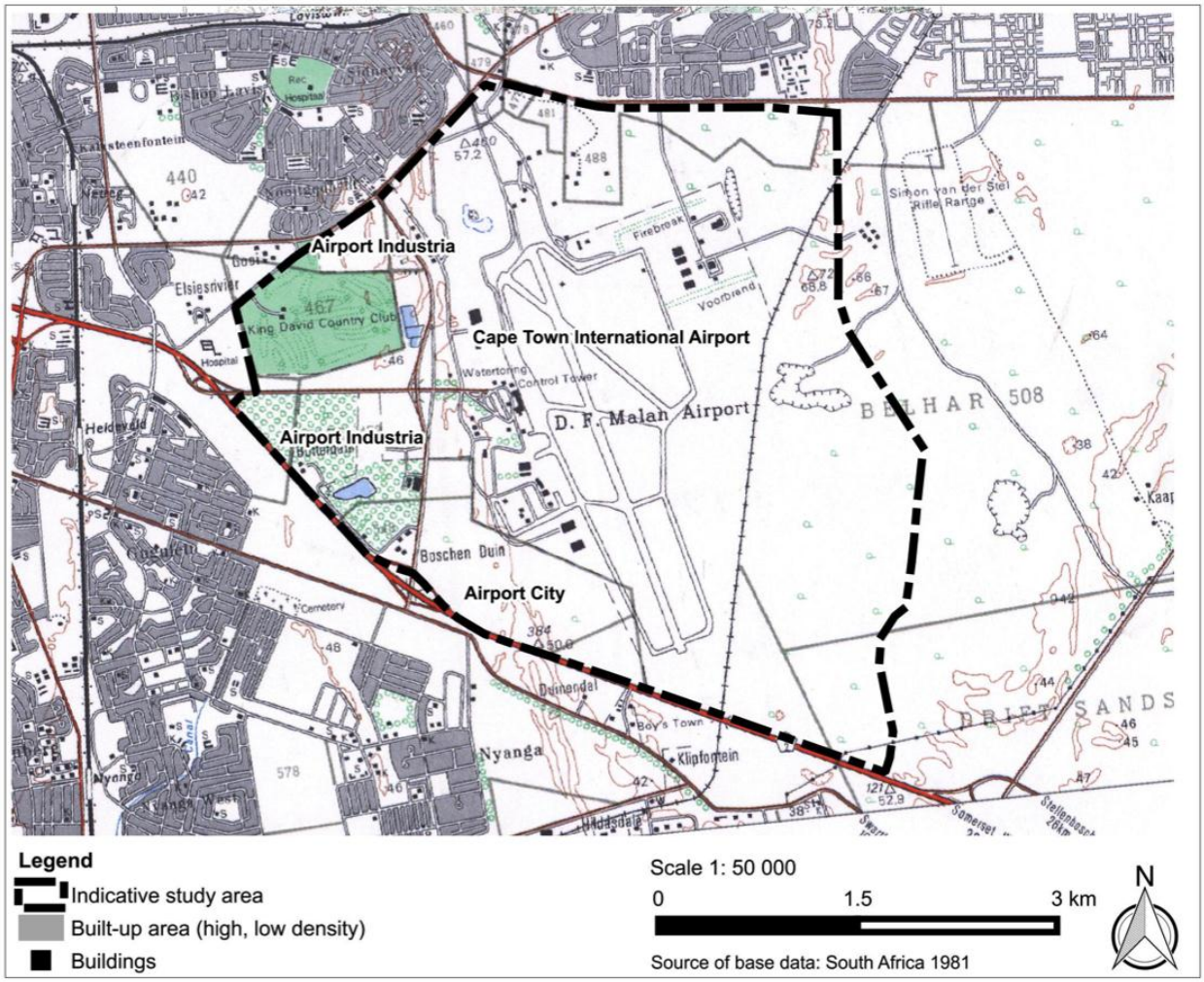

Figure 5.11 Cape Town International Airport and surrounds in 1979

5.3.4 Cape Town and Johannesburg airport-centric developments in 1980-1989

In 1983, there was further establishment of economic activities in Jet Park and Elandsfontein to the south west of ORTIA (Figure 5.12). The aforementioned areas, with Spartan and Isando, had transformed significantly to accommodate industrial activities (a discrepancy is however noted in that, in Figure 5.12, Spartan is shown as a built-up area, while it is indicated with buildings in the previous and subsequent maps). The 1980s is the decade that Rogerson (1998) discovered a concentration of high-technology manufacturing activities around ORTIA (see Chapter Two, for a review of Rogerson's work). According to CDE (1997), the decade of the 1980s was marked by a significant shift of industrial activities from the traditional manufacturing areas toward locations with freeway access close to ORTIA. As a result of this shift, rentals of industrial premises increased in Isando and new industrial properties were developed in Jet Park (CDE 1997).

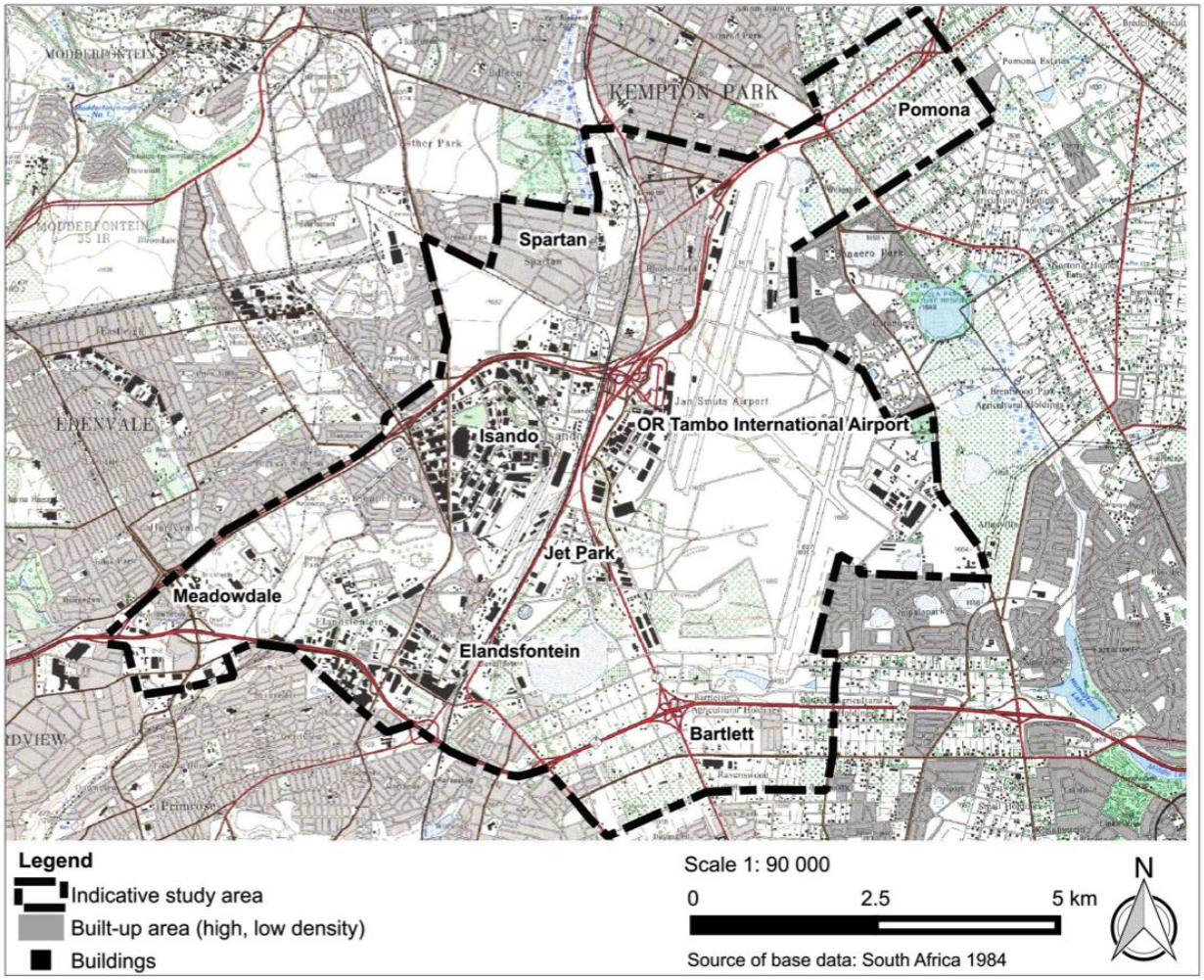

Figure 5.12 OR Tambo International Airport and surrounds in 1983

In Cape Town in the 1970s and 1980s, the government was trying to promote industrial activity in the vicinity of CTIA. In 1981, approximately 130 ha of land at Borcherds Quarry (now Airport Industria) was zoned for industrial purposes (City of Cape Town Municipality 1983), and the majority (79 ha) of that land was not occupied (Van Zyl 1981). The zoning of the area was consistent with the City's spatial planning policy, the Cape Metropolitan Area guide plan (1984), which designated Borcherds Quarry for industrial purposes (Guide Plan Committee for the Cape Metropolitan Area 1984). However, despite these attempts to promote industrial development, the spatial form of the environs of CTIA had not changed significantly in 1983, about 29 years after the opening of the airport (see Figure 5.13).

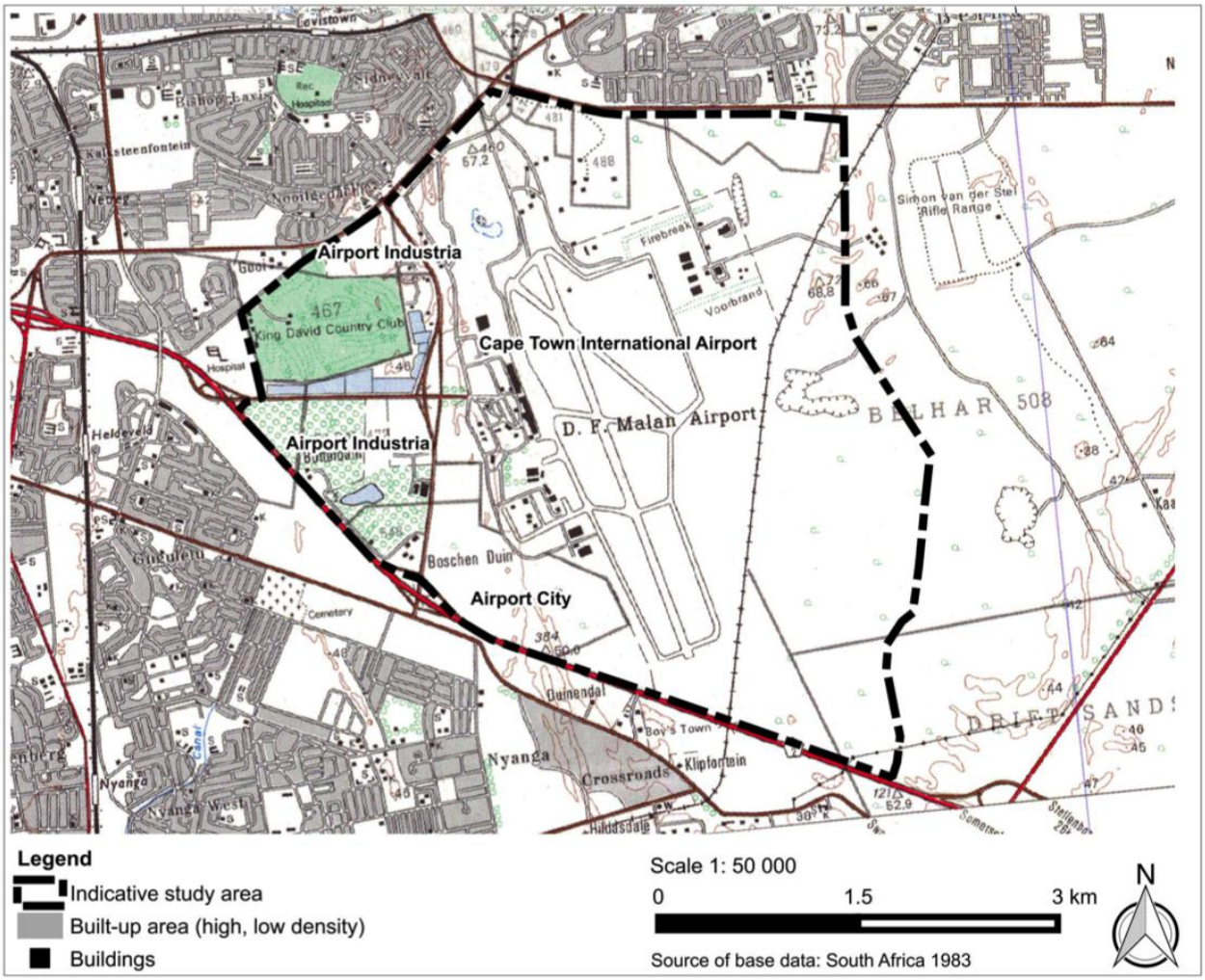

Figure 5.13 Cape Town International Airport and surrounds in 1983

5.3.5 Cape Town and Johannesburg airport-centric developments in 1990-1999

In the 1990s, according to CDE (1997), new just-in-time distribution methods resulted in the creation of distribution hub for logistics companies around ORTIA, including the construction of new warehousing facilities for both manufacturing and retail companies. In 1995, Jet Park was largely developed, in addition to the areas of Isando, Spartan and Elandsfontein. Around that time, establishments were beginning to emerge at Meadowdale to the far south west of ORTIA. A further change in the form of ORTIA and surrounds was also brought about by the cropping up of activities to the east of the airport premises (Figure 5.14).

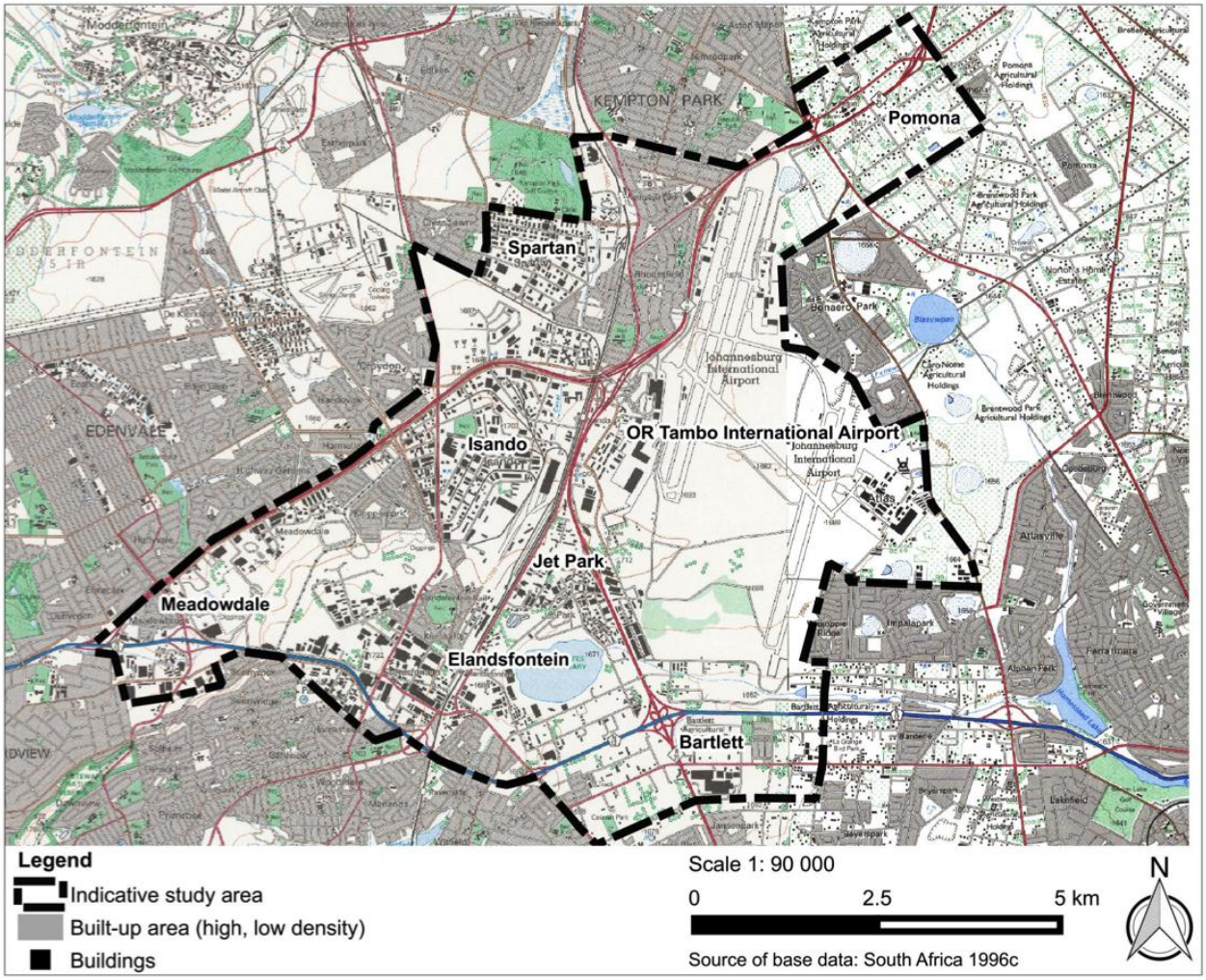

Figure 5.14 OR Tambo International Airport and surrounds in 1995

In 1993, as regards Cape Town airport-centric development, a trend could be identified of a new, but still small growth in warehousing and storage facilities close to CTIA (City of Cape Town Municipality 2002). As shown in Figure 5.15 below, the form of the environs of CTIA had changed considerably from the previous decade, particularly with more activities concentrating to the west of the airport, at Airport Industria. Around the time, ACSA also started to enable the landside to attract investment from industrial, freight and warehousing firms (City of Cape Town Municipality 2002).

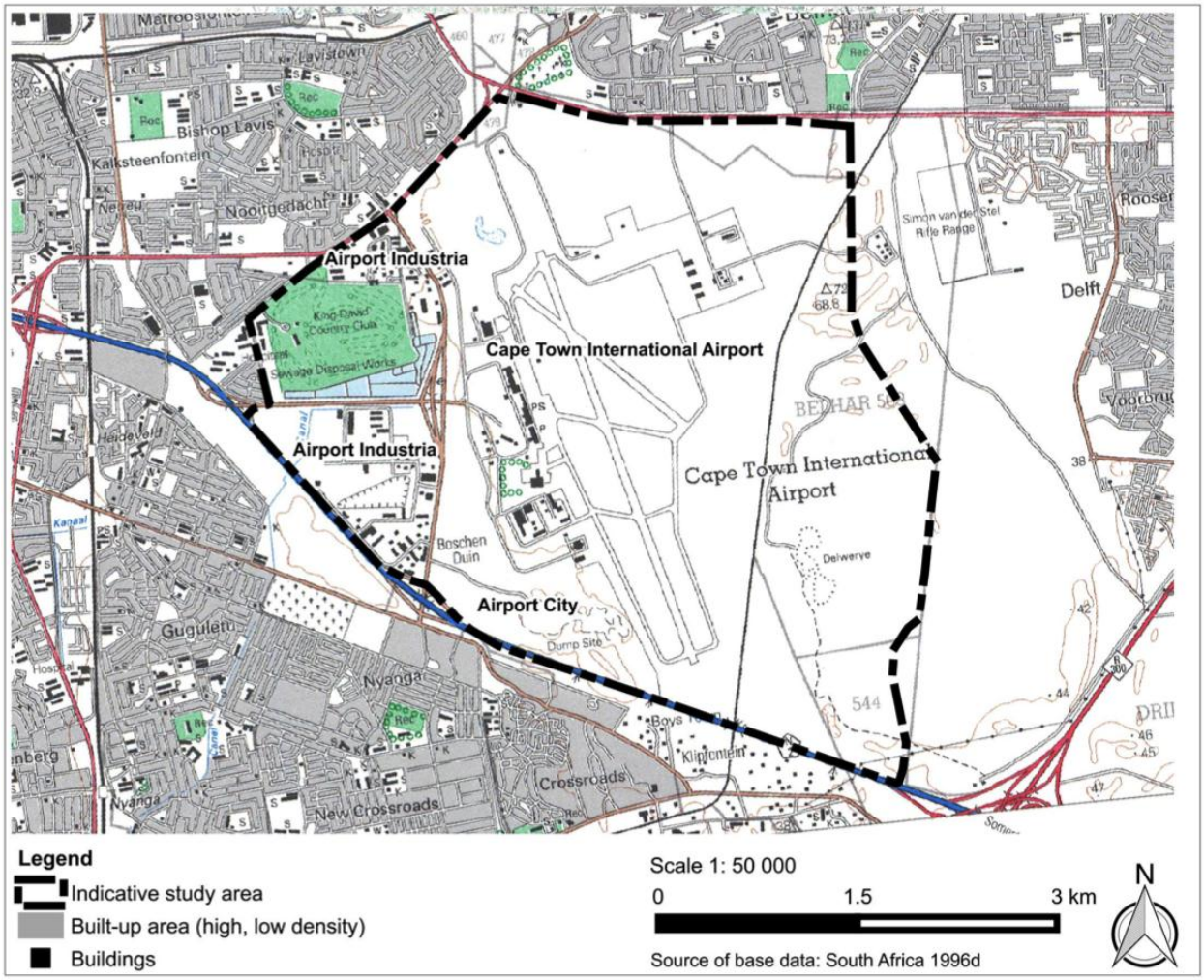

Figure 5.15 Cape Town International Airport and surrounds in 1993

5.3.6 Cape Town and Johannesburg airport-centric developments in 2000-2009

Figure 5.16 shows the environs of ORTIA in 2002. At that time, the development had extended to Bartlett, an area to the south of the airport, and Meadowdale was continuing to accommodate more urban activities.

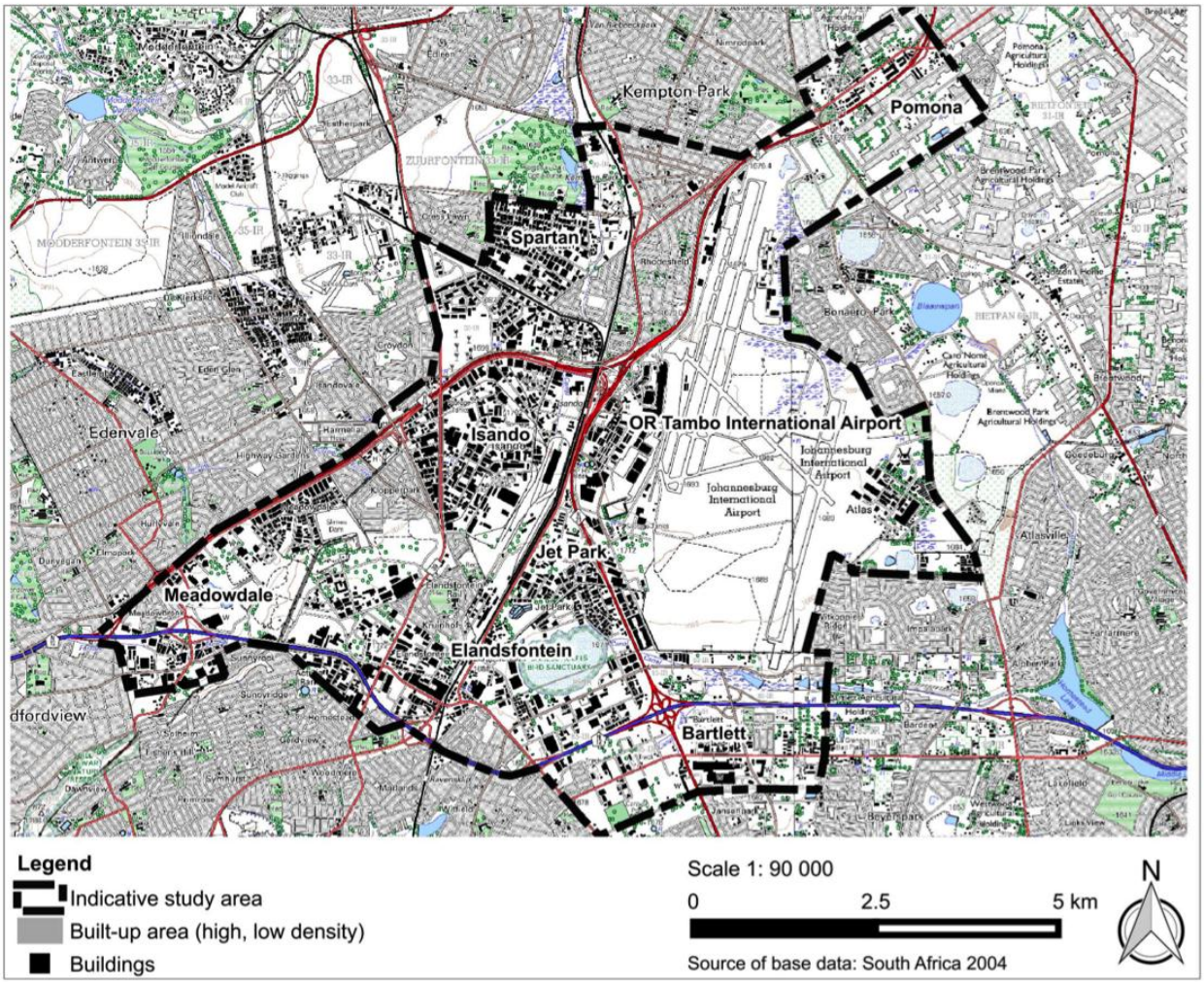

Figure 5.16 OR Tambo International Airport and surrounds in 2002

At CTIA and surrounds, a significant part of Airport Industria's land area was developed in 2000. At the time, Airport City to the south of CTIA was not yet established (see Figure 5.17). At a wider municipal area, Cape Town City Council (1992) notes that Montague Gardens had been the fastest growing industrial area since 1985 and other areas, including Airport Industria, had also grown over the same period. The location of Montague Gardens is shown earlier in the chapter, in Figure 5.5.

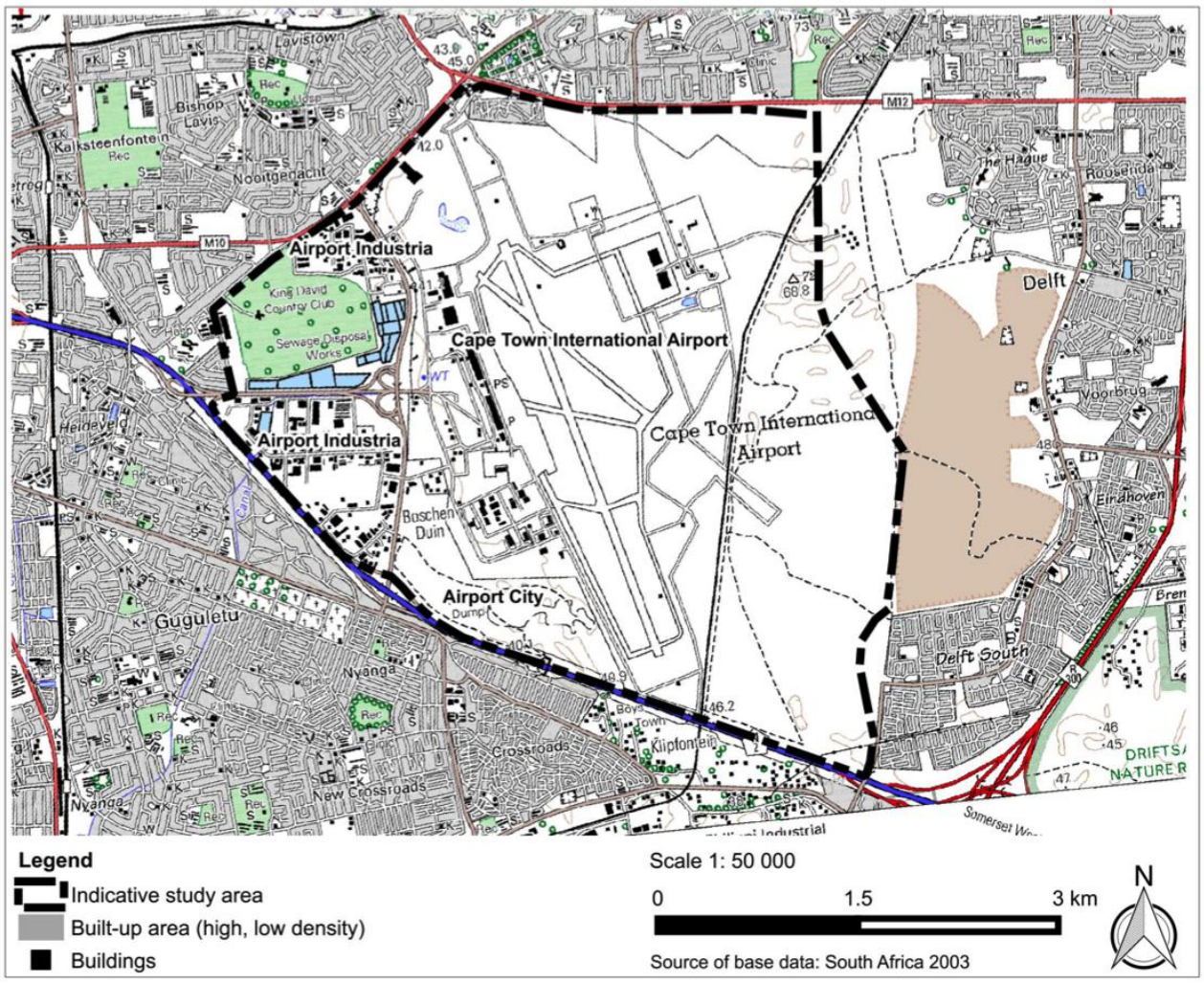

Figure 5.17 Cape Town International Airport and surrounds in 2000

5.4 SUMMARY

In preparation of the presentation of empirical findings in Chapter Six, this chapter introduced the spatial economic context of the two cases studied. The chapter noted that ORTIA and CTIA handle the largest volumes of passengers and airfreight in South Africa. These airports are located in the country's wealthiest locations of the Gauteng city-region and the Cape Town functional region; and Johannesburg and Cape Town are notably the only South African cities that feature prominently in the interactions between cities across the world. It was also noted that Cape Town and Johannesburg airport-centric developments are generally regarded as industrial nodes in Cape Town and Ekurhuleni respectively. Johannesburg airport-centric development has a longer history as it emerged significantly in the 1970s, while Cape Town airport-centric development emerged only in the 1990s. Johannesburg airport-centric development emerged from the rigorous attempts by the municipality to promote manufacturing activity to drive the economy when gold mining declined as anticipated. Compared to the environs of ORTIA, the industrial area around CTIA emerged and developed at a slow pace despite the area being

designated for industrial uses in the planning documents, and being zoned as such. With this background, the next chapter presents the findings of analyses conducted at the Cape Town and Johannesburg airport-centric developments.

6 SPATIAL ECONOMIC ATTRIBUTES OF THE AIRPORT-CENTRIC DEVELOPMENTS OF THE CAPE TOWN AND OR TAMBO AIRPORTS: EMPIRICAL FINDINGS

The preceding chapter provided an overview of the Cape Town and OR Tambo airports, and presented the evolution of development around the two airports. Prior to that, Chapter Four outlined the methodology and methods used to investigate forces that drive the location and mix of the airport-centric developments of Cape Town and OR Tambo airports. The current chapter presents the findings, which are based upon the survey and qualitative interviews conducted. Section 6.1 presents the findings of the airport-centric development of Cape Town Airport, herein referred to as Cape Town airport-centric development. Section 6.2 focuses on the airport-centric development of OR Tambo Airport, herein referred to as Johannesburg airport-centric development. The findings are presented as a synthesis of the three levels of analysis, that is, firms located around the airport, firms on the landside, and firms within the airport terminals. This combined presentation is informed by the response rate of 95% confidence level (at 5% interval) attained at the overall case study level (see Chapter Four, Section 4.2.3.4). However, where clarification is required because of anomalies, the findings are briefly presented at the individual level of analysis. Section 6.3 compares and contrasts the findings of the two cases studied. Section 6.4 summarises and concludes the chapter.

6.1 CAPE TOWN AIRPORT-CENTRIC DEVELOPMENT

The presentation of findings hereunder is organised into three closely interrelated components. The first part discusses employment characteristics of the Cape Town airport-centric development, and identifies forces that influenced the firms to locate on and around Cape Town International Airport (CTIA). The second part unpacks the linkages that characterise the Cape Town airport-centric firms. The third part synthesises the findings to identify the propulsive economic character of CTIA and the surrounding firms.

6.1.1 Employment size and locational characteristics

6.1.1.1 Employment size

Figure 6.1 below shows that the employment distribution of the Cape Town airport-centric firms is skewed towards the lower categories, showing that there are more firms that employ relatively low number of people. The employment of the firms at the case studied has a median of 19.5,

though with a large range of 691 between a firm with the lowest number of employees and a firm with the highest number of employees (see Table 6.1). The discussion of firm sizes is one of the factors necessary towards determining the propulsive economic qualities of CTIA and the surrounding firms, as discussed further in Section 6.1.3.

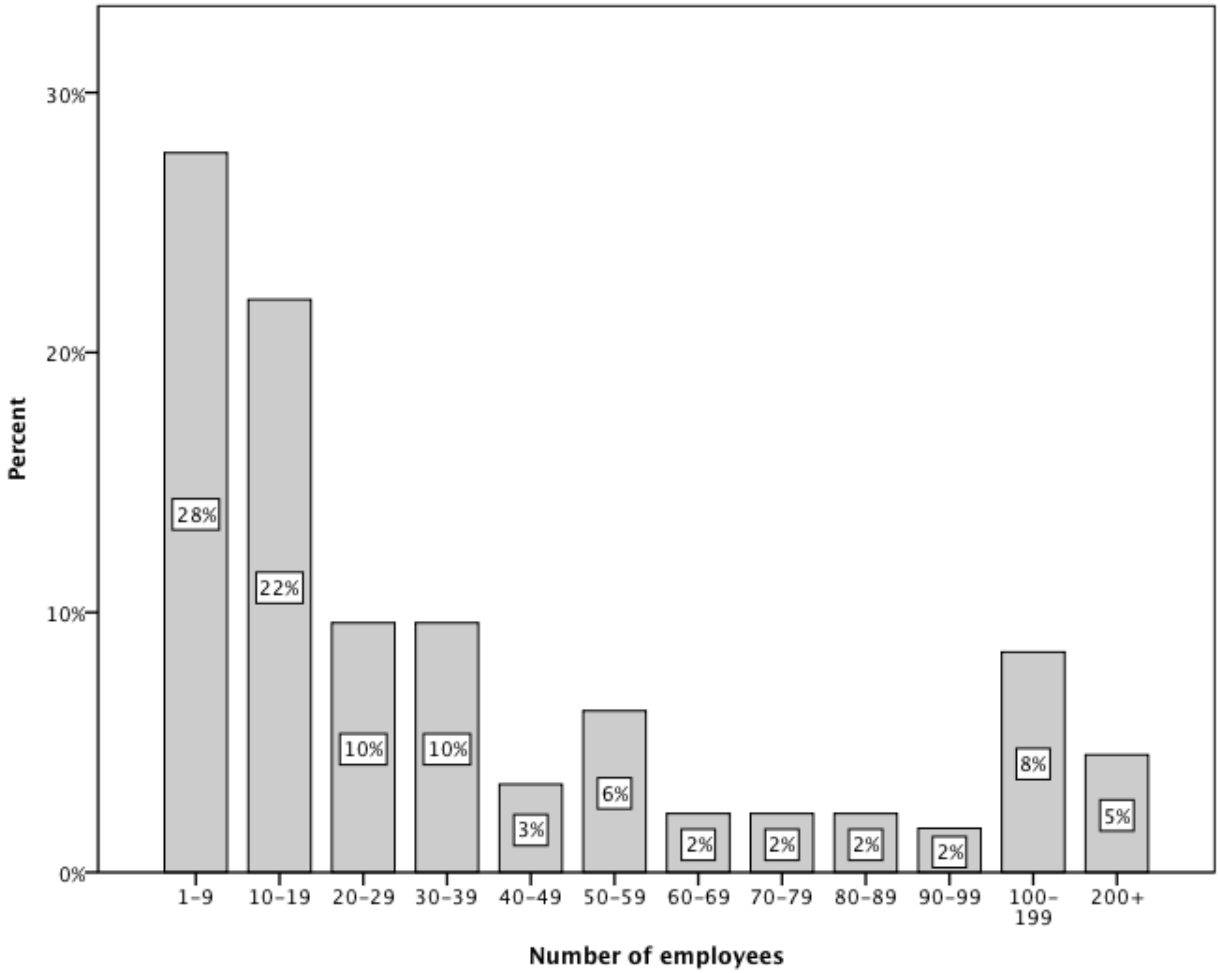

Figure 6.1 Cape Town airport-centric firms' employment distribution

Table 6.1 Cape Town airport-centric firms' employment central tendency and variation

N	Valid	176
	Missing	36
Mean		48.43
Median		19.50
Mode		5[a]
Std. Deviation		88.233
Variance		7785.103
Range		691

a. Multiple modes exist. The smallest value is shown

As shown in Figure 6.1 above, about 13% of the respondent airport-centric firms employ 100 or more people. Based on the criteria set by South Africa (1996b), 18 large firms were recorded at

the Cape Town airport-centric development as shown in Table 6.2 below.[50] These firms constitute about 9% of the sample investigated. The largest firm at the study area employs about 692 people.

Table 6.2 Large Cape Town airport-centric firms

	Type of firm	**Number of employees**	**Size of firm**
1	Manufacturing	200	Large
2	Transport, storage and related activities	590	Large
3	Transport, storage and related activities	400	Large
4	Transport, storage and related activities	300	Large
5	Transport, storage and related activities	200	Large
6	Transport, storage and related activities	172	Large
7	Transport, storage and related activities	150	Large
8	Transport, storage and related activities	120	Large
9	Transport, storage and related activities	105	Large
10	Transport, storage and related activities	100	Large
11	Wholesale and retail	180	Large
12	Wholesale and retail	120	Large
13	Other	692	Large
14	Other	320	Large
15	Other	160	Large
16	Other	100	Large
17	Other	100	Large
18	Other	100	Large

6.1.1.2 Cape Town forces of attraction

Analyses of spatial economic attributes of the Cape Town airport-centric firms need to go beyond the economic activity mix presented in Chapter Four, Section 4.2.2. A preliminary consideration necessary towards uncovering forces that drive the location and mix of the Cape Town airport-centric development was analyses of centripetal forces that attracted firms towards CTIA. Centripetal forces are the factors that contributed towards a concentration of firms on and around CTIA. Before identifying those forces, it was imperative to present the year of location of firms on and around CTIA as, in line with the argument of Garretsen & Martin (2010) and Massey (2005); the economic space of airport-centric firms cannot be sufficiently understood

[50] South Africa (1996b) classifies the size of firms in terms of three categories, namely number of employees, total annual turnover and total gross asset value. As regards number of employees, different sizes of firms are indicated according to the SIC categories. It should be noted that South Africa (1996b) does not make reference to large firms, and only discusses the ceiling number of employees required for a firm to be classified as micro, very small, small and medium. In the dissertation, the firms that exceed the maximum number of employees for a medium-sized firm were regarded as large.

independently of time (see Chapter Three, Section 3.1). It was equally important to discuss the locational behaviour of firms, particularly the relocation of firms from elsewhere towards CTIA.

The analysis of time factor was complicated by the fact that some firms previously changed premises within the study area (that is, on and around CTIA); and some respondents could not recall or did not know the locational details of the firm prior to the current location. To address this challenge, the year of location of a firm was considered to refer to the year of location at the current premises. The firms were then categorised into three groups and their characteristics investigated independently. These groups are: one, firms that have always been at their current premises, implying that the firms originated there. This means that such firms located at the current premises since their establishment, and not necessarily that the business idea originated at the current premises; two, firms that relocated to their current premises from elsewhere in the Cape metropolitan area, the functional region and the rest of South Africa; and three, firms that relocated from within the Cape Town airport-centric development, that is, within the study area. Different locational forces would presumably have influenced these groups; hence it was important to disaggregate the findings to find if indeed that was the case. Where relevant, this categorisation of firms is used in other sections of the chapter.

Table 6.3 shows that despite the fact that CTIA was established over 61 years ago, the majority (44%) of the Cape Town airport-centric firms were established at their current premises between 2000 and 2009. Firms established between 1990 and 1999 follow (at 25%), and at a third place are firms established at the current premises between 2010 and 2015. No firm was established on and around CTIA before the opening of the airport in 1954, which is not a surprise as the environs of CTIA was farmland at the time (see Chapter Five). The findings above show that Cape Town airport-centric firms are young in terms of their year of location at CTIA and surrounds.

Table 6.3 Cape Town airport-centric firms' year of location at the current premises

			Previous location of firm			Total
			In and around CTIA	Elsewhere in the city or region	Originated at the current premises	
Year of establishment at the current premises	**2010 - 2015**	Count	4	9	21	**34**
		% of Total	2.2%	5.0%	11.6%	**18.8%**
	2000 - 2009	Count	8	23	48	**79**
		% of Total	4.4%	12.7%	26.5%	**43.6%**
	1990 - 1999	Count	6	12	28	**46**
		% of Total	3.3%	6.6%	15.5%	**25.4%**
	1980 - 1989	Count	0	6	10	**16**
		% of Total	0.0%	3.3%	5.5%	**8.8%**
	1970 - 1979	Count	1	2	1	**4**
		% of Total	0.6%	1.1%	0.6%	**2.2%**
	1960 - 1969	Count	0	0	1	**1**
		% of Total	0.0%	0.0%	0.6%	**0.6%**
	1950 - 1959	Count	0	0	1	**1**
		% of Total	0.0%	0.0%	0.6%	**0.6%**
Total		Count	19	52	110	**181**
		% of Total	10.5%	28.7%	60.8%	**100%**

The matter of Cape Town airport-centric firms as subsidiaries of multi-locational firms is discussed later in the section. However, given the findings above regarding the young firms, a brief discussion is provided hereunder of the year of location at current premises for the airport-centric head offices and branches. This is done to uncover if different units have varying characteristics as regards their year of location on and around CTIA. Just about half (46%) of head offices were established on and around CTIA between 2000 and 2009. These are followed by 33% of the head offices that were established there between 1990 and 1999. Approximately 13% were established recently, between 2010 and 2015. No head office was established at CTIA and surrounds before 1970.

The majority (44%) of Cape Town airport-centric branches were established at their current premises between 2000 and 2009. Following these are branch firms that were established between 2010 and 2015, with a representation of 22%. About 21% were established between 1990 and 1999; and 10% were established at the case studied between 1980 and 1989. This brief outline indicates that regardless of whether the Cape Town airport-centric firms are head offices or branches, the majority were established at their current premises on and around CTIA between 1990 and 2009.

In light of the findings above that show the young nature of the Cape Town airport-centric firms, it was crucial to explore their locational behaviour, as regards the locational flexibility (relocation) (see Stam 2007). The majority of Cape Town airport-centric firms show limited locational flexibility, given that 58% have always been at their current premises, that is, they originated there. Over a quarter (31%) of the firms relocated from other parts of the Cape metropolitan area, but does not necessarily imply the firms originated from within Cape Town, as some might have relocated from elsewhere towards Cape Town. The areas in the Cape metropolitan area that 31% of airport-centric firms moved from, include Ndabeni, Woodstock, Epping, Montague Gardens, Bellville and Cape Town CBD, which are all within a distance of 20 km from the case studied. Notably, the relocations reflect movement from other Cape Town's industrial concentrations as discussed in Chapter Five and depicted in Figure 5.5. Approximately 11% of the firms relocated from within CTIA and surrounds.

At this juncture, given the disparities in locational flexibility of Cape Town airport-centric firms between the levels of analysis, it was pertinent to disaggregate the findings. The first category covers firms located within the terminals of CTIA, whereby all of them (100%) originated at the current premises. The second category is firms that are located around CTIA, whereby 43% of them originated there; meaning that prior to the current premises, 57% of the firms around CTIA relocated from elsewhere. The third group includes firms located on the landside of CTIA, wherein 72% of them originated there, implying that 28% moved from elsewhere. The findings above show that forces of attraction are potentially more influential on firms that are located on the landside and terminals, given that most of them originated at CTIA. It can be partially argued that the firms within the airport premises show a higher level of certainty in making the decision of locating there than firms outside the premises. The matter is however more complicated and the details could not be extracted from investigations conducted in the study. For instance, firms that locate on the landside and terminals operate there on the basis of lease agreements with the landowner, the Airports Company South Africa. This implies that a firm that is currently located on particular premises (on the landside or terminal) does not necessarily reflect complete satisfaction with the location of the current premises. Once the forces of attraction towards the airport have acted, other forces, including legal obligations in terms of standing agreements might be at play to keep the current airport-centric firms on the airport premises.

With the findings of the year of location of firms, and their locational behaviour in the background, the section culminates in the identification of centripetal forces, as regards reasons the firms chose to locate at the current premises on and around CTIA. Figure 6.2 shows that the

majority (44%) of the Cape Town airport-centric firms chose their current premises because they wanted to be geographically proximate to CTIA, customs offices and the associated concentration of logistics firms. The findings therefore show that CTIA is a significant force of attraction in the location of firms. The centrality of the study area to markets, clients and business associates are also important factors given that they influenced 32% of the airport-centric firms to locate at the current premises on and around CTIA.

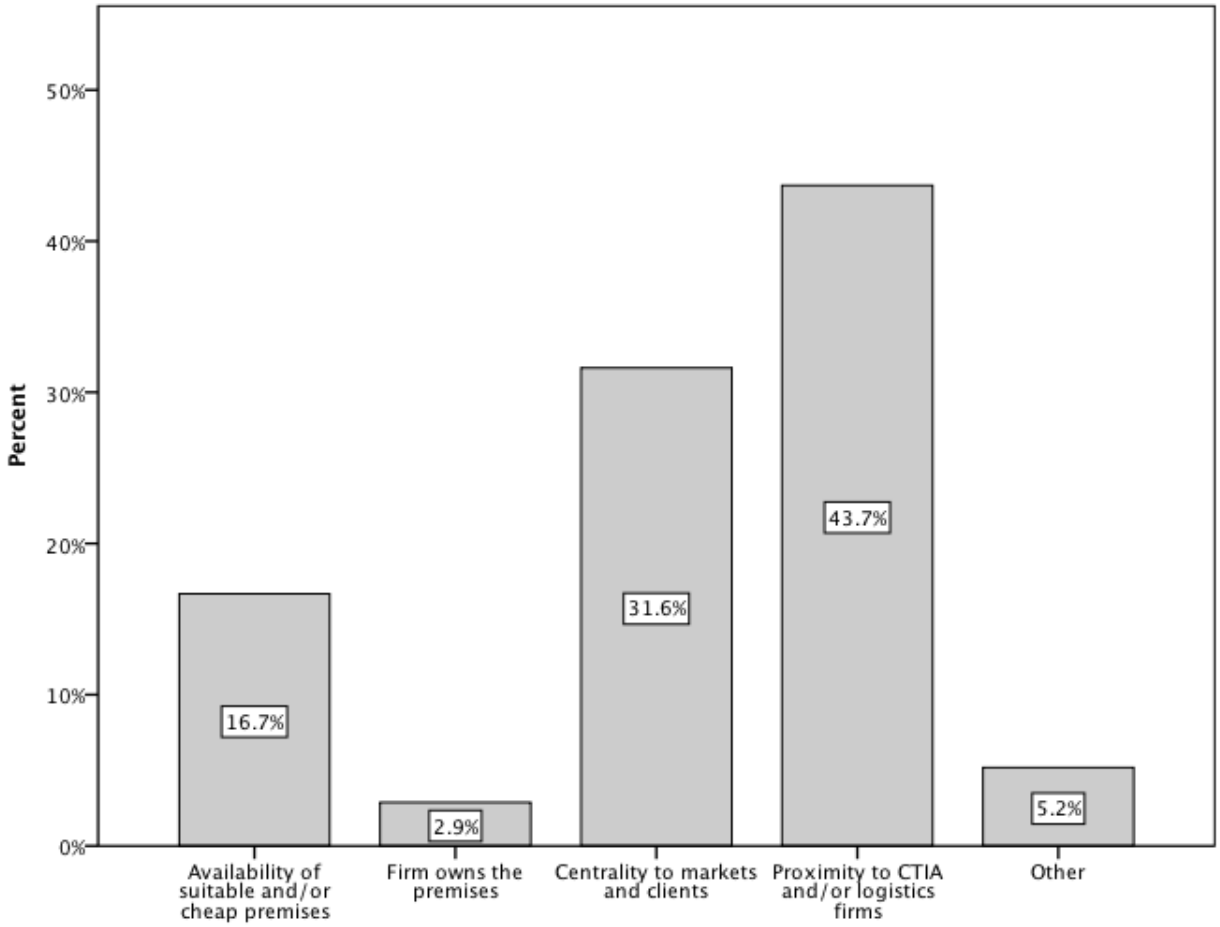

Figure 6.2 Factors that influenced the Cape Town airport-centric firms' choice of location

6.1.1.3 Economies internal to the firm

Against a backdrop above of CTIA being a significant force of attraction in the location of firms, this section investigates elements of aspects of internal economies that are potentially reaped by the Cape Town airport-centric firms. The section also aims to discover whether the benefits make use of agglomeration economies (based on linkages that utilise geographical and organisational proximity) or dispersion economies based on linkages that utilise organisational proximity.

Internal economies are considered below through the discussion of Cape Town airport-centric firms as subsidiaries of multi-locational firms. It should however be remembered that a multi-locational structure does not automatically generate internal economies. Franchising is a good case in point, and is overviewed below. This discussion of franchises was also motivated by the need to investigate the unequal intra-firm relationships, given that the different units of a firm possess different levels of power (Pred 1977). This consideration would therefore yield insights into the role of the Cape Town airport-centric franchise firms in the web of unequal business relationships. Franchising is a business arrangement where the franchisor grants a firm or individual (known as the franchisee) the right (franchise) to conduct business in a prescribed manner in a specific place, and over a certain period (Vaughn 1979). To protect the franchise brand, the franchise agreement grants the franchisor power to exercise control over the operations of the franchise units. This control is achieved through a prescription of the manner the franchisees should conduct business. Head offices of the franchisors control and monitor the franchise firms through overseeing the franchise agreements.

Given that a franchise agreement only stipulates business relationship between the franchisor and a franchisee, the franchise firms have business linkages only with their head offices and not necessarily with each other. The units are therefore not part of the same intra-firm economic space, even though they have the same business name, identity and branding. Hence, the franchise arrangements do not generate internal economies. It was crucial to investigate the proportion of franchise firms at and around CTIA, and determine whether they are head offices or branches. If branches, it would be informative to understand where their head offices are located, so as to understand where they are functionally controlled on how to run their operations.

Only 7% of Cape Town airport-centric firms are franchises. None of them are head offices (franchisors), implying that their structural control is elsewhere. Approximately 48% of the head offices of these franchise firms are located within the Cape metropolitan area, and 40% are located in Johannesburg. The dominance of Cape metropolitan area in the location of franchisors points to some relevance of geographical proximity in the franchisee-franchisor relationships. Vaughn (1979) notes that a number of factors are normally taken into consideration in determining whether to establish a franchise at a particular location. The decision can be influenced by geographical distance from the head office; and upon market potential, which denotes the number of potential customers that the goods would be sold to, or services offered to (Vaughn 1979). This brief discussion culminates in the argument that although franchises are

part of multi-locational firms, they do not benefit from internal economies because of the absence of linkages between the different franchise units. The discussion to follow therefore excludes franchises, and focuses only on the Cape Town airport-centric firms that potentially benefit from internal economies due to intra-firm linkages.

Just over three-quarters (76%) of Cape Town airport-centric firms are subsidiaries of multi-locational firms that potentially have intra-firm linkages occurring within a framework of head offices and branches. Table 6.4 below shows that the majority of these are transport-oriented firms, which are a group dominated by couriers, freight carriers, and airlines. These represent 83% of all respondent transport-oriented firms at CTIA and surrounds (see Chapter Four), which is a strong indicator of the intra-firm relational nature of this group of firms.

Table 6.4 Cape Town airport-centric firms that are subsidiaries of multi-locational firms

			Yes	No	Total
Type of firm	Manufacturing	Count	**13**	14	27
		% of Total	**6.4%**	6.9%	13.2%
	Transport, storage and related activities	Count	**69**	12	81
		% of Total	**33.8%**	5.9%	39.7%
	Wholesale and retail	Count	**37**	11	48
		% of Total	**18.1%**	5.4%	23.5%
	Accommodation and catering	Count	**4**	0	4
		% of Total	**2.0%**	0.0%	2.0%
	Car repair, tyre dealer, testing and repair of machinery	Count	**6**	5	11
		% of Total	**2.9%**	2.5%	5.4%
	Other	Count	**25**	8	33
		% of Total	**12.3%**	3.9%	16.2%
Total		**Count**	**154**	50	204
		% of Total	**75.5%**	24.5%	100%

The different firms that are part of multi-locational firms possess varying levels of power and control, with a head office at the top of the hierarchy and thus coordinate the activities of a firm (Pred 1977). Given the unequal intra-firm structures, it was pertinent to investigate the locational distribution of different units of multi-locational firms. Such analyses were necessary towards achieving two things: one, to determine where the intra-firm economic space is controlled; and two, to uncover whether the intra-firm linkages make use of geographical proximity and/or organisational proximity. As shown in Table 6.5, about three quarters (76%) of Cape Town airport-centric firms that are subsidiaries of multi-locational firms are branches. Head offices at CTIA and surrounds have a low representation of less than a quarter, that is, 17%. The findings

therefore show that Cape Town airport-centric firms (that are subsidiaries of multi-locational firms) are predominantly controlled elsewhere, not at CTIA and surrounds. The locations of the head offices are discussed below to identify if the intra-firm linkages potentially generate elements of agglomeration economies or elements of dispersion economies.

Table 6.5 Cape Town airport-centric head office and branch firms

			Head Office	Branch	Other	Total
Type of firm	Manufacturing	Count	4	6	0	10
		% of Total	2.8%	4.2%	0.0%	6.9%
	Transport, storage and related activities	Count	11	51	6	68
		% of Total	7.6%	35.4%	4.2%	47.2%
	Wholesale and retail	Count	1	33	2	36
		% of Total	0.7%	22.9%	1.4%	25.0%
	Accommodation and catering	Count	0	2	0	2
		% of Total	0.0%	1.4%	0.0%	1.4%
	Car repair, tyre dealer, testing and repair of machinery	Count	2	3	0	5
		% of Total	1.4%	2.1%	0.0%	3.5%
	Other	Count	7	15	1	23
		% of Total	4.9%	10.4%	0.7%	16.0%
Total		**Count**	**25**	**110**	**9**	**144**
		% of Total	**17.4%**	**76.4%**	**6.3%**	**100%**

Given the dominant representation of branches in the composition of Cape Town airport-centric development, it is important to discuss the location of the head offices of these firms. The locations within South Africa were grouped in terms of the eight metropolitan municipalities. These are Cape Town, Johannesburg, Ekurhuleni, Tshwane (Pretoria), Mangaung (Bloemfontein), eThekwini (Durban), Buffalo City (East London) and Nelson Mandela Bay (Port Elizabeth). These locations denote the municipal areas, and are therefore not limited to specific cities or towns within the municipalities. The respondents could not distinguish the Johannesburg municipal area from Ekurhuleni, and they referred to locations in Ekurhuleni as Johannesburg. Johannesburg and Ekurhuleni were therefore grouped to avoid errors in the analyses. Other locations in South Africa, besides those mentioned above, were classified under the ‘other’ category.

About 90% of head offices of Cape Town airport-centric branches are located in South Africa. Given that linkages exist between franchise units and their head offices, the findings presented here encompass head offices of franchise firms. It should be noted that the number of head offices recorded is not equivalent to the number of branches, as some firms have two or more

head offices. This is a normal arrangement of multi-locational firms, which would have divisional head offices functioning as the second highest level (behind the organisation-wide head office) of the firm's internal structure (see, for instance, Pred 1977). Approximately 59% of the head offices are located in the Johannesburg-Ekurhuleni area. This shows that the Cape Town airport-centric branch firms make use of organisational proximity in the intra-firm linkages with the head offices. Less than a quarter (18%) of the head offices are located within the Cape metropolitan area. A minimal proportion (3.9%) of head offices are located in Durban; 3.1% in Port Elizabeth; and the same number is located in Europe. The absence of head offices within the study area shows that the branches do not make use of agglomeration economies based on internal economies. Rather, given the high proportion of head offices in the Johannesburg-Ekurhuleni area, the branches can be regarded as potentially benefitting from dispersion economies based on the linkages that make use of organisational proximity.

The results above on the location of head offices also show that the Cape Town airport-centric firms have intra-firm structural relations controlled in the Johannesburg-Ekurhuleni area, than in the Cape Town metropolitan area. Significantly, 20% of Cape Town airport-centric branch firms have their head offices located within the Johannesburg study area discussed in Section 6.2 of the chapter. This finding shows a significant level of intra-firm linkages between the dissertation's two cases studied. Further, it reflects a level of organisational control of the Johannesburg airport-centric firms over their Cape Town counterparts.

Besides linkages with their head offices, Cape Town airport-centric branch firms are part of a wider intra-firm network, including other branches. Franchises are excluded from the findings below, as linkages do not necessarily exist between the franchise units. Cape Town branch airport-centric firms are part of the intra-firm economic space including a total of 648 other units. Over half (63%) of Cape Town branch airport-centric firms have smaller intra-firm economic space including the head office(s) and between 1 and 4 other branches, stores or outlets. About 16% of the firms have between 5 and 9 other units of the same firm. Approximately 12% of Cape Town branch airport-centric firms have a bigger intra-firm economic space including 20 and more other units of the same firm; 8% between 10 and 14; and only 1% between 15 and 19. Although it can be argued that the branch firms do not interact directly with other branches, and typically coordinated by the head offices, there is still some form of structural and functional linkages between the different units.

With an understanding above of branches at CTIA and surrounds, the discussion proceeds to Cape Town airport-centric head offices, the location of their branches and the size of intra-firm economic space they control. As noted previously, only 17% of Cape Town airport-centric firms with multi-locational structures are head offices. A significant majority (93%) of branches with head offices at CTIA and surrounds are located in South Africa. Most of these branches (36%) are located in the Johannesburg-Ekurhuleni area. The findings further show strong intra-firm linkages between Cape Town airport-centric firms and the Johannesburg-Ekurhuleni area. Durban accommodates the second most number of branches headquartered at CTIA and surrounds, with just about a quarter (23%) of branches. Only 13.2% of the branches are located in Cape Town. Port Elizabeth accommodates 11.3% of the branches of firms with head offices at CTIA and surrounds**.** These findings show that the head offices at CTIA and surrounds mostly make use of organisational proximity with the head offices, and therefore do not make use of agglomeration economies internal to the firm.

It is important to understand the extent of control the Cape Town head office airport-centric firms have. In this regard, the number of branches is used to understand the size of the head office control, emanating from the Cape Town airport-centric development. The intra-firm economic space controlled by these firms includes 53 branch firms. The majority (90%) of the head offices control a smaller number of between one and four units; and 9.5% have between five and nine branches. None of the Cape Town head office airport-centric firms has 10 or more units. These findings show that head offices at CTIA and surrounds are in control of relatively small economic spaces, each including less than five branch firms.

In summary, the foregoing discussion shows that Cape Town airport-centric firms (that are subsidiaries of multi-locational firms) do not make use of agglomeration economies internal to the firm, as most head offices and branches are not geographically close to CTIA.

6.1.2 External linkages of the Cape Town airport-centric firms

The section discusses linkages that characterise the Cape Town airport-centric firms as follows: one, linkages between firms within the study area; two, linkages with Cape Town International Airport (CTIA); three, linkages with firms in the Cape metropolitan area, the region, the rest of South Africa and outside the country; and four, linkages with airport-centric firms elsewhere in the country and beyond. With each of these four categories, the discussion aims to discover whether the linkages are based on geographical proximity and/or organisational proximity, towards understanding if the firms potentially make use of agglomeration economies.

6.1.2.1 Linkages with other firms

Borrowing the remarks of Richardson (1972) on the nature of firms, Cape Town airport-centric firms are not islands of economic activity. At the basic level, the firms are linked in patterns of coordination internally (as discussed in the preceding Section 6.1.1.3), potentially generating dispersion economies. Such coordination does not terminate within the individual firm, but also exists between autonomous firms. As discussed in Chapter One, agglomeration economies based on external economies are influenced by the operations of other firms and as such are not totally controlled by the individual Cape Town airport-centric firms.

The first inter-firm consideration that was investigated is linkages that occur amongst the Cape Town airport-centric firms, that is, within the study area. Table 6.6 shows that about three-quarters of airport-centric firms have business interactions with the geographically neighbouring firms. This situation shows that the linkages of these firms make use of geographical proximity and the firms potentially benefit from elements of agglomeration economies that are external to the firm. The linkages of these firms could be upstream, downstream and/or lateral. The fact that the investigations conducted in the study could not distinguish clearly between the different types of linkages was identified as a main limitation of the study (see Chapter One, Section 1.6.3). To further identify the elements of agglomeration economies, below is a discussion of linkages of airport-centric firms with firms in the study area and elsewhere, through the concept of subcontracting.

Table 6.6 Cape Town airport-centric firms' linkages with neighbours

			Interactions with neighbouring firms		
			Yes	No	Total
Type of firm	Manufacturing	Count	**20**	7	27
		% of Total	**9.4%**	3.3%	12.7%
	Transport, storage and related activities	Count	**74**	9	83
		% of Total	**34.9%**	4.2%	39.2%
	Wholesale and retail	Count	**24**	30	54
		% of Total	**11.3%**	14.2%	25.5%
	Accommodation and catering	Count	**4**	0	4
		% of Total	**1.9%**	0.0%	1.9%
	Car repair, tyre dealer, testing and repair of machinery	Count	**9**	2	11
		% of Total	**4.2%**	0.9%	5.2%
	Other	Count	**22**	11	33
		% of Total	**10.4%**	5.2%	15.6%
Total		**Count**	**153**	59	212
		% of Total	**72.2%**	27.8%	100%

There are different ways that co-operation and linkages between independent firms are realised, and frequently take place within the structure of subcontracting. This is a business arrangement wherein a firm employs another firm to undertake part of its work. Although it is a sign of co-operation, subcontracting is also indicative of unequal business linkages between the partners, in which controlling power is held by the contracting party (Richardson 1972).

The analyses of subcontracting activities of Cape Town airport-centric firms can yield insights into two interrelated aspects. Firstly, they would detect some inter-firm linkages (potentially horizontal linkages). Secondly, the analyses would provide insights into the size of inter-firm economic space that these firms are part of. The firms that are used by (or use) the Cape Town airport-centric firms through subcontracting are located at the following geographical locations with increasing geographical distances from the study area. One, on and around CTIA, reflecting linkages amongst the Cape Town airport-centric firms; two, elsewhere in the Cape metropolitan area; three, in the broader region, which refers to other municipalities in the Western Cape province; four, elsewhere in South Africa; and five, outside South Africa. The locations above are not exclusive and firms can utilise the services of others, or offer their services to firms at one or more of the locations above.

The discussion below on subcontracting is in two categories, of Cape Town airport-centric firms that use the services of other firms through subcontracting, and those that offer their services to others through subcontracting. A single firm can participate in both arrangements. It should be noted that during the interviews, the respondents were explicitly informed that the subcontracting investigated relates to the firm's core business. For instance, cleaning activities would not be regarded as a subcontracting activity, for a firm that is not in the business of cleaning. This clarification also applies to the parallel discussion of Johannesburg airport-centric firms, in Section 6.2.2.1.

Towards fulfilling their core business activities, 44% of Cape Town airport-centric firms use the services of other firms through subcontracting. The majority of subcontracting occurs within the Cape metropolitan area (excluding CTIA and surrounds), as 43% of the responses noted that the firms used through subcontracting are located within the Cape metropolitan area. About 31% of responses were for firms that use other firms located within the study area. These two categories reflect some relevance of geographical proximity as regards airport-centric firms that use other firms through subcontracting, although the proportion of linkages within the study area is lower than linkages within the broader metropolitan area. In this regard, agglomeration forces, that

make use of subcontracting linkages, appear stronger at the metropolitan area, than at CTIA and surrounds. Only 4% of the responses are related to the use of firms that are outside South Africa, showing that the geographically far firms are also relatively far in terms of subcontracting linkages.

Contrary to a large percentage (44%) above that utilises the services of other firms, only 22% of Cape Town airport-centric firms offer their services to other firms through subcontracting. The majority (31%) of responses noted that the firms' services are offered to firms within the Cape metropolitan area. This is followed at 22%, by responses pertaining to firms that assist firms within the study area. Similar to the preceding discussion, the findings show that subcontracting linkages mostly occur within the metropolitan area than within the study area. This therefore shows more signs of agglomeration (using subcontracting linkages) at the metropolitan level, compared to CTIA and surrounds. Only 7% of responses relates to airport-centric firms that offer their services to firms that are located outside South Africa.

6.1.2.2 Linkages with airport-centric firms elsewhere

The previous two sections dealt with the general linkages that the Cape Town airport-centric firms have. To an extent, the current section draws on those, but focuses exclusively on the linkages of the Cape Town airport-centric firms with airport-centric firms at other parts of South Africa and outside the country. The linkages investigated are both inter-firm and intra-firm. As regards intra-firm linkages, this section has resemblance to Section 6.1.1.3 on airport-centric firms as subsidiaries of multi-locational firms. However, as noted before, linkages do not necessarily exist between subsidiaries of the same firm that are located at different airports and surrounds. The findings presented hereunder are therefore based on firms that were explicitly asked about linkages with airport-centric firms elsewhere. The findings are broken down into two components: linkages of Cape Town airport-centric firms with their counterparts elsewhere in South Africa, and linkages with airport-centric firms outside South Africa.

About half (48%) of Cape Town airport-centric firms maintain intra-firm and inter-firm linkages with firms at and around other airports in South Africa. Table 6.7 shows that 62% of the firms with such linkages are those involved in transport, storage and related activities (dominated by couriers and freight carriers). The linkages of these firms are typically in terms of flows of information and shipments between airports. The strong representation of transport-oriented firms is supported by a significant correlation (between the type of firm and linkages) at the 0.01 level (2-tailed). This correlation shows that the change in the type of firm can influence the

existence of linkages extending to different airports and surrounds, with transport-oriented firms dominating such linkages. As noted earlier, the investigations conducted could not explicitly distinguish whether the linkages of Cape Town airport-centric firms with other airport-centric firms elsewhere are upstream, downstream and/or lateral.

Table 6.7 Cape Town airport-centric firms' linkages with airport-centric firms elsewhere in South Africa

Type of firm	Manufacturing	Count	9
		% of Total	8.9%
	Transport, storage and related activities	Count	63
		% of Total	62.4%
	Wholesale and retail	Count	17
		% of Total	16.8%
	Accommodation and catering	Count	1
		% of Total	1.0%
	Car repair, tyre dealer, testing and repair of machinery	Count	3
		% of Total	3.0%
	Other	Count	8
		% of Total	7.9%
Total		Count	101
		% of Total	100%

The linkages of Cape Town airport-centric firms are not uniform across the various airports and surrounds. Most linkages are with firms at OR Tambo International Airport (ORTIA) and surrounds, as 34% of the respondent firms noted that the firms they have linkages with are at that location. About 20% of the respondent firms noted that the firms they have linkages with are at King Shaka International Airport (KSIA) and surrounds. From these findings, it is interesting to note that the majority of linkages are with fully functional international airports in the country. Domestic airports and international airports that are not operating as such have fewer linkages with Cape Town airport-centric firms. Given the great geographical distances between CTIA and other airports in the country, the linkages (intra-firm and inter-firm) utilise organisational proximity, not geographical proximity, in their business operations. Therefore, the firms do not make use of agglomeration economies.

Approximately 21% of Cape Town airport-centric firms have linkages with airport-centric firms located outside South Africa, reflecting a low magnitude of linkages compared to the within-country linkages above. During the interviews, not all respondents could specify airports and surrounds they have linkages with. Thus, to avoid a distorted presentation of results, the airports and surrounds (that have linkages with Cape Town airport-centric firms) are not specified here.

Nonetheless, from the respondents that could name the airports their firms have linkages with, it was noted that the linkages are more with European and Asian countries, than America, Australia and the rest of the African continent. This particularly supports the argument of Massey (1999b) that globalisation does not result in a uniform integration of economic systems around the globe, given that the systems are dominated by certain continents, countries and cities. The majority of the firms that have linkages extending beyond the country are transport-oriented, particularly couriers and freight carriers (see Table 6.8).

Table 6.8 Cape Town airport-centric firms' linkages with airport-centric firms outside South Africa

			Yes	No	Total
Activities of firm	Manufacturing	Count	**1**	26	27
		% of Total	**0.5%**	12.3%	12.7%
	Transport, storage and related activities	Count	**39**	44	83
		% of Total	**18.4%**	20.8%	39.2%
	Wholesale and retail	Count	**2**	52	54
		% of Total	**0.9%**	24.5%	25.5%
	Accommodation and catering	Count	**1**	3	4
		% of Total	**0.5%**	1.4%	1.9%
	Car repair, tyre dealer, testing and repair of machinery	Count	**0**	11	11
		% of Total	**0.0%**	5.2%	5.2%
	Other	Count	**1**	32	33
		% of Total	**0.5%**	15.1%	15.6%
Total		**Count**	**44**	168	212
		% of Total	**20.8%**	79.2%	100%

From the inter-country and intra-country linkages identified, it can be argued that Cape Town airport-centric development is part of a global airfreight system, resulting from the processes of internalisation and globalisation. At this point, it is important to draw briefly on Hoover's (1948) notion of transshipment locations. In terms of airfreight, CTIA and surrounds is understood as a transshipment location that handles incoming and outgoing freight. This role is made possible by strong linkages between different transshipment locations, anchored by transport-oriented firms (further evidence to support this argument is provided in Section 6.1.2.3 below). In summary, the linkages above between Cape Town airport-centric firms and other airport-centric firms elsewhere do not generate agglomeration economies because of the great distances between CTIA and other airports. The linkages are based on organisational proximity.

6.1.2.3 Linkages with CTIA

While the previous section presented the Cape Town airport-centric firms' linkages with airport-centric firms elsewhere in South Africa and outside the country, the current section deals with linkages the firms have with Cape Town International Airport (CTIA). The current discussion is essential given that the linkages with other airport-centric firms elsewhere (particularly for material flows in terms of airfreight) are facilitated through CTIA. Besides complementing the previous section, the linkages of the firms with CTIA discussed hereunder are important to discover if the firms potentially make use of urbanisation economies.

As shown in Table 6.9 below, about three quarters (70%) of Cape Town airport-centric firms make use of CTIA for air passenger services and/or airfreight. This finding partially shows that firms potentially make use of urbanisation economies by virtue of being located in the geographical proximity of CTIA; given the study area is within approximately 2.5 km radius of the airport. The firms that reflect the dominant usage of CTIA are those involved in transport, storage and related activities; manufacturing; and wholesale and retail. The former is a group of firms typified by couriers and freight carriers (see Table 6.9).

Table 6.9 Cape Town airport-centric firms' use of CTIA

			Yes	No	Total
Type of firm	Manufacturing	Count	**20**	7	27
		% within type of firm	**74.1%**	25.9%	100.0%
		% of Total	**9.4%**	3.3%	12.7%
	Transport, storage and related activities	Count	**69**	14	83
		% within type of firm	**83.1%**	16.9%	100.0%
		% of Total	**32.5%**	6.6%	39.2%
	Wholesale and retail	Count	**27**	27	54
		% within type of firm	**50.0%**	50.0%	100.0%
		% of Total	**12.7%**	12.7%	25.5%
	Accommodation and catering	Count	**3**	1	4
		% within type of firm	**75.0%**	25.0%	100.0%
		% of Total	**1.4%**	0.5%	1.9%
	Car repair, tyre dealer, testing and repair of machinery	Count	**7**	4	11
		% within type of firm	**63.6%**	36.4%	100.0%
		% of Total	**3.3%**	1.9%	5.2%
	Other	Count	**23**	10	33
		% within type of firm	**69.7%**	30.3%	100.0%
		% of Total	**10.8%**	4.7%	15.6%
Total		**Count**	**149**	63	212
		% of Total	**70.3%**	29.7%	100%

It was important to examine the extent to which the firms use CTIA for a specific purpose. A significant majority (64%) of airport-centric firms that utilise CTIA do so for airfreight purposes (see Table 6.10). These firms constitute about half (45%) of all Cape Town airport-centric firms, showing that airfreight is a key component of the economic activities of Cape Town airport-centric firms. The use of the airport airfreight is however not consistent across the different firms, given a significant correlation at the 0.05 level (1-tailed) calculated between the type of firm and the use of CTIA for airfreight. This correlation shows that the change in the activities of a firm can potentially affect the magnitude at which CTIA is used for airfreight purposes. The majority (68%) of transport-oriented firms that utilise CTIA do so for airfreight purposes. Similarly, the majority (65%) of manufacturing airport-centric firms that utilise CTIA do so for airfreight purposes (see Table 6.10), partially showing that CTIA could be a transshipment location used by manufacturing firms to reach suppliers and markets. This aspect is discussed further below.

Table 6.10 Cape Town airport-centric firms' use of CTIA for airfreight

			Yes	No	Total
Type of firm	Manufacturing	Count	**13**	7	20
		% within type of firm	**65.0%**	35.0%	100.0%
		% of Total	**8.8%**	4.7%	13.5%
	Transport, storage and related activities	Count	**47**	22	69
		% within type of firm	**68.1%**	31.9%	100.0%
		% of Total	**31.8%**	14.9%	46.6%
	Wholesale and retail	Count	**18**	9	27
		% within type of firm	**66.7%**	33.3%	100.0%
		% of Total	**12.2%**	6.1%	18.2%
	Accommodation and catering	Count	**2**	1	3
		% within type of firm	**66.7%**	33.3%	100.0%
		% of Total	**1.4%**	0.7%	2.0%
	Car repair, tyre dealer, testing and repair of machinery	Count	**3**	3	6
		% within type of firm	**50.0%**	50.0%	100.0%
		% of Total	**2.0%**	2.0%	4.1%
	Other	Count	**11**	12	23
		% within type of firm	**47.8%**	52.2%	100.0%
		% of Total	**7.4%**	8.1%	15.5%
Total		**Count**	**94**	54	148
		% of Total	**63.5%**	36.5%	100.0%

Given the usage above of airfreight services at CTIA (that is, 45% of all airport-centric firms); the remainder of the section examines the economic forces that drive the airfreight element of Cape Town airport-centric development. The discussion on the linkages of airport-centric firms

with CTIA as regards airfreight needs to be introduced with the reasons for choice of location around CTIA (see Section 6.1.1.2), to determine the extent to which CTIA is a force that attracts airfreight users. The findings to follow are based upon a combination of two sets of firms: those that relocated from elsewhere (that is, not within the airport and surrounds), and firms that originated at their current premises. Over half (53%) of the reasons cited by firms (that use the airport for airfreight) as factors that influenced their choice of location are for the firms to be geographically proximate to CTIA, customs and/or the associated concentration of couriers and freight carriers. These findings show that CTIA is a force that attracts firms that use it for airfreight purposes. Thus, geographical proximity to CTIA appears to be important in the operations of the airport-centric firms that use the airport for airfreight purposes. Other cited reasons for choice of location are less significant. About a quarter (23%) of reasons cited by firms that use CTIA for airfreight are property-related considerations in terms of availability of bigger, suitable or cheap business premises. Approximately 21% of the reasons cited pertain to accessibility of the premises to the market.

The findings above provide a partial picture of the forces that drive the airfreight operations at CTIA and surrounds. More interestingly, all (100%) manufacturing firms that use CTIA for airfreight do so through couriers and freight carriers. The findings show that although 45% of Cape Town airport-centric firms make use of CTIA for airfreight, they mainly do so through couriers and freight carriers. These findings bring a new dimension of agglomeration economies summarised as follows. Although Cape Town airport-centric firms that make use of CTIA can be understood to potentially benefit from urbanisation economies, they reap the benefits through the assistance of couriers and freight carriers. This state of affairs reflects a dependence of other airport-centric firms on their transport-oriented neighbours, in terms of not only linkages with CTIA as regards airfreight services, but also as regards linkages with airports and airport-centric firms elsewhere in the country and beyond. An additional element was brought to light during the qualitative interviews in that some Cape Town airport-centric firms do not use CTIA for airfreight, and rather rely on sea and road-based modes of transport. Such firms use the neighbouring couriers and freight carriers to transport goods by sea and road, showing that transport-oriented firms are also important in assisting the neighbouring firms beyond airfreight requirements.

Given the role of transport-oriented firms at CTIA and surrounds, it is important to summarise below the standard airfreight operations. In logistics, airborne shipments are dealt with in two ways. Firstly, they are delivered directly to airlines at an airport; and secondly, shipments are

handed over to freight forwarders for consolidation and all the subsequent forwarding processes. The air forwarding industry works with the air carriers, in which the forwarders consolidate shipments and tender them in containers that are ready for aircraft loading. This role of forwarders results in ground handling timesaving for the airlines. Therefore, airlines encourage forwarder traffic because it results in a clear and efficient division of labour. The forwarders provide the retailing function and deal with each individual shipper and consignee, and the airline concentrates on transporting the forwarders' loaded containers between airports. Few firms rely solely on in-house personnel to manage all shipping operations (Murphy & Wood 2004) and therefore utilise couriers and freight carriers as in the case of the Cape Town airport-centric development. It came to light with the qualitative interviews that the non transport-oriented firms do not have the expertise to deal efficiently with the airlines and customs offices; hence they hand over the shipping processes to the freight carriers, who in turn have a network of couriers they work with.

6.1.3 Clustering and the propulsive economic qualities of Cape Town Airport

This section aims to identify the propulsive economic character of CTIA and the surrounding firms, through a synthesis of the concepts of linkages, agglomeration economies (discussed in Sections 6.1.1 and 6.1.2) and clustering. It was also needed to determine whether Cape Town airport-centric firms are spatially clustered and/or organisationally clustered.

6.1.3.1 Linkages, agglomeration economies and clustering

Section 6.1.2.1 discovered that a significant majority (72%) of Cape Town airport-centric firms have linkages with other firms within the study area. As the study area is enclosed within a radius of about 2.5 km from the terminal buildings, the findings show that the linkages of the firms make use of geographical proximity, and the firms potentially benefit from localisation economies and/or activity-complex economies.

Section 6.1.2.3 discovered that 70% of Cape Town airport-centric firms make use of CTIA for air passenger services and/or airfreight. As the airport-centric firms are located within 2.5 km of CTIA, these linkages with CTIA make use of geographical proximity, and provide indication that Cape Town airport-centric firms potentially benefit from urbanisation economies. Overall, about half (45%) of all Cape Town airport-centric firms make use of CTIA for airfreight purposes, indicating that airfreight is an important component of the operations of Cape Town airport-centric development. The linkages with the neighbouring firms and CTIA summarised

above (that make use of geographical proximity) show signs that the Cape Town airport-centric firms are spatially clustered around CTIA.

Section 6.1.2.2 discovered that about half (48%) of Cape Town airport-centric firms have linkages with airport-centric firms elsewhere in South Africa. Given the great distances between the Cape Town case studied and other airports in the country, the linkages make use of organisational proximity and do not generate agglomeration economies. Also showing the use of organisational proximity, about a quarter (21%) of Cape Town airport-centric firms maintain linkages with airport-centric firms outside South Africa.

Section 6.1.1.3 discovered that 75% of Cape Town airport-centric firms have intra-firm linkages typically occurring within a framework of head office and branch. The majority (59%) of head offices of the Cape Town airport-centric branch firms are located in the Johannesburg-Ekurhuleni area. In this regard, given the great distances between the case studied and Johannesburg, the linkages between head offices and branches are based on organisational proximity, and show that the firms potentially benefit from dispersion economies (see Polenske 2008), not agglomeration economies. These intra-firm linkages show that Cape Town airport-centric branch firms are potentially organisationally clustered with their head offices in the Johannesburg-Ekurhuleni area. Only 18% of the head offices of Cape Town airport-centric firms are located within the Cape metropolitan area, which are areas that are relatively geographically proximate to the case studied.

Section 6.1.1.3 discovered that the majority (36%) of the branches of the Cape Town head office airport-centric firms are located in the Johannesburg-Ekurhuleni area, 23% are located in Durban and only 13% of the branches are in the Cape metropolitan area. The intra-firm linkages with branches in the Johannesburg-Ekurhuleni area and Durban do not generate agglomeration economies. The findings above show that Cape Town airport-centric firms are organisationally clustered with firms elsewhere in South Africa and outside the country, including other airport-centric firms located elsewhere.

Drawing on the idea of systems of cities advanced by among others Berry (1964); Pred (1975, 1977); Wells (1903), it can be argued that Cape Town airport-centric development is part of a global cluster of airport-centric developments. Different elements of this cluster (which include Cape Town airport-centric firms) are part of the same economic space, regardless of their distinct geographical location. Couriers, freight carriers and airlines are key elements and anchors in the

organisational clustering of Cape Town airport-centric firms with other firms elsewhere in the world.

6.1.3.2 The propulsive economic character of Cape Town Airport

The findings on forces that drive the location and mix of the Cape Town airport-centric development boil down to the identification of the propulsive economic character of CTIA and the surrounding airport-centric firms. An argument is advanced that CTIA is a propulsive economic element and the Cape Town airport-centric development has growth pole properties because of the following main findings. Firstly, a significant majority (70%) of Cape Town airport-centric firms make use of CTIA for airfreight and/or air passenger services. About half (45%) of all firms in the study area utilise the ORTIA specifically for airfreight services. This high usage of the airport shows that CTIA is a force that binds the cluster together, whereby the airport-centric firms make use of urbanisation economies.

Secondly and related to the previous point, CTIA is a significant force of attraction in the location of firms on and around it, given that 40% of the airport-centric firms chose their current premises so as to be geographically close to the airport, customs offices and the concentration of logistics firms (see Section 6.1.1.2). Thirdly, the spatial cluster of Cape Town airport-centric firms also has growth pole properties given the following high magnitude of linkages occurring within the study area. About three-quarters (72%) of the firms have linkages with other firms (neighbours) within the study area. Further, with regard to subcontracting, 32% of the responses noted that the firms used are located within the study area (compared to 43% for the Cape metropolitan area), showing that significant subcontracting linkages occur within the study area. As regards Cape Town airport-centric firms that offer their services to other firms through subcontracting, 22% of the responses relates to firms that assist firms within the case study area. Fourthly, it is important to note that 8.5% of the sampled Cape Town airport-centric firms are large, which in part points to the propulsive qualities of CTIA and surrounds.

6.2 JOHANNESBURG AIRPORT-CENTRIC DEVELOPMENT

This section presents the findings of forces that drive the location and mix of the Johannesburg airport-centric development. Where pertinent, the section highlights similarities and differences between the two cases studied. The structure of the discussion is similar to the preceding Section 6.1, whereby the first part presents the employment attributes of the Johannesburg airport-centric development, and identifies forces that influenced the firms to locate on and around OR Tambo International Airport (ORTIA). The second part focuses on the linkages that characterise the Johannesburg airport-centric firms. The third section synthesises the findings to determine the propulsive economic character of ORTIA and the surrounding firms.

6.2.1 Employment size and locational characteristics

6.2.1.1 Employment size

As shown in Figure 6.3, the employment distribution of the Johannesburg airport-centric firms is skewed towards the lower categories, showing that there are more firms that employ relatively few people. The employment of the firms has a median of 30 and a range of 1599 (see Table 6.11), reflecting a big gap between a firm with the lowest number of employees and a firm with the largest number of employees. The median and range of the Johannesburg case studied are higher than that of the Cape Town airport-centric firms in Section 6.1.1.1.

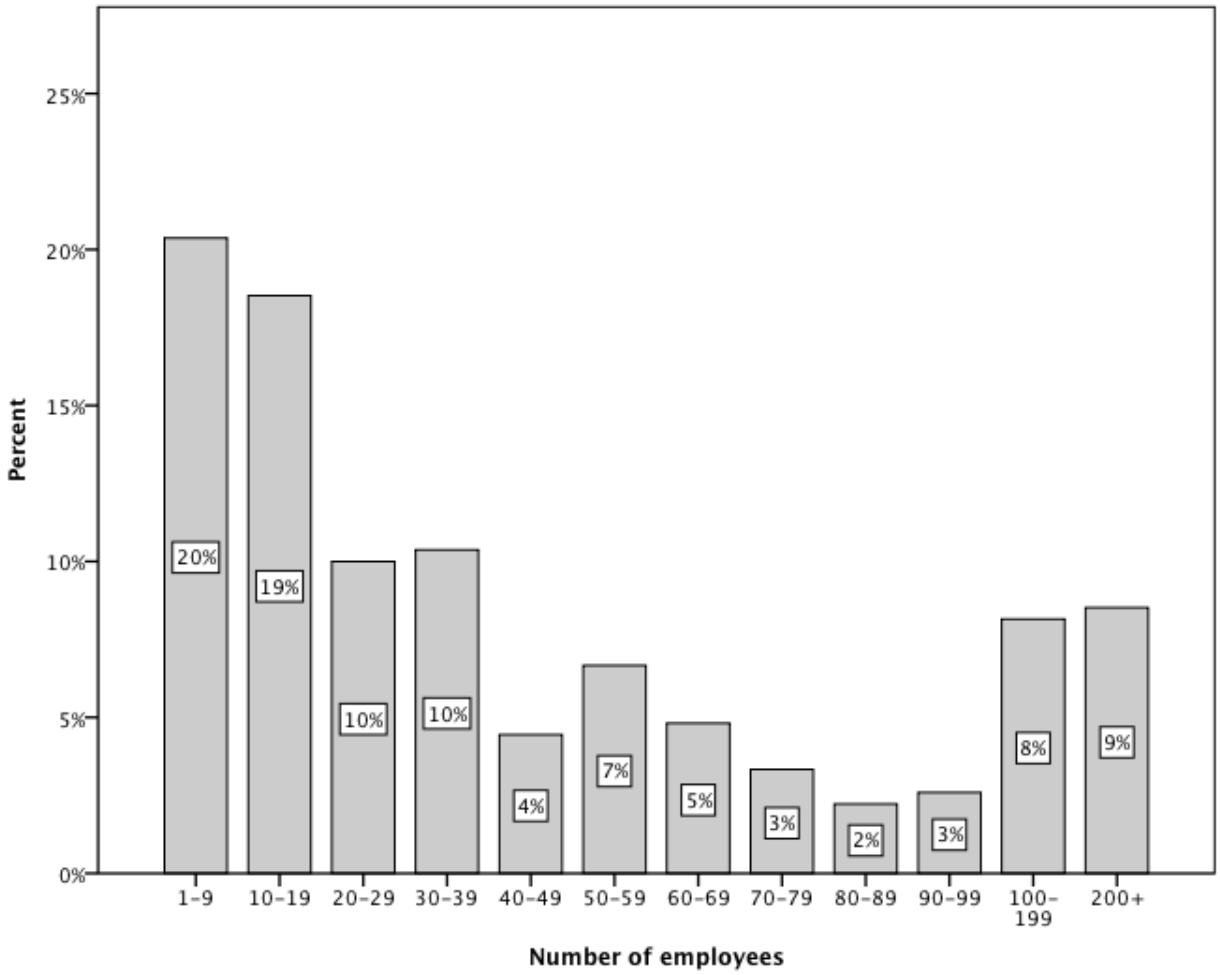

Figure 6.3 Johannesburg airport-centric firms' employment distribution

Table 6.11 Johannesburg airport-centric firms' employment central tendency and variation

N	Valid	270
	Missing	41
Mean		78.40
Median		30.00
Mode		30
Std. Deviation		178.365
Variance		31814.227
Range		1599

As reflected earlier in Figure 6.3, 17% of the respondent Johannesburg airport-centric firms have 100 or more employees. The determination of the size of large firms was informed by South Africa (1996b) through the criteria defined in Section 6.1.1.2. Towards determining the propulsive qualities of ORTIA and surrounds, it is important to note that 38 large firms were recorded at the Johannesburg airport-centric development as outlined in Table 6.12 below. These firms represent 12% of the sample investigated. The largest firm at the study area, involved in manufacturing activities, employs 1600 people.

Table 6.12 Large Johannesburg airport-centric firms

	Type of firm	**Number of employees**	**Size of firm**
1	Manufacturing	1600	Large
2	Manufacturing	550	Large
3	Manufacturing	550	Large
4	Manufacturing	485	Large
5	Manufacturing	300	Large
6	Manufacturing	250	Large
7	Manufacturing	250	Large
8	Manufacturing	250	Large
9	Manufacturing	200	Large
10	Transport, storage and related activities	1100	Large
11	Transport, storage and related activities	600	Large
12	Transport, storage and related activities	300	Large
13	Transport, storage and related activities	250	Large
14	Transport, storage and related activities	180	Large
15	Transport, storage and related activities	150	Large
16	Transport, storage and related activities	150	Large
17	Transport, storage and related activities	150	Large
18	Transport, storage and related activities	150	Large
19	Transport, storage and related activities	150	Large
20	Transport, storage and related activities	103	Large
21	Transport, storage and related activities	100	Large
22	Wholesale and retail	1500	Large
23	Wholesale and retail	1000	Large
24	Wholesale and retail	400	Large
25	Wholesale and retail	400	Large
26	Wholesale and retail	300	Large
27	Wholesale and retail	250	Large
28	Wholesale and retail	170	Large
29	Wholesale and retail	160	Large
30	Wholesale and retail	102	Large
31	Wholesale and retail	100	Large
32	Wholesale and retail	100	Large
33	Wholesale and retail	100	Large
34	Accommodation and catering	250	Large
35	Accommodation and catering	100	Large
36	Car repair, tyre dealer and repair of machinery	124	Large
37	Other	375	Large
38	Other	200	Large

6.2.1.2 Johannesburg forces of attraction

As noted with the discussion of the Cape Town case studied (Section 6.1.1.2), the analyses of spatial economic attributes of airport-centric firms should not stop with the presentation of economic activity mix in Chapter Four, Section 4.2.2. A basic requirement was to discuss the centripetal forces that attracted firms towards ORTIA, and in the process contributed towards a

concentration of firms on and around that airport. Before identifying those forces, the discussion unpacks the year of location of firms on and around ORTIA. Due to challenges mentioned in Section 6.1.1.2, the year of location of firms was considered to refer to the year of location at the current premises. The firms were then classified into three groups as follows. One, firms that have always been at their current premises, meaning they originated there; two, firms that relocated from elsewhere in the Ekurhuleni metropolitan area, the Gauteng city-region and the rest of the country; and three, firms that relocated from within the study area, that is, within ORTIA and surrounds. The section also investigates the locational behaviour of Johannesburg airport-centric firms, as regards the relocation of firms from elsewhere towards ORTIA.

Notwithstanding that ORTIA was opened in 1952, Table 6.13 shows that the majority (37%) of the Johannesburg airport-centric firms were established at the current premises between 2000 and 2009. A similar situation of a high proportion of young firms was discovered at the Cape Town airport-centric development discussed in Section 6.1.1.2. Over a quarter (27%) of Johannesburg airport-centric firms were established at the current premises between 1990 and 1999, followed at 17% by firms that were established there between 2010 and 2015. Unlike the Cape Town case studied that had no firms before the opening of CTIA, one Johannesburg airport-centric firm was established at the current premises before 1949, prior to the opening of ORTIA. However, this might potentially be an error in the information from the respondent because at that time, the current location of ORTIA was farmland (see Chapter Four). All in all, similar to the Cape Town airport-centric firms, Johannesburg airport-centric firms are young as regards their year of location at the current premises.

Table 6.13 Johannesburg airport-centric firms' year of location at the current premises

			Previous location of firm				Total
			In and around ORTIA	Elsewhere in the city or region	Elsewhere in the country	Originated at the current premises	
Year of establishment at the current premises	**2010 - 2015**	Count	14	14	0	17	**45**
		% of Total	5.4%	5.4%	0.0%	6.6%	**17.4%**
	2000 - 2009	Count	8	16	1	71	**96**
		% of Total	3.1%	6.2%	0.4%	27.5%	**37.2%**
	1990 - 1999	Count	6	16	0	48	**70**
		% of Total	2.3%	6.2%	0.0%	18.6%	**27.1%**
	1980 - 1989	Count	3	4	0	21	**28**
		% of Total	1.2%	1.6%	0.0%	8.1%	**10.9%**
	1970 - 1979	Count	0	3	0	7	**10**
		% of Total	0.0%	1.2%	0.0%	2.7%	**3.9%**
	1960 - 1969	Count	0	0	0	7	**7**
		% of Total	0.0%	0.0%	0.0%	2.7%	**2.7%**
	1950 - 1959	Count	0	0	0	1	**1**
		% of Total	0.0%	0.0%	0.0%	0.4%	**0.4%**
	1949 -	Count	0	0	0	1	**1**
		% of Total	0.0%	0.0%	0.0%	0.4%	**0.4%**
Total		Count	31	53	1	173	**258**
		% of Total	12.0%	20.5%	0.4%	67.1%	**100%**

A detailed discussion on Johannesburg airport-centric firms as subsidiaries of multi-locational firms is undertaken later in the section. However, it was necessary to reflect on the year of location at the current premises for airport-centric head offices and branches. As regards the head offices, the majority (33%) were established at the current premises on and around ORTIA between 1990 and 1999. These are followed at 32% by head offices established on and around ORTIA between 2000 and 2009, and 17% of head offices were established there between 2010 and 2015.

The branches within the Johannesburg case studied display a slightly different pattern to the head offices above, as the majority (42%) were established at the current premises between 2000 and 2009. The brief outline above shows that similar to the Cape Town case studied, the majority of Johannesburg airport-centric firms are young as regards the year of location at the current premises, regardless of whether they are head offices or branches.

The discussion now focuses on the locational behaviour of Johannesburg airport-centric firms, in terms of relocations towards ORTIA and surrounds. Similar to the Cape Town airport-centric firms, the majority (63%) of the Johannesburg airport-centric firms originated at the current

premises, thus reflecting limited locational flexibility. About a quarter (24%) of the firms relocated from other parts of the Ekurhuleni metropolitan area, and the broader Gauteng city-region. Approximately 12% of the firms moved from within ORTIA and surrounds; and the remaining 1% moved from elsewhere in South Africa, that is, outside the Gauteng city-region.

Given the disparities of location behaviour between the levels of analysis of the case studied, it was important to disaggregate the findings according to the levels of analysis. The first group covers firms located within the terminals of ORTIA, and it was discovered that all (100%) of them originated there. The second category includes firms located on the landside of ORTIA, whereby 88% of them originated there. The third category covers firms located around ORTIA, and 56% of them originated there. Similar to the Cape Town case studied, the effects of forces of attraction seem to be stronger on the firms located within the airport premises (terminal and landside), given that most of them originated there as shown above.

In light of the locational behaviour (relocations from elsewhere towards ORTIA), the section identifies centripetal forces that attracted the firms towards the current premises at ORTIA and surrounds. As shown in Figure 6.4 below, the majority (41%) of the firms chose their location so as to be geographically close to ORTIA, customs offices and/or the concentration of couriers and freight carriers. Similar to the Cape Town case studied, the results show that ORTIA represents a significant force of attraction in the location of firms. Centrality of the study area to markets, clients and business associates also represent important forces that influenced 28% of the airport-centric firms to locate at the current premises.

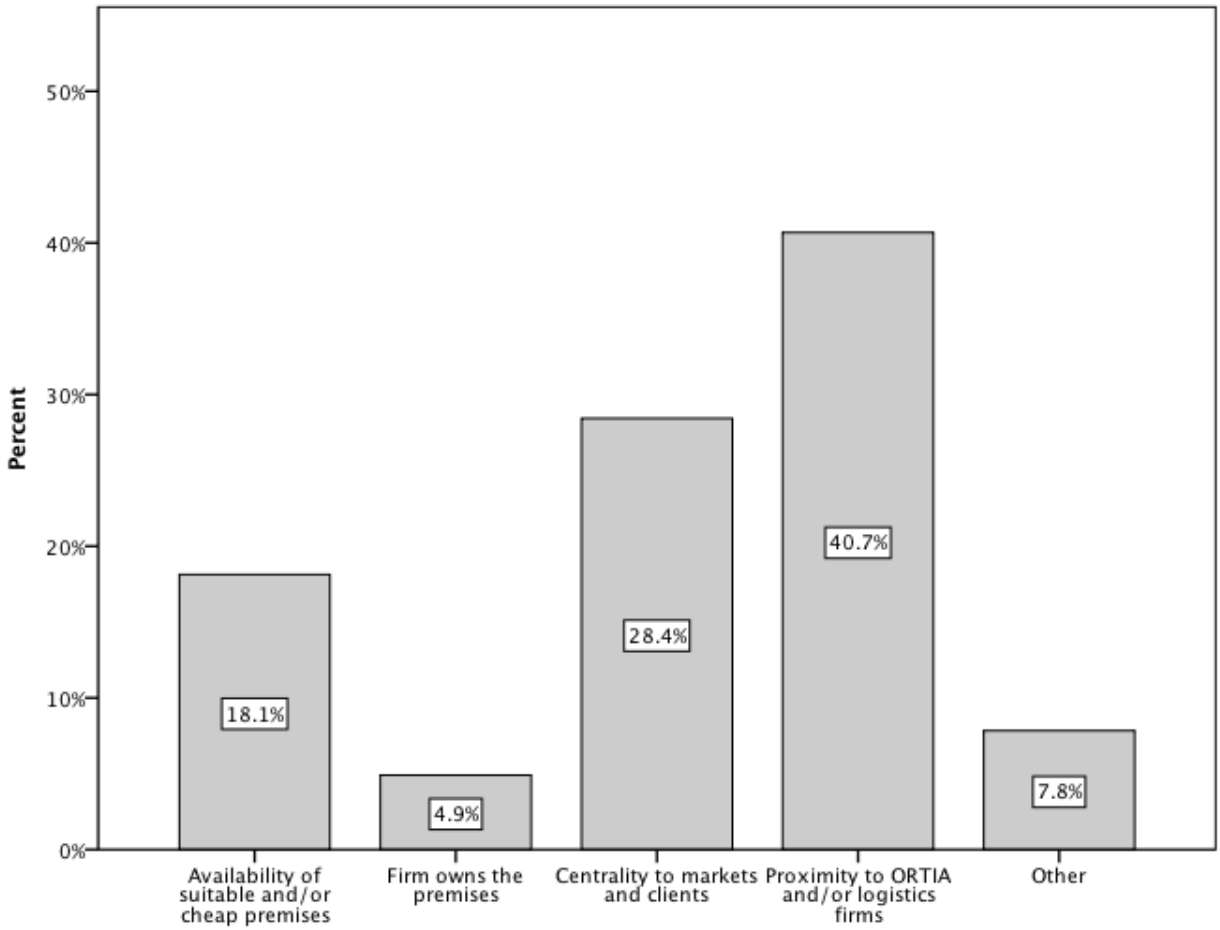

Figure 6.4 Factors that influenced the Johannesburg airport-centric firms' choice of location

6.2.1.3 Economies internal to the firm

In light of the findings above regarding ORTIA as an important force of attraction in the location of firms, the current discussion investigates elements of internal economies that the Johannesburg airport-centric firms potentially benefit from. The objective of the discussion is also to determine whether the benefits make use of agglomeration economies (derived from linkages that utilise geographical and organisational proximity) or dispersion economies based on linkages that mainly make use of organisational proximity.

As with the Cape Town case studied, internal economies are analysed through the discussion of Johannesburg airport-centric firms as subsidiaries of multi-locational firms. It should however be noted that such structures do not automatically generate internal economies. Franchises are good examples of multi-locational firms whose units are not functionally linked, and therefore not part of the same economic space. The operations of a franchise system include only the given franchise and franchisor, and not the other units that have the same name and branding. The nature of franchising is discussed in Section 6.1.1.3 and not repeated here. Like at the Cape Town case studied, a minority (6%) of Johannesburg airport-centric firms are franchises, and

none of them are head offices, implying that they are structurally controlled elsewhere. Approximately 64% of the head offices of these franchise firms are located within the Johannesburg area, and 7% located in Ekurhuleni. This means that about three-quarters (71%) of the head offices are located in the Johannesburg-Ekurhuleni area. Over a quarter (29%) of the head offices of the Johannesburg airport-centric franchise firms are located in Cape Town. The findings reflect that most franchisee-franchisor linkages occur in areas that are relatively geographically close to the study area, indicating some relevance of geographical proximity in those linkages. Because franchise systems do not necessarily generate internal economies, the rest of the section focuses on firms that potentially make use of internal economies through intra-firm linkages.

As shown in Table 6.14, the majority (61%) of Johannesburg airport-centric firms are subsidiaries of multi-locational firms with potential intra-firm linkages. Though followed closely by wholesale and retail firms, transport-oriented firms form the majority (19%) of the firms with relational intra-firm structures. This is a group that is typified by airlines, couriers and freight carriers. The dominant representation of these firms is further supported by the fact that they represent 66% of all respondent transport-oriented firms (see Chapter Four).

Table 6.14 Johannesburg airport-centric firms that are subsidiaries of multi-locational firms

			Yes	No	Total
Type of firm	Manufacturing	Count	**41**	38	79
		% of Total	**14.2%**	13.2%	27.4%
	Transport, storage, logistics and related activities	Count	**56**	28	84
		% of Total	**19.4%**	9.7%	29.2%
	Wholesale and retail	Count	**51**	23	74
		% of Total	**17.7%**	8.0%	25.7%
	Accommodation and catering	Count	**5**	4	9
		% of Total	**1.7%**	1.4%	3.1%
	Car repair, tyre dealer, testing and repair of machinery	Count	**5**	10	15
		% of Total	**1.7%**	3.5%	5.2%
	Other	Count	**17**	10	27
		% of Total	**5.9%**	3.5%	9.4%
Total		**Count**	**175**	113	288
		% of Total	**61%**	39%	100%

The intra-firm economic space is not even: it is characterised by centres of control and dependence. Unlike the Cape Town airport-centric development that has a high representation of branches, Table 6.15 shows that over half (60%) of Johannesburg airport-centric firms that are

part of multi-locational firms are head offices. This finding shows that Johannesburg airport-centric firms have a significant control over the intra-firm economic space that they are part of; more than they are controlled elsewhere.

Table 6.15 Johannesburg airport-centric head office and branch firms

			Head Office	Branch,	Other	Total
Type of firm	Manufacturing	Count	27	9	0	36
		% of Total	16.1%	5.4%	0.0%	21.4%
	Transport, storage and related activities	Count	33	22	0	55
		% of Total	19.6%	13.1%	0.0%	32.7%
	Wholesale and retail	Count	30	21	0	51
		% of Total	17.9%	12.5%	0.0%	30.4%
	Accommodation and catering	Count	0	4	0	4
		% of Total	0.0%	2.4%	0.0%	2.4%
	Car repair, tyre dealer, testing and repair of machinery	Count	3	2	0	5
		% of Total	1.8%	1.2%	0.0%	3.0%
	Other	Count	7	8	2	17
		% of Total	4.2%	4.8%	1.2%	10.1%
Total		**Count**	**100**	**66**	**2**	**168**
		% of Total	**59.5%**	**39.3%**	**1.2%**	**100%**

Given the high representation of the head offices noted above, it was crucial to investigate the location of the branches of those head offices. This would provide insights into the size of intra-firm economic space; the extent of organisational control over this space that emanates from ORTIA and surrounds; and also insights on whether the intra-firm linkages make use of geographical proximity and/or organisational proximity, and accordingly whether the firms potentially make use of agglomeration economies.

Before discussing the specific locations of the branch units, it is important to note that the majority (91%) are located in South Africa. In terms of the specific locations, the majority (19%) of branches of the head offices at the Johannesburg case studied are located in other parts of South Africa, that is, at locations other than the eight metropolitan municipalities. The same proportion (19%) of the branches is located in Cape metropolitan area. Branches located in Durban follow closely at 18%. The relatively geographically proximate locations within the Ekurhuleni-Johannesburg area accommodate only 13% of branches of the head offices at ORTIA and surrounds (these consist of 7% in Ekurhuleni and 6% in the Johannesburg municipal area). This low proportion of branches located in the geographical proximity of ORTIA and surrounds show that the firms do not benefit from agglomeration economies based on internal economies.

The findings rather show that the intra-firm linkages are based on organisational proximity, and the firms potentially benefit from dispersion economies. Approximately 7.4% of the branches are located elsewhere on the African continent. The findings further point to the following as regards the intra-firm economic space with head offices at ORTIA and surrounds. One, the economic space mostly includes secondary/intermediate cities,[51] not necessarily the metropolitan areas in the country. Two, the high representation of branches in Cape Town indicates the importance of this metropolitan area in the intra-firm economic space of the Johannesburg airport-centric firms. This partially corroborates Section 6.1.1.3, which discovered that the majority of Cape Town airport-centric firms (that are subsidiaries of multi-locational firms) have their head offices at ORTIA and surrounds.

It was further important to understand the size of this economic space in terms of the number of branches that are controlled by head offices at the Johannesburg case studied. These head offices have a total of 357 branches. The majority (75%) of the head offices have between one and four units. Approximately 19% have between five and nine branches. Only 1% of the head offices have over 20 branches. The results show that although a large number of 357 firms are controlled at the Johannesburg study area, the majority (75%) of head offices control smaller intra-firm economic spaces, including less than five branch firms.

On the background of the intra-firm economic space that is controlled at ORTIA and surrounds, the discussion shifts to the Johannesburg airport-centric branch firms. As with the Cape Town case studied, the number of head offices discussed is not equivalent to the number of branches concerned, because some firms have more than one head office. Areas in South Africa accommodate 85% of the head offices of branches at ORTIA and surrounds. In terms of specific locations, 28% of the head offices are located in the Cape metropolitan area. A quarter of head offices of these airport-centric firms are located in the Johannesburg municipal area, and 13% are located in Ekurhuleni. When combined, the Ekurhuleni-Johannesburg area accommodates 38% of the head offices. Approximately 5% are located in the USA; and Durban accommodates 8% of head offices. The high proportion of head offices located in Cape Town shows that the Johannesburg airport-centric branch firms do not make use of agglomeration economies internal

[51] In South Africa, the notion of secondary cities refers to non-metropolitan cities as follows: Welkom, Vereeniging, Krugersdorp, Pietermaritzburg, Newcastle, Richards Bay, Ellisras, Pietersburg, Witbank, Secunda, Nelspruit, Middleburg, Klerksdorp, Brits, Mafikeng, Rustenburg, Potchefstroom, Upington, Kimberley, Paarl, George and Stellenbosch (South African Cities Network 2012). In a later work, South African Cities Network (2014) adopts the term ‘intermediate cities’ to put more emphasis on the function of the cities, not just the sizes of cities implied by the term ‘secondary cities’. Intermediate cities are understood to mediate the metropolitan areas and smaller urban areas and rural areas (South African Cities Network 2014).

to the firm, and it can be argued that the firms make use of dispersion economies as the intra-firm linkages are based on organisational proximity, not geographical proximity.

Johannesburg airport-centric branch firms are part of a wide economic space including not only head offices but other branches as well. These firms have 665 other branches, indicating a big intra-firm economic space. In terms of specific sizes, the majority (63%) of Johannesburg airport-centric branch firms are part of the economic space encompassing the head office and between one and four other branches. About 20% of Johannesburg airport-centric branches are part of intra-firm economic space involving the head office and between five and nine other branches. Only 10% are part of a bigger intra-firm economic space encompassing 20 or more other branches. Although the linkages between these units are not definite, as head offices typically coordinate them, the subsidiaries of the multi-locational firms have linkages with each other and therefore part of the same intra-firm economic space.

The findings above on the intra-firm economic space show that the firms do not make use of agglomeration economies internal to the firm, given that the majority of locations of head offices and branches are not in the geographical proximity of ORTIA.

6.2.2 External linkages of the Johannesburg airport-centric firms

This section focuses on the linkages that characterise the Johannesburg airport-centric firms as follows: one, linkages between airport-centric firms within the study area; two, linkages with OR Tambo International Airport (ORTIA) and other airports in the Gauteng functional region; three, linkages with firms in the Ekurhuleni metropolitan area, the Gauteng functional region, other parts South Africa and outside the country; and four, linkages with airport-centric firms at other parts of South Africa and outside the country. With each of the four sets of linkages, the discussion attempts to understand whether the Johannesburg airport-centric firms make use of agglomeration economies.

6.2.2.1 Linkages with other firms

The first consideration in this section is a discussion of linkages that exist between the Johannesburg airport-centric firms, that is, linkages occurring within the study area. As shown in Table 6.16, about three-quarters (74%) of Johannesburg airport-centric firms have linkages with the geographically neighbouring firms. This shows that geographical proximity is important in the linkages of airport-centric firms, and these firms potentially make use of agglomeration economies. The linkages within the study area could be upstream, downstream and/or lateral.

However, as a main limitation of the study, the investigations were not able to explicitly distinguish between the different types of linkages. Further on, the discussion compares the linkages within the study area and linkages occurring elsewhere through subcontracting. It is important to note that the linkages that exist within the case study area do not necessarily imply that the biggest customers or clients (in terms of value or frequency of transactions) are located in the vicinity of ORTIA, as a respondent remarked during the qualitative interviews "… most of my clients are not in the area…"

Table 6.16 Johannesburg airport-centric firms' linkages with neighbours

			Interactions with neighbouring firms		
			Yes	No	Total
Activities of firms	Manufacturing	Count	**63**	16	79
		% of Total	**20.7%**	5.2%	25.9%
	Transport, storage and related activities	Count	**77**	8	85
		% of Total	**25.2%**	2.6%	27.9%
	Wholesale and retail	Count	**52**	38	90
		% of Total	**17.0%**	12.5%	29.5%
	Hotel and catering	Count	**3**	6	9
		% of Total	**1.0%**	2.0%	3.0%
	Car repair, tyre dealer, testing and repair of machinery	Count	**13**	2	15
		% of Total	**4.3%**	0.7%	4.9%
	Other	Count	**19**	8	27
		% of Total	**6.2%**	2.6%	8.9%
Total		**Count**	**227**	78	305
		% of Total	**74.4%**	25.6%	100%

As with the Cape Town case studied, subcontracting was used as one of the means of identifying linkages (possibly lateral) between independent firms, and also served as an indication of the use of elements of agglomeration economies. The discussion of subcontracting below is in terms of two categories, namely airport-centric firms that utilise the services of other firms through subcontracting; and airport-centric firms that offer their services to others through the framework of subcontracting. These categories are not mutually exclusive and a given firm can utilise both arrangements simultaneously. The linkages exist with firms within the study area, the Ekurhuleni metropolitan area, Gauteng city-region, other parts of South Africa and areas outside the country. In this way, the analyses of subcontracting can also provide partial insights into the size of the inter-firm economic space that Johannesburg airport-centric firms are part of.

In their core business activities, 30% of Johannesburg airport-centric firms use the services of other firms through subcontracting. The majority of responses (34%) indicated that the firms

used through subcontracting are located in the Ekurhuleni metropolitan area. A quarter (25%) of responses relate to firms that use the neighbouring airport-centric firms though subcontracting, reflecting some relevance of geographical proximity in such arrangements. Similar to the Cape Town case studied, the high proportion of linkages at the broader municipal area shows signs of agglomeration (making use of subcontracting linkages) at the metropolitan area, and not necessarily at ORTIA and surrounds. The Gauteng city-region has a share of 19% of the responses, followed by other parts of the country at 15%.

A small proportion (15%) of Johannesburg airport-centric firms assist other firms through subcontracting arrangements. Over a quarter (27%) of the responses noted that the services of Johannesburg airport-centric firms are offered to firms within the Ekurhuleni metropolitan area. About a quarter (23%) of responses related to firms that offer their services to firms in the broader Gauteng city-region. Approximately 20% relate to firms that assist other airport-centric firms of ORTIA. The findings show signs of agglomeration benefits from subcontracting at the broader metropolitan area and even the region, not necessarily at ORTIA and surrounds. Only 12% pertains to firms that assist other firms located outside South Africa. The findings above on the linkages (both for firms that use the services of other firms and those that provide their services to other firms) at the metropolitan area show that the Johannesburg airport-centric firms potentially make use of agglomeration economies at the broader area, not necessarily at ORTIA and surrounds.

6.2.2.2 Linkages with airport-centric firms elsewhere

Building on the preceding discussion, the current section focuses on the linkages that the Johannesburg airport-centric firms have with airport-centric firms elsewhere in South Africa and outside the country. Those linkages are inter-firm and intra-firm. In respect of inter-firm linkages, the discussion draws partly on the findings of the Johannesburg airport-centric firms as subsidiaries of multi-locational firms in Section 6.2.1.3, though as indicated before, linkages do not necessarily exist between units of the same firm that are located at different airports and surrounds. Therefore, the findings presented here are based on the responses of firms that were explicitly asked about their linkages with airport-centric firms elsewhere.

Approximately 18% of Johannesburg airport-centric firms maintain intra-firm and inter-firm linkages with firms at and around other airports in South Africa. This percentage is lower compared to the linkages of Cape Town airport-centric firms in Section 6.1.2.2. Table 6.17 below indicates that over three-quarters (77%) of firms with such linkages are those involved in

transport, storage and related activities, typified by couriers and freight carriers. A dominant representation of transport-oriented firms was also discovered at the Cape Town case studied.

Table 6.17 Johannesburg airport-centric firms' linkages with airport-centric firms elsewhere in South Africa

Type of firm	Manufacturing	Count	2
		% of Total	3.5%
	Transport, storage and related activities	Count	44
		% of Total	77.2%
	Wholesale and retail	Count	6
		% of Total	10.5%
	Car repair, tyre dealer, testing and repair of machinery	Count	1
		% of Total	1.8%
	Other	Count	4
		% of Total	7.0%
Total		Count	57
		% of Total	100%

At the Johannesburg case studied, 13% of the firms have linkages with airport-centric firms outside South Africa. As with the Cape Town case studied, though respondents could not specify airport and surrounds their firms have inter-firm linkages with, it was noted that linkages are more with Europe and Asia, and less with other African countries. In closing the discussion, the linkages identified above between the Johannesburg airport-centric firms and other airport-centric firms elsewhere are based on organisational proximity (because of the great distances between the airports) and therefore do not generate agglomeration economies.

6.2.2.3 Linkages with ORTIA

The current section discusses the linkages that Johannesburg airport-centric firms have with ORTIA, to understand if the firms make use of urbanisation economies. Table 6.18 shows that the majority (73%) of the firms make use of ORTIA for air passenger services and/or airfreight. The findings partially show that Johannesburg airport-centric firms make use of urbanisation economies by virtue of being situated geographically proximate to ORTIA (as the study area is within a radius of about 5 km of the airport). The firms that show a high usage of ORTIA are a group of transport-oriented firms; and manufacturing firms (see Table 6.18).

Table 6.18 Johannesburg airport-centric firms' use of ORTIA

			Yes	No	Total
Type of firm	Manufacturing	Count	**64**	16	80
		% within type of firm	**80.0%**	20.0%	100.0%
		% of Total	**20.9%**	5.2%	26.1%
	Transport, storage and related activities	Count	**76**	9	85
		% within type of firm	**89.4%**	10.6%	100.0%
		% of Total	**24.8%**	2.9%	27.8%
	Wholesale and retail	Count	**56**	34	90
		% within type of firm	**62.2%**	37.8%	100.0%
		% of Total	**18.3%**	11.1%	29.4%
	Accommodation and catering	Count	**3**	6	9
		% within type of firm	**33.3%**	66.7%	100.0%
		% of Total	**1.0%**	2.0%	2.9%
	Car repair, tyre dealer, testing and repair of machinery	Count	**7**	8	15
		% within type of firm	**46.7%**	53.3%	100.0%
		% of Total	**2.3%**	2.6%	4.9%
	Other	Count	**17**	10	27
		% within type of firm	**63.0%**	37.0%	100.0%
		% of Total	**5.6%**	3.3%	8.8%
Total		**Count**	**223**	83	306
		% of Total	**72.9%**	27.1%	100%

It was crucial to discuss the specific purposes that the firms use ORTIA for. Table 6.19 shows that the majority (61%) of the firms that use ORTIA do so for airfreight services. These airfreight users represent 44% of all Johannesburg airport-centric firms, which shows that airfreight is a key component of the activities of the firms on and around ORTIA. As with the Cape Town case studied, the use of ORTIA for airfreight is not consistent among various firms, as shown by a significant correlation at the 0.01 level (2-tailed) calculated between the type of firm and the use of ORTIA for airfreight. As shown in Table 6.19, 82% of transport-oriented firms that utilise ORTIA do so for airfreight services, and 63% of manufacturing firms that utilise ORTIA do so for airfreight purposes. ORTIA and surrounds can thus be regarded as having signs of a transshipment location that links suppliers and markets. This matter is discussed further in the remainder of this section.

Table 6.19 Johannesburg airport-centric firms' use of ORTIA for airfreight

			Yes	No	Total
Type of firm	Manufacturing	Count	**40**	24	64
		% within type of firm	**62.5%**	37.5%	100.0%
		% of Total	**17.9%**	10.8%	28.7%
	Transport, storage and related activities	Count	**62**	14	76
		% within type of firm	**81.6%**	18.4%	100.0%
		% of Total	**27.8%**	6.3%	34.1%
	Wholesale and retail	Count	**28**	28	56
		% within type of firm	**50.0%**	50.0%	100.0%
		% of Total	**12.6%**	12.6%	25.1%
	Accommodation and catering	Count	**0**	3	3
		% within type of firm	**0.0%**	100.0%	100.0%
		% of Total	**0.0%**	1.3%	1.3%
	Car repair, tyre dealer, testing and repair of machinery	Count	**2**	5	7
		% within type of firm	**28.6%**	71.4%	100.0%
		% of Total	**0.9%**	2.2%	3.1%
	Other	Count	**4**	13	17
		% within type of firm	**23.5%**	76.5%	100.0%
		% of Total	**1.8%**	5.8%	7.6%
Total		**Count**	**136**	87	223
		% of Total	**61.0%**	39.0%	100%

The discussion of the airfreight element within Johannesburg airport-centric development needs to be introduced with a discussion of choice of location for firms that use ORTIA for airfreight purposes. This was necessary to uncover whether ORTIA is a force that attracts airfreight-using firms to locate in its geographical proximity. The two combined categories considered are firms that were located elsewhere before their current premises (excluding those that relocated from within the case study), and firms that originated at the current premises (see Section 6.2.1.2). The majority (61%) of firms that use ORTIA for airfreight services chose their current premises because they wanted to be geographically proximate to ORTIA, customs offices and/or the concentration of transport-oriented firms. Similar to the Cape Town case studied, these findings show that ORTIA is a force that attracts firms that utilise airfreight services. Geographical proximity to ORTIA therefore appears relevant in the operations of such airport-centric firms.

Notably, about half (46%) of Johannesburg airport-centric firms that utilise ORTIA for airfreight do so through the assistance of couriers and freight carriers. It should be noted that this figure is modest, as the total from which the percentage was calculated includes transport-oriented firms,

the majority of which are couriers and freight carriers.[52] For instance, as regards firms in specific economic sectors, 73% of the manufacturing firms that use ORTIA for airfreight do so through the above-mentioned transport-oriented firms. All retail and wholesale firms that use ORTIA for airfreight ship through couriers and freight carriers.

Because of the high magnitude of the usage of ORTIA for airfreight (by 44% of all Johannesburg airport-centric firms), it can be argued that there are signs that the firms potentially make use of urbanisation economies. This is also supported by the fact that ORTIA is a force that attracts these firms to locate in its geographical proximity. Non transport-oriented firms realise the economies through the geographically neighbouring couriers and freight carriers. These firms therefore perform a central and anchoring role in the economic activities of the fellow airport-centric firms. A detailed discussion of the typical operations of freight carriers is provided in Section 6.1.2 with the Cape Town case study and is not repeated here. It is important to note that, as discovered through qualitative interviews, there are airport-centric firms that do not ship through ORTIA and rather through the ports of Durban, Port Elizabeth and Durban. Interestingly, such firms depend on the neighbouring couriers and freight carriers to transport the imported material from the ports. The final products from the manufacturing process are also transported via road, with the assistance of the neighbouring transport-oriented firms. This shows that the role of transport-oriented airport-centric firms goes beyond airfreight operations.

Following the findings above on the utilisation of ORTIA, it was important to discuss the Johannesburg airport-centric firms' usage of other airports in the Gauteng city-region. The discussion can partially reflect the importance of the airport's geographical proximity in the activities of airport-centric firms. Approximately 34% of Johannesburg airport-centric firms make use of Lanseria Airport located about 40 km from ORTIA (see Chapter Five). It is interesting to note that all firms that use Lanseria do so for air passenger services, and not airfreight. Notably, no Johannesburg airport-centric firm utilises other airports in the region, namely Rand, Grand Central and Wonderboom airports. During the qualitative interviews, transport-oriented firms noted that they do not utilise Lanseria Airport because of the lack of international flights, and accordingly the absence of customs offices and adequate facilities to clear international shipments.

[52] To avoid errors in analysis, transport-oriented firms were not excluded from the total used to calculate the percentage of firms that ship with the assistance of couriers and freight carriers. As shown in Chapter Four, Section 4.2.3.4, some of the transport-oriented firms are not involved in airfreight operations and ship through the fellow transport-oriented firms. Therefore, it would be erroneous to use a blanket approach and exclude all transport-oriented firms from the total.

6.2.3 Clustering and the propulsive economic qualities of OR Tambo Airport

This section identifies the propulsive economic character of ORTIA and the surrounding firms, by synthesising the concepts of linkages and agglomeration economies (discussed in Sections 6.2.1 and 6.2.2 above) and clustering. It was also important to determine whether Johannesburg airport-centric firms are spatially clustered and/or organisationally clustered.

6.2.3.1 Linkages, agglomeration economies and clustering

In Section 6.2.2.1, it was found out that about three-quarters (74%) of Johannesburg airport-centric firms have linkages with firms located within the study area. Because the study area is enclosed within a radius of about 5 km, the findings show that the linkages with the neighbouring firms make use of geographical proximity, and the firms potentially benefit from localisation economies and/or activity-complex economies.

Section 6.2.2.3 discovered that about three-quarters (73%) of Johannesburg airport-centric firms make use of ORTIA for airfreight and/or air passenger services. Given that all airport-centric firms are located within a radius of about 5 km, these linkages with ORTIA make use of geographical proximity, and show that the firms potentially benefit from urbanisation economies. As a reflection that airfreight is an important component of the airport-centric firms, 44% of all Johannesburg airport-centric firms utilise ORTIA for airfreight. The linkages summarised above (with neighbouring firms and ORTIA) make use of geographical proximity, and show signs that Johannesburg airport-centric firms are spatially clustered around ORTIA.

Section 6.2.2.2 discovered that 18% of Johannesburg airport-centric firms have linkages with airport-centric firms elsewhere in South Africa. Because of the great distances between ORTIA and other airports in South Africa, the linkages above utilise organisational proximity. Moreover, 13% of Johannesburg airport-centric firms have linkages with airport-centric firms outside the country. As these linkages are based on organisational proximity, they do not generate agglomeration economies.

In Section 6.2.1.3, it was discovered that 61% of Johannesburg airport-centric firms have intra-firm linkages that occur within a framework of multi-locational firms encompassing head office, branch or store. Over half (60%) of these firms are head offices. Approximately 19% of the branches of these head offices are located within the case study area, and the same proportion (19%) located in the Cape metropolitan area. Unlike the Cape Town case studied, the findings

above do not clearly show that the firms benefit from dispersion; as many linkages occur within the case study area.

Section 6.2.1.3 discovered that over a quarter (28%) of the head offices of Johannesburg branch airport-centric firms are located in Ekurhuleni metropolitan area, 25% in Johannesburg and only 13% in Ekurhuleni. The high proportion of head offices located elsewhere, as opposed to the study area, show that the firms do not make use of agglomeration economies. The linkages above with firms elsewhere, mostly make use of organisational proximity, showing that Johannesburg airport-centric firms are potentially organisationally clustered with firms elsewhere in South Africa and outside the country, including other airport-centric firms elsewhere.

6.2.3.2 The propulsive economic character of OR Tambo Airport

The analyses of forces that drive the location and mix of the Johannesburg airport-centric development are concluded with the identification of the propulsive economic character of ORTIA and the surrounding firms. Similar to CTIA (see Section 6.1.3), it is argued that ORTIA is a propulsive economic element and together with the airport-centric development have growth pole properties because of the following reasons. Firstly, about three quarters (73%) of Johannesburg airport-centric firms utilise ORTIA for passenger services and/or airfreight. Approximately 44% of all airport-centric firms specifically use ORTIA for airfreight services. This high magnitude of linkages with the airport shows that ORTIA is a force that binds the cluster of airport-centric firms together.

Secondly, and related to the previous point, the majority (41%) of airport-centric firms chose their current premises so as to be geographically proximate to ORTIA and/or customs offices and logistics firms, showing that ORTIA is a significant force of attraction that influences the firms to locate in its proximity. Thirdly, the cluster of Johannesburg airport-centric firms also possesses growth pole properties because of the high magnitude of linkages occurring within the study area as follows. About three-quarters (74%) of the airport-centric firms have linkages with other firms within the study area. In terms of subcontracting, 31% of the responses indicated that the firms used are located within the study area (compared to 34% of responses that were for firms used that are located in the Ekurhuleni area). As regards the Johannesburg airport-centric firms that offer their services to other firms through subcontracting, 20% of the responses relates to firms that assist other firms located within the study area, in contrast to 27% for the Ekurhuleni metropolitan area and 23% in the broader Gauteng city-region. Fourthly, in part

showing signs of propulsive qualities of ORTIA and surrounds, large firms within the Johannesburg airport-centric development constitute 12% of the sample investigated.

6.3 Comparison between the Cape Town and Johannesburg airport-centric developments

Following the presentation of findings in Sections 6.1 and 6.2 above (and economic activity mix described in Chapter Four), the current section draws out the main differences and similarities between the Cape Town and Johannesburg airport-centric developments. The economic activity mix of the two developments is dominated by similar economic activities as shown in Chapter Four, with the representation as follows: at CTIA and surrounds, wholesale and retail trade; and repair of motor vehicles and motorcycles dominate the mix (at 37%), followed by transportation and storage firms (28%) and manufacturing firms (12%). At ORTIA and surrounds, wholesale and retail trade; and repair of motor vehicles and motorcycles form the majority of firms (at 34%), followed by manufacturing firms (at 21%) and transportation and storage firms (6%). Despite the similarity in the dominant land uses, the Johannesburg airport-centric development accommodates more, and diverse firms than the Cape Town airport-centric development. ORTIA and surrounds accommodate approximately 1629 firms in 17 SIC categories, while CTIA has about 461 firms in only 12 SIC categories.

Both CTIA and ORTIA were found to be significant forces that attract firms to locate in their geographical proximity. At the Cape Town airport-centric development, the majority (44%) of firms chose their current premises because they wanted to be geographically proximate to CTIA. At the Johannesburg airport-centric development, similarly, the majority of firms (41%) chose their current premises so as to be geographically close to ORTIA. The firms located on and around the two airports are relatively young, as the majority (44%) of Cape Town airport-centric firms were established at their current premises between 1990 and 1999; and the majority of Johannesburg airport-centric firms were established at their current premises between 2000 and 2009. Despite these similarities in the young nature of firms, the Johannesburg case studied accommodates firms that are larger than the Cape Town airport-centric firms (as determined by the number of employees per firm): with 38 large firms (representing 12% of the total) recorded at ORTIA, and 18 large firms (9% of the total) recorded at CTIA and environs. Further, the largest firm at ORTIA and surrounds employs 1600 people, with the entire airport-centric development having a median of 30; while the largest firm at CTIA environs employs only 692 people, with the Cape Town airport-centric development having a median of 19.5.

Firms at the two cases studied have a high usage of the respective airports as follows: 73% of the Johannesburg airport-centric firms make use of ORTIA for air passenger services and/or airfreight. Significantly, 44% of all firms specifically use ORTIA for airfreight services. Similarly, at the Cape Town airport-centric development, 70% of the firms make use of CTIA for air passenger services and/or airfreight. Approximately 45% of all Cape Town airport-centric firms specifically use the airport for airfreight. This high usage of the airports for airfreight services shows that airfreight is an important element of the operations of the Cape Town and Johannesburg airport-centric developments, in part supporting the argument that CTIA and ORTIA are potentially transshipment locations that link the sources of inputs, manufacturers and markets. It is also important to note that, at the two cases studied, the majority of non transported-oriented firms (that use the airport for airfreight services) do so through the assistance of couriers and freight carriers, making the latter firms important anchors that facilitate the operations of airport-centric developments.

At the two cases studied, the majority of firms are subsidiaries of multi-locational firms with potential intra-firm linkages as follows: 61% of Johannesburg airport-centric firms are subsidiaries of multi-locational firms, and over three quarters (76%) of firms at CTIA and surrounds are subsidiaries of multi-locational firms.

Approximately 72% of Cape Town airport-centric firms have business linkages with the neighbouring firms. Similarly, at the Johannesburg airport-centric development, 74% of the firms have linkages with the geographically neighbouring firms. The linkages do not stop within the confines of the study areas and extend to other areas as follows. As regards linkages with external firms, 44% of Cape Town airport-centric firms use the services of other firms through subcontracting. At the Johannesburg airport-centric development, 30% of the firms use the services of other firms through subcontracting. At the two cases studied, fewer firms that assist others through subcontracting were recorded as follows: only 15% of the Johannesburg airport-centric firms assist others through subcontracting; and at CTIA and surrounds, only 22% of the firms offer their services to other firms through subcontracting.

In terms of the linkages with airport-centric firms elsewhere in South Africa, about half (48%) of Cape Town airport-centric firms maintain linkages with firms at and around other airports in South Africa; and at the Johannesburg case studied, only 18% of the firms have linkages with airport-centric firms elsewhere in the country. For linkages that extend beyond the country, 21% of Cape Town airport-centric firms have linkages with airport-centric firms located outside

South Africa; and at the Johannesburg airport-centric development, 13% of the firms have linkages with airport-centric firms outside the country.

Due to the presence of large firms, the high magnitude of airport-centric firms' linkages with the airports, and the linkages with neighbouring firms, CTIA and ORTIA display propulsive economic qualities, and the two airport-centric developments have growth pole properties à la Perroux (1955). Further, because of the linkages that the two cases studied have with airport-centric developments elsewhere in South Africa and beyond, an argument is advanced that the Cape Town and Johannesburg airport-centric developments are potentially part of a global organisational cluster of airport-centric developments. This argument draws on the seminal idea of systems of cities of, inter alios, Berry (1964); Pred (1977); and Wells (1903).

6.4 SUMMARY

This chapter presented the findings of analyses undertaken on the Cape Town and Johannesburg airport-centric developments, to attempt to describe and explain forces that drive their location and mix. The findings of the two cases studied largely corroborated each other, and led to a conclusion that the firms are spatially clustered around Cape Town and OR Tambo airports, and also organisationally clustered with firms elsewhere. It was also noted that CTIA and ORTIA (and their airport-centric developments) have growth pole properties because of the linkages the airport-centric firms have with the airport; the fact that the two airports are significant forces of attraction that influence the firms choice of location; and the high magnitude of linkages that occur between the airport-centric firms. The next chapter synthesises the findings, contributes towards airport-centric developments' theoretical framework, and draws out the implications for practice.

7 SYNTHESIS OF THE FINDINGS, CONTRIBUTION TOWARDS THEORY AND IMPLICATIONS FOR PRACTICE

Chapter Six presented the empirical findings of forces that drive the location and mix of airport-centric developments of the Cape Town and OR Tambo airports. This chapter synthesises the results with a view to addressing the overall aim of the study. The chapter is organised into three main sections. Section 7.1 contributes towards a theoretical framework and the associated descriptive model. Informed by the theoretical framework developed, Section 7.2 draws practical implications pertaining to ways that the emergence and growth of airport-centric developments could be approached, directed and managed. The final section concludes the dissertation and recommends areas for future research on the topic of spatial economic attributes of airport-centric developments.

7.1 TOWARDS A THEORY AND MODEL OF AIRPORT-CENTRIC DEVELOPMENTS

It is important to note that the contribution to theoretical framework here proposed is based upon international airports (Cape Town and OR Tambo airports) that handle large volumes of passengers and cargo. As such, the contribution towards a theory and descriptive model should not be generalised a priori to other airports.

7.1.1 A spatial economic theory of airport-centric developments

Prior to advancing the building blocks of a theoretical framework, a brief summary is provided of the informants and main investigations undertaken in the study. As discussed in Chapter Three, the study was based upon the premise of theory not being a rigid framework that is used to generate predictions and laws (see Wilson 1980) of airport-centric developments. Rather, theory was regarded as a descriptive and explanatory framework that can assist towards the conceptualisation of forces that drive the location and mix of the airport-centric developments of the Cape Town and OR Tambo airports.

Towards building a descriptive and explanatory framework, a set of concepts was required to serve as the building blocks. The concepts identified in the study have, in one way or another and at different times, been fundamental in human geography. These are the relationally interpreted concepts of economic space, firm, geographical and organisational proximity, scale and pattern. These are understood in terms of their interconnections with the concepts of linkages,

agglomeration economies, clustering, and propulsive economic element. Chapter Three assessed the relevant theoretical bodies against the relational interpretation of the former set of concepts. The assessment discovered the growth pole theory (Perroux 1955) as the most appropriate framework to be used as basis for analysing the spatial economic attributes of airport-centric developments. However, this selection did not discard completely elements of other theories that have some relevancy to the description and/or explanation of airport-centric developments. Chapter Six then analysed forces that drive the location and mix of Cape Town and Johannesburg airport-centric developments, informed predominantly by the conceptualisation of the growth pole theory; particularly its concepts of linkages, agglomeration, clustering, and propulsive economic activities. Given the principles of the growth pole theory, which were subjected to the empirical investigations, the contribution towards the airport-centric developments' theoretical framework is based on the conceptualisation below.

Relational firms: airport-centric firms are not atomistic islands or the so-called black boxes that merely transmit market transactions. These firms have two main characteristics that provide evidence of their relational nature. Firstly, airport-centric firms are characterised by high intensity of inter-firm linkages with independent but associated firms. Secondly, they have a high magnitude of intra-firm linkages (in the context of subsidiaries of multi-locational firms). If airport-centric firms were atomistic, they would not be able to facilitate the fundamental linkages and be part of the primary economic space discussed below. The propulsive economic qualities of the airports (in conjunction with the role of transport-oriented firms) are important in facilitating the linkages and the entire operations of the economic space.

Economic space: the space that airport-centric firms are part of is not equivalent to geographical space. Fixed geographical locations (airport environs) represent areas where certain resources of a firm are situated and certain activities of the firm organised; but the linkages, and organisational clustering are not restricted within such spaces. Airport-centric firms are part of the same economic space with other firms (or units of the same firm), and specifically other airport-centric firms elsewhere, regardless of the distinct geographical locations at different parts of the world. The linkages that define this space are however not uniform across the world, and are dominated by (and concentrated in) certain continents and countries. The economic space anchored by the transport-oriented firms is not necessarily the only form of space, as Massey (2005) notes that space is multi-dimensional. Further, given that the economic space is open, there might be new linkages in future that would incorporate more firms into the economic space of airport-centric firms.

Physical and organisational proximity: in their economic activities, airport-centric firms rely on a combination of geographical proximity and organisational proximity. The linkages and spatial clustering of airport-centric firms dismiss the notion that geography is dead. To an extent, these firms use geographical proximity, particularly as regards linkages with each other and linkages with the airport. Reflecting the relevance of geographical proximity, it is important to note that the airport represents a significant force that attracts the firms to locate in its geographical vicinity. The economic activities of airport-centric developments are however not deterred by increase in geographical distances. The linkages and organisational clustering of the airport-centric firms support the dualism of farness and nearness (see Shields 1992), where some of the firms that are close to each other geographically are not necessarily more economically and functionally proximate. The closeness of airport-centric firms to other firms and/or subsidiaries of multi-locational firms operational in the economic space is also measured organisationally, not only geographically.

Relational scale and pattern: geographical or political scales do not limit the linkages and organisational clustering of airport-centric firms, and the overall operations of the economic space. The extent of linkages and the nature of clustering define the relational scale that airport-centric firms are part of. Regardless of the porous boundaries, the linkages are not uniform across the world (intra-country and inter-country) but are dominated by certain firms and reflect linkages with certain cities and countries à la Massey 1999b. Nonetheless, given the intricacies of the spatial economic attributes of airport-centric firms, their activities cannot be reduced to a logical pattern that could be mapped on a geographical space.

The elementary conceptualisation proposed above could be regarded as the beginnings of a contribution towards a spatial economic theory of airport-centric developments. It is hoped that in future, the framework would be improved upon (see Section 7.3.2).

7.1.2 Foundations of a model

Given the outline above of basic conceptualisation, this part provides the foundations of a descriptive spatial economic model of airport-centric developments, outlined later in Section 7.1.3. As discussed in Chapter Three, contrary to a popular interpretation, the terms ‘model’ and ‘theory’ are not synonymous. A model presented in Section 7.1.3 is a representation of the conceptualisation outlined above, so as to make the theoretical framework comprehensible. Unlike the normative models of airport-led developments (reviewed in Chapter Two), the model presented here is not the idealised picture of how airport-centric developments should be or

should function, spatially and economically. Thus, the model is not normative but descriptive. It is purely an empirically grounded demonstration of forces that drive the location and mix of airport-centric developments, so as to aid description and explanation. This matter is discussed further in Section 7.2 with the practical implications of the dissertation.

The foundations of the descriptive model are based on a set of assumptions. Unlike models that use assumptions to abstract from reality, the assumptions hereunder are based on the spatial economic characteristics discovered through the investigations of the airport-centric developments of the Cape Town and OR Tambo airports. The word assumption is used because these considerations might not be the same at airports and surrounds elsewhere, and would need to be tested and revised through relevant case study investigations. As shown earlier in the chapter, the model is centred on international airports that handle large volumes of passengers and cargo. It is therefore emphasised that the assumptions below and the resultant model (in Section 7.1.3) should not automatically be generalised to other airports.

The underlying assumptions are stated as follows and reflected in Figure 7.1.

- Airport (A1) is located in metropolitan area (M1), in region (R1), in country (C1). This is the primary airport in the region (R1)
- Airport (A1) is surrounded by airport-centric firms (FA1), which include airlines (Ai). A collection of firms (FA1) is airport-centric development (ACD1)
- In addition to airport (A1), airports (A2i,… n) are located elsewhere in the metropolitan area (M1), and are surrounded by airport-centric firms (AF2i,… n) that constitute airport-centric developments (ACD2i,… n)
- Firms (FM1,… n) are located elsewhere in the metropolitan area (M1), other than on airports and surrounds
- Airports (A3i,… n) are located beyond (M) in the region (R1), and surrounded by airport-centric firms (AF3i,… n) that constitute airport-centric developments (ACD3i,… n)
- Firms (FR1,… n) are located elsewhere in the region (R1), other than on airports and surrounds
- Airports (A4i,… n) are located elsewhere in country (C1) beyond (R), and surrounded by airport-centric firms (AF4i ,… n) that constitute airport-centric developments (ACD4i,… n)
- Firms (FC1,… n) are located elsewhere in country (C1), other than on airports and surrounds

- Airports (A5i,… n) are located outside country (C1) in countries (C2,… n), and surrounded by airport-centric-firms (AF5i,… n) that constitute airport-centric developments (ACD5i,… n)

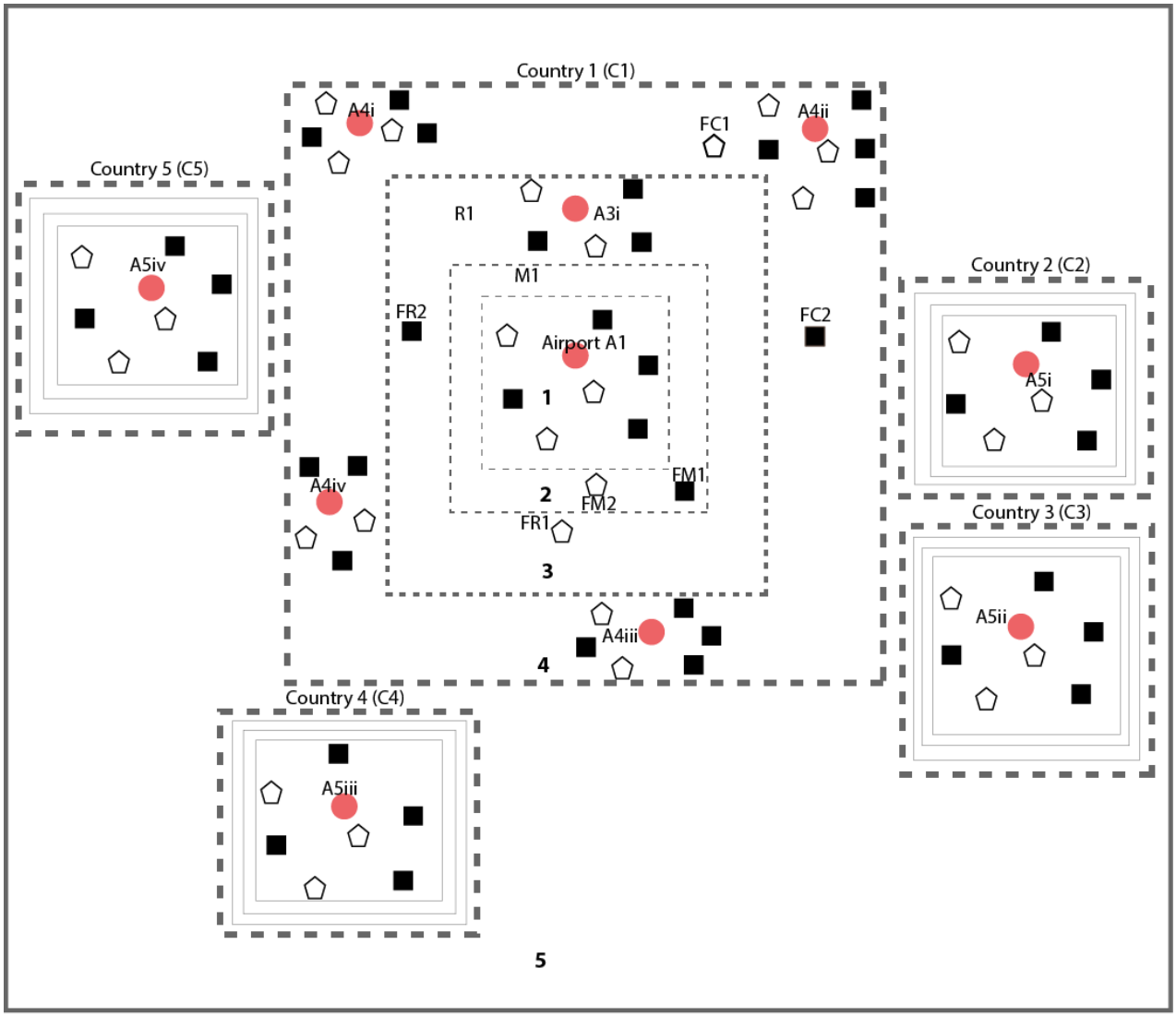

Figure 7.1 Foundations of a model

Source: Author 2015

7.1.3 A descriptive model of airport-centric developments

On the background of the foundation in Section 7.1.2 above, the descriptive model is presented below and encapsulated in Figure 7.2. The discussion below outlines the linkages, agglomeration and clustering (spatial and organisational) of airport-centric firms, and the role of the transport-oriented firms found on and around airport (A1).

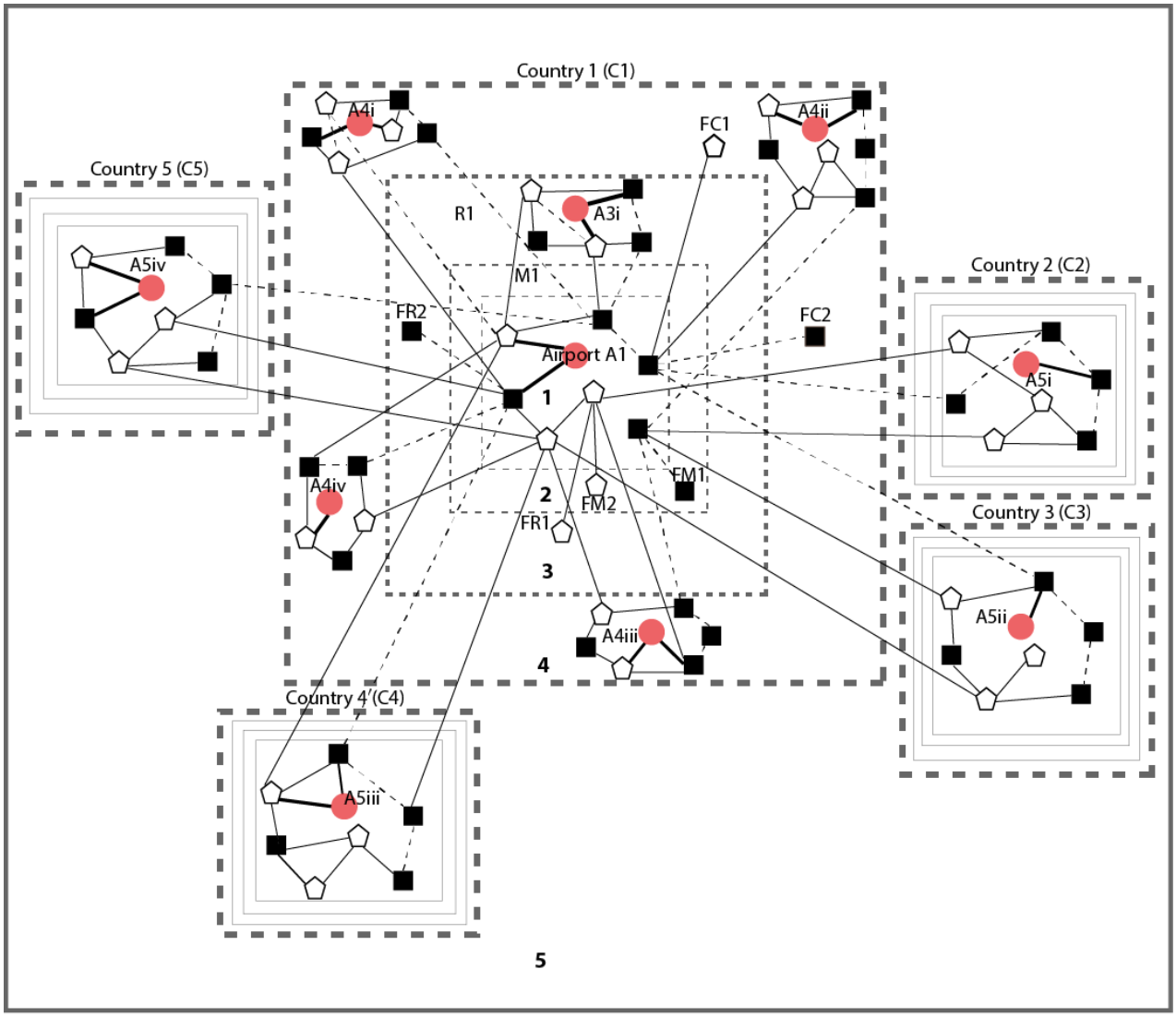

Figure 7.2 A descriptive model of airport-centric developments

Source: Author 2015

7.1.3.1 Gateway to the economic space

The airport (A1) and airlines (Ai) form the heart of the economic space of airport-centric firms (FA1). The two fundamental elements are indivisible: the airport cannot function without the airlines and the airlines cannot operate without the airport. The essential connection of the two is in terms of air passenger services and airfreight operations across the economic space. The five interrelated components of the model are described below. These are not hierarchical compartments at different geographical or political scales but a simplified layering of the economic space of airport-centric firms and developments. Each of the components has a set of airport(s), airport-centric firms and developments that are numbered from one (1) to five (5).

7.1.3.2 Economic activities in the geographical vicinity of an airport

The first component of the economic space (labelled 1) represents the geographical location of the airport (A1) and airport-centric firms (FA1). These are firms that are located within the airport terminals, on the airport landside and around the airport. Firms (FA1) have the following underlying characteristics that exert influence over the rest of the economic space. One, those with inter-firm linkages with firms in the geographical surrounds and/or elsewhere; two, those with intra-firm linkages with units of same firm located in the geographical surrounds and/or elsewhere; three, airport-centric firms with a combination of intra-firm and inter-firm linkages; and four, firms that do not have fundamental structural inter-firm and intra-firm linkages, such as franchises. The latter set represents a negligible number of firms (FA1) that, although located at the airports and surrounds, do not form main part of the airport-centric firms' economic space. However, given that space is multi-dimensional, these firms might still play a certain role in the economic space. The aggregate of airport-centric firms (FA1) is referred to as airport-centric development (ACD1).

Airport-centric firms choose their location for the following three main reasons, which are not mutually exclusive. Firstly, the majority of airport-centric firms (FA1) choose their location so as to be geographically proximate to the airport (A1), as a locational constant and a non-central place. This is evidence that the airport is a force that attracts firms (FA1) to locate in its geographical proximity. As gateways to the airport (A1), airlines (Ai) are a set of the firms whose operational units need to be located at airport (A1). Secondly, some of the firms (FA1) choose their location due to the advantageous location of the airport and surrounds within the broader metropolitan area (M1). The area might be easily accessible to markets, suppliers and business partners, in comparison to other areas in the metropolitan area. Some firms (FA1) select the location because of property-related considerations, including the availability of premises

that are suitable for the firm's operations. In the latter two considerations, the airport has no significant role in influencing the location of airport-centric firms. A small number of firms (FA1) move within the airport and surrounds, predominantly influenced by property-related considerations.

Within the economic space, airlines (Ai) play a significant role in that they link the airport (A1) with other firms (other airport-centric firms, firms in the metropolitan area, firms in the region and firms in other parts of the country and beyond). These fundamental linkages are in terms of airfreight and air passenger services. The airport-centric firms (airline and non-airline) have linkages with the airport (A1), and use it for air passenger services and airfreight. When non-airline airport-centric firms use the airport for air passenger services, they operate directly with the airlines. With regard to airfreight, the linkages with the airport are complex and are facilitated by the transport-oriented firms. There are two ways that the airport-centric firms access the airport (A1) for airfreight services. On the one hand, despite being geographically proximate to the airport, the majority of airport-centric firms do not use the airlines directly. They rely on the couriers and freight carriers to access the airlines, which in turn provide access to airport's airfreight services. On the other hand, a limited number of firms access the airlines and ship directly. Some transport-oriented firms also assist neighbours and firms elsewhere to ship through the sea and also to transport the shipments by road, and to a lesser extent rail.

Besides the linkages with the airport (through the airlines, couriers and freight carriers), airport-centric firms have intra-firm and inter-firm linkages with each other. Fundamental linkages amongst the airport-centric development include the aforementioned whereby firms interact with the geographically neighbouring transport-oriented firms so as to gain access to the airport's airfreight services. The linkages of airport-centric firms with the airport (A1) and linkages with fellow airport-centric firms are based on geographical proximity, and to a lesser extent organisational proximity. The latter form of proximity is relevant, particularly in the case of intra-firm linkages with units of the same firm within the airport-centric development (ACD1).

Due to their use of the airport for air passenger services and particularly airfreight services, the airport-centric firms benefit from urbanisation economies by virtue of being geographically proximate to airport (A1). As noted above, the operations of the transport-oriented firms are fundamental for other airport-centric firms to make use of these economies. Because of their high magnitude of linkages, airport-centric firms represent a spatial cluster centred on airport (A1).

7.1.3.3 Economic activities extending to the broader metropolitan area

The linkages and organisational clustering characterising airport-centric firms (FA1) are not restrained by geographical proximity to each other and to the airport (A1). The second component of the economic space (labelled 2) represents a metropolitan area (M1) within which the airport (A1) is located. Metropolitan area does not refer to a specific city or town, but to the broader municipal area as defined by the administrative boundaries. Given the multi-nodal nature of contemporary urban areas, a municipal area can have more than one urban centre, as opposed to a single central business district (CBD).

The firms (FM1,… n) located in a metropolitan area have the following characteristics, in relation to airport-centric firms (FA1). Firstly, there are firms (FM) with intra-firm linkages with airport-centric firms (FA1). Secondly, some firms (FM) have inter-firm linkages with airport-centric firms (FA1). These two categories are not mutually exclusive, hence some firms (FA1) have a combination of inter and intra-firm linkages with firms (FM). Lastly, other firms (FM) do not have significant structural linkages with airport-centric firms, and are therefore not in the same economic space with airport-centric firms (FA1). Notably, the majority of firms (FA1) do not have linkages with airports (A2i,… n) and airport-centric-firms (AF2i,… n) located elsewhere in the metropolitan area.

Subcontracting is one of the business arrangements used to effect the inter-firm linkages between firms (FM) and airport-centric firms (FA1) as follows. Firstly, firms (FA1) use the services of firms (FM) through subcontracting; and secondly, firms (FM) use the services of firms (FA1) through subcontracting. Firms (FA1) utilise these two arrangements simultaneously. These inter-firm linkages reflect unequal business relationship that is controlled and dominated by the subcontracting firm over the subcontracted party.

The transport-oriented firms (within ACD1) have the highest magnitude of linkages with firms in the metropolitan area (FM) that are realised within the framework of subcontracting. At this level of the economic space, the linkages are necessary for the transport-oriented firm to achieve its role, that is, linking firms in the metropolitan area with the airlines and airport (A1) with regard to airfreight. Overall, the linkages of the transport-oriented firm are either with independent firms (inter-firm), or with units of the multi-locational firms located in the broader metropolitan area.

The linkages of airport-centric firms and firms elsewhere in the metropolitan area are based on both geographical proximity and organisational proximity, although the relevance of the former is fading, given the increasing geographical distances from airport (A1). Airport-centric firms' (internal and external) linkages and organisational clustering include firms in the metropolitan area. Therefore, as regards airfreight activities, firms (FM1,… n) and (FA1) are part of the same economic space, and constitute an organisational cluster that is facilitated by the transport-oriented firms at and around airport (A1).

7.1.3.4 Economic activities extending to the functional region

The intra-firm and inter-firm linkages and organisational clustering involving airport-centric firms (FA1) do not terminate within the metropolitan area (M1) as defined by the administrative boundaries. The third component of the economic space (labelled 3) denotes a functional region (R1). The distinction between (M1) and (R1) is not clear as it is not based on administrative boundaries. The region does not have distinctive boundaries, hence it can be referred to as a functional region.

The functional region accommodates firms (FR1,… n) and in some cases, these firms are located on and around airports, and known as firms (AF3,…n). Similar to the characteristics of the metropolitan area, the region (R1) accommodates firms (FR) with the following characteristics. Firstly, firms (FR) that have intra-firm linkages with airport-centric firms (FA1); and secondly, firms (FR) that have inter-firm linkages with airport-centric firms (FA1). Airport-centric firms (F1) use these arrangements simultaneously. Other firms (FR) do not have significant structural linkages with firms (FA1), and therefore do not form main part of the airport-centric firms' economic space. At this level of the economic space, subcontracting is still used as one of the business arrangements to achieve the inter-firm structural linkages between firms (FR1,… n) and firms (FA1).

The relevance of geographical proximity is disappearing and the linkages are mostly based on organisational proximity. However, because the airport (A1) is not located at the geographical centre of the metropolitan area (M1), it may be geographically closer to some parts of the region as compared to other parts of the metropolitan area. Therefore, geographical proximity still has a minor role in the operations of the airport-centric firms' economic space, with firms (FR1,… n).

The transport-oriented firms located at and around airport (A1) still have more linkages required to link firms in the broader region with the airlines and airport as regards airfreight. However, the

linkages of the airport-centric firms and other airport-centric firms (AF3,… n) in the region are insignificant. This provides evidence that the firms at and around airport (A1) mainly utilise that airport and not other airports in the region.

Although the magnitude of linkages is declining, airport-centric firms' (FA1) organisational clustering includes firms in the region. Firms (FR1,… n) are therefore part of the same intra-firm and inter-firm cluster with airport-centric firms (FA1) regardless of the increasing geographical distances and changes in administrative boundaries. This cluster is facilitated by the activities of the transport-oriented firms located at the airport-centric development (ACD1).

7.1.3.5 Economic activities extending to other parts of a country

Airport-centric firms' (FA1) linkages and organisational clustering extend beyond the region (R1). The fourth component of the economic space (labelled 4) denotes other parts of the country (C1) that accommodate firms (FC1). Firms (FC1) include firms that are located at and around airports (A4i,… n). These are referred to as airport-centric firms (AF4,… n) and constitute airport-centric developments (ACD4,… n).

Firms (FA1) have linkages with firms (FC1,... n). Similar to firms in other components of the economic space, firms (FC) are characterised by the following linkages: one, firms (FC) that have intra-firm linkages with airport-centric firms (FA1); two, firms (FC) with inter-firm linkages with airport-centric firms (FA1). The inter-firm linkages can be realised through the framework of subcontracting, wherein firms (FA1) use the services of firms (FC), or offer their services to firms (FC). Three, there are firms (FC) with a combination of intra-firm and inter-firm linkages with firms (FA1). Other firms (FC) do not have fundamental linkages with firms (FA1) and are therefore not part of the airport-centric firms' economic space.

There is a new dimension of linkages and organisational clustering introduced strongly at this component of the economic space. Firms (FA1) have a high magnitude of intra-firm and inter-firm linkages with other airport-centric firms (AF4,… n) located elsewhere in the country (C1). As noted previously, airports and the transport-oriented firms play a key role in these linkages. The transport-oriented firms have intra-firm units at various airports in the country, which enable them to effect linkages to and from airport (A1). Therefore, in comparison to their counterparts at and around airport (A1), transport-oriented firms have a greater magnitude of intra-firm and inter-firm linkages with other airport-centric firms in the country. These link the geographically

neighbouring firms, the metropolitan area and the region, with other parts of the country, as regards airfreight activities.

At this level, geographical proximity has no role in the operations of airport-centric firms. The inter-firm and intra-firm linkages and entire operations of the economic space are predominantly based on organisational proximity. Firms (FA1) are therefore part of the same economic space with firms (FC1,… n), including airport-centric firms (AF4,… n) regardless of the great physical distances and administrative boundaries that separate them. This structure can be regarded as a national intra-firm and inter-firm cluster of airport-centric developments.

7.1.3.6 Economic activities extending to other countries

Airport-centric firms' (FA1) linkages and organisational clustering extend beyond the borders of country (C1) and culminate in the last component of the model (labelled 5). Firms (FA1) have intra-firm and inter-firm linkages with firms (FW) in different countries (C2,… n). Though with differing magnitude, the linkages of firms (FA1) can extend across the five continents, that is, the rest of Africa, America, Asia, Europe and Australia. Subcontracting is still one of the business arrangements used to achieve the inter-firm linkages across national borders.

Some of the firms (FW) are located at and around airports. These are airport-centric firms (AF5,… n), which constitute airport-centric developments (ACD5,… n). Airport-centric developments (ACD5,… n) have multi-layered intra-country economic spaces in their respective countries, which are not demonstrated in the current model. Compared to their counterparts at and around airport (A1), the transport-oriented firms have a greater magnitude of linkages with airport-centric firms located outside country (C1). As regards airfreight operations, these firms link the geographically neighbouring firms, the metropolitan area, broader region, and other parts of the country (C1) with the rest of the world. It should once again be noted that the linkages are not uniform across the globe and exist mainly with certain continents and cities.

Given the intra-firm and inter-firm linkages, airport-centric firms (FA1), (AF4,… n) and (AF5,… n) are organisationally clustered in the same economic space, despite the great geographical distances between them. In the style of Perroux (1950a), the economic space and clustering that airport-centric developments are part of can be global. At this level of the economic space that crosses national borders, geographical proximity does not exist and firms rely on organisational proximity. The propulsive qualities of the international airports, and the transport-oriented firms coordinate this global economic space of airport-centric developments.

It can therefore be argued that airport-centric firms form part of a global system of airport-centric developments characterised by intra and inter-firm interdependencies, linkages and organisational clustering.

7.2 CONTRIBUTION TO PRACTICE

As noted before, the contribution towards a theoretical framework and descriptive model do not present an idealised spatial economic form of airport-centric developments. As highlighted in Chapter One (Section 1.2.1) and reiterated earlier in this chapter, this study should not be confused with the existing models of the so-called airport-related developments, dominated by the notions of airport city and aerotropolis. The limitations of these models are discussed in Chapter Two, and pertain mostly to their theoretical vacuum. As regards contribution to practice, the ultimate intention of the model developed in the study is to guide the analyses of the spatial economic attributes, with a view to appropriately informing the planning and management of airport-centric developments.

7.2.1 Analyses of spatial economic attributes of airport-centric developments

To inform the spatial economic planning initiatives, the following intertwined elements should be considered carefully in the analyses of airport-centric developments:

1) The economic space (nature and extent) that airport-centric firms are part of. With the comprehensive analyses and understanding of the economic space, the interventions could be appropriately directed towards supporting, facilitating or unlocking spatial economic linkages that define the airport-centric firms' economic space. The multi-dimensionality of the economic space should also be considered carefully to investigate among others the needs of airport-centric firms pertaining to sea and road-based modes of transport.

2) The propulsive economic characteristics that are important in the operations of airport-centric firms in the economic space mentioned above. Airports are different: they were established for different purposes, they have different characteristics and roles, and are located in towns or cities of varying sizes and economic characteristics. For a specific airport, comprehensive analyses could be conducted towards identifying an economic sector or firms that might facilitate the linkages and general operations of the airport-centric firms' economic space.

3) Elements of distance and proximity that different airport-centric firms utilise, that is geographical proximity, organisational proximity, other forms of proximity or combination thereof. This consideration refers to proximity of airport-centric firms to other elements in the economic space. With a comprehensive airport-specific understanding, linkages could be supported depending on the type of proximities required.

4) Patterns of linkages, agglomeration and clustering. The considerations above would lead to an inclusive understanding of the spatial economic patterns that characterise the operations of airport-centric firms. These patterns would be airport-specific and would be supported or enhanced through different interventions.

7.2.2 Planning initiatives

Informed by the approach to analysis proposed in Section 7.2.1 above, the current section outlines ways that the model developed can be operationalised for spatial economic planning purposes. A word of caution is necessary at the onset, as it will be noticed that the discussion below is rather brief and does not propose specific planning instruments. It is believed that the work based on only two case studies represents the beginnings of a model and the associated contribution to practice. As shown in Section 7.3.2, further work is required on more case studies to improve and elaborate on the work here proposed.

It might come as a surprise to some people that a model that is primarily based on growth pole theory is potentially to be used for planning purposes, given the questionable success of the growth pole strategies.[53] It should be remembered that those strategies in a way misinterpreted and deviated from the original growth pole theory, discussed in Chapter Three, Section 3.2.3. As originally developed by Perroux (1955), the theory was too abstract to be used as a basis for planning, and attempts to use the growth pole theory for such purposes would require global planning (Higgins 1983, 1988). The discussion hereunder should therefore be understood in terms of the original ideas of Perroux, instead of only the geographically restricted version of the theory (see Boudeville 1966).

[53] In South Africa, for instance, Todes & Watson (1984) evaluated the industrial decentralisation policy (based on the growth pole theory) through the analysis of 13 growth centres. The success of the policy was discovered to be minimal as regards the ability of the growth pole to achieve self-sustaining growth, and the ability to address the problem of uneven regional development.

Furthermore, in light of the numerous models of 'airport-led development', commentators might wonder whether there is a need for a new model of airport-centric developments that could be operationalised for spatial economic planning purposes. As noted before, the model here proposed does not argue for an idealised spatial form of airport-centric developments; and unlike the existing models of airport-led development, the model could be used for planning beyond the metropolitan area and the functional region that a particular airport is located within, per the interpretation of Higgins (1983, 1988) above. Because of the relational interpretation of the concepts of economic space, proximity, firm, scale and pattern; the model of airport-centric developments can be operationalised at three levels, largely following the components of the economic space discussed in Section 7.1.3. These are: one, airport environs and the broader metropolitan area; two, functional region; three, the broader country; and four, planning across international frontiers. These levels are closely intertwined, and the possibility of a given airport to participate in one or more of the levels needs to be informed by the approach to analysis proposed in the study.

7.2.2.1 Local and metropolitan planning

At a local level, planning efforts could be directed towards enhancing the organisational clustering and particularly the spatial clustering of firms on and around airports. The latter form of clustering makes use of geographical proximity and generates economies internal to the firm (economies of scope, scale and complexity); and/or economies external to the firm (localisation, urbanisation and activity-complex) as discussed in Chapter One, Section 1.2.2. Supporting the firms that utilise the airport facilities (especially airfreight) would be essential towards promoting urbanisation economies. In this way, planning efforts could also be used to augment the transshipment capabilities of airports and airport-centric developments. It would also be important to identify the propulsive economies qualities of a given airport (and its airport-centric development) that could have influence on the other levels of planning below.

7.2.2.2 Regional planning

At the level of a functional region, planning efforts could be focussed on enhancing linkages that airport-centric firms have (or potentially require) with different cities and towns in the region; in terms of the flow of materials and/or services between the firms, and flows within a firm. These linkages would utilise elements of geographical proximity and generate certain forms of agglomeration economies, internal and/or external to the firms. However, because of the increasing geographical distances between the airport and other related actors in the region, consideration should be given towards promoting organisational proximity that would potentially

generate dispersion economies. The main objective at this level should therefore be to promote intra-firm and inter-firm organisational clustering of airport-centric firms with firms elsewhere in the functional region.

7.2.2.3 National planning

In the previous and current planning frameworks in South Africa, the role of airports in promoting manufacturing through enhancing imports and exports is acknowledged (see Chapter One, Section 1.4.1). However, such initiatives consider airports, and their (anticipated) airport-centric developments in isolation of each other. For instance, IDZs were declared at ORTIA and KSIA, without carefully considering the firms' economic space beyond the immediate geographical limits (or regions); the linkages with other IDZs elsewhere in the country, linkages with other non-airport areas, and importantly how those linkages could be piggybacked on, and enhanced towards promoting development.

At a national level, the economic spaces of different airport-centric developments should be considered as an aggregate, while exploring linkages between the various airports as transshipment locations. Development indicatives and efforts could thus be around enhancing organisational clustering among different airport-centric developments. Unlike at the level of airport environs and metropolitan area, at the countrywide level, the airport-centric firms would make use of organisational proximity and potentially generate dispersion economies, instead of agglomeration economies. The linkages that could be identified are not only between airport-centric developments, but also between airport-centric developments and non-airport locations in secondary/intermediate cities (See Chapter Six, Section 6.2.1.3).

The understanding above could potentially be used as input into, for instance, South Africa's integrated urban development framework (IUDF) (South Africa 2014c), spatial economic development zones, or derivatives thereof. It is important to note that currently, the country's IUDF does not consider the potential role of airport-centric developments in influencing (at least in part) the spatial economic structure of South Africa.

7.2.2.4 International planning

At the international level, planning interventions could be directed towards enhancing the organisational clustering of airport-centric developments in different countries. The linkages of firms across international frontiers would make use of organisational proximity and potentially generate dispersion economies. Planning could be effected through agreements of regional

bodies such as the Southern African Development Community (SADC). It is acknowledged that the potential use of SADC agreements to effect flows of airfreight between airports in the member countries is not a novice idea; for instance, see the argument for the promotion of development on and around the Windhoek International Airport, in Namibia (Eicker 2009b). The approach to analysis here proposed distinguishes the dissertation from those ideas.

7.3 CONCLUSIONS AND AREAS FOR FURTHER RESEARCH

In light of the foregoing discussion on contribution towards a theoretical framework, descriptive model, and implications for practice; this section concludes the dissertation, and provides recommendations for future research on the topic of spatial economic attributes of airport-centric developments.

7.3.1 Conclusion

The aim of the dissertation was to contribute towards an empirically informed theoretical framework for analysing the spatial economic attributes of airport-centric developments (realised in Sections 7.1 and 7.2 above). Coincidentally, the dissertation contributed towards debates on the relationship between regions, cities and transport flows. The following objectives were set towards achieving the research aim, and for ease of reference, indication is provided of main sections where the objectives were addressed.

1) The first objective was to establish the type of economic activities that are located on and around the Cape Town and OR Tambo airports, and analyse the reasons for locating there. The objective was addressed in Chapter Four (Section 4.2.2) and Chapter Six (Sections 6.1.1 and 6.2.1).

2) The second objective was to identify the propulsive economic element found around the Cape Town and OR Tambo airports, and analyse the linkages they have with the airport-centric developments and airports. This objective was addressed in Chapter Six (Sections 6.1.3 and 6.2.3).

3) The third objective was to analyse the spatial, economic and structural linkages within the airport-centric developments of the Cape Town and OR Tambo airports, between airport-centric developments and the airports, as well as airport-centric developments' linkages with their metropolitan areas and other national and international airport-centric

developments and locations. The objective was addressed in Chapter Six (Sections 6.1.1, 6.1.2, 6.2.1 and 6.2.2).

4) The fourth objective was to establish changes that have occurred over time in the form of the airport-centric developments of the Cape Town and OR Tambo airports. The objective was addressed in Chapter Five.

7.3.2 Areas for further research

The following further areas of research are necessary with a view to improving the theoretical framework and descriptive model proposed, and accordingly improve the contribution to practice.

1) Empirical investigations could be conducted on a wide variety of airport-centric development case studies to test and improve the work.

2) Further investigations are necessary to further understand the extent to which airports act as forces that influence the location of firms. This could be done through case studies where a significant airport relocated, such as the decommissioned Durban International Airport, to understand the extent to which firms migrated from the old airport environs to the new airport.

3) Investigations are required to analyse in detail the similarities and differences between the spatial economic attributes of airport-centric developments and other nodes in a metropolitan area; so as to uncover the economic significance of the airport environs in the metropolitan economy.

4) To further understand the significance of the airport-centric development, analyses are required pertaining to the employment generated and the resultant commuting patterns. Such investigations would extend the work of ACSA (2013), conducted on the origin-destination of employees at CTIA premises.

5) Institutional dynamics of airport-centric developments can be analysed, and lessons be integrated into the model proposed, particularly as regards the role of different role players at different levels of the economic space of airport-centric developments. This would improve the model's contribution to practice.

6) The relevance of the contribution towards a theoretical framework and model can be tested on the economic operations of seaports. Further, because some airport-centric firms engage in both seafreight and airfreight chains, it would be informative to analyse in detail the spatial economic attributes of subsidiaries of multi-locational firms that engage in both seafreight and airfreight operations. Such investigations would add to the work of, inter alios, Fujita & Mori (1996) on the role of ports in the concentration of economic activities.

7) With the support of further empirical studies, the contribution towards a framework can be tested and applied to other areas of interest, such as the transit-oriented developments that are associated with rail and/or road modes of transport.

REFERENCES

ACI (Airports Council International) 2004. The social and economic impact of airports in Europe. [Online] Available from: https://www.ryanair.com/doc/news/2012/ACI-Report.pdf [Accessed 20 August 2015].

Ackoff RL 1953. *The design of social research*. Chicago: The University of Chicago Press.

ACSA (Airports Company South Africa) 2009. Airports Company South Africa Annual Report 2009. Bedfordview: ACSA.

ACSA (Airports Company South Africa) 2011. Cape Town International Airport macro economic impact study. Cape Town: ACSA.

ACSA (Airports Company South Africa) 2012. Airports Company South Africa Integrated Annual Report 2012. Bedfordview: ACSA.

ACSA (Airports Company South Africa) 2013. Cape Town International Airport Transport Impact Study. Cape Town: ACSA.

ACSA (Airports Company South Africa) 2014a. Airports Company South Africa Integrated Report 2014. Bedfordview: ACSA.

ACSA (Airports Company South Africa) 2014b. Cape Town International Airport: Airlines, shops, restaurants and services database [online]. Bedfordview: ACSA. Available from: www.acsa.co.za [Accessed 09 June 2014].

ACSA (Airports Company South Africa) 2014c. OR Tambo International Airport: Airlines, shops, restaurants and services database [online]. Bedfordview: ACSA. Available from: www.acsa.co.za [Accessed 09 June 2014].

ACSA (Airports Company South Africa) 2015. Airports Company South Africa Integrated Report 2015 [online]. Bedfordview: ACSA. Available from: http://www.airports.co.za/FinancialResults/ACSA%20IR%202015.pdf [Accessed 07 December 2015].

Adey P 2006. Airports and air-mindedness: Spacing, timing and using the Liverpool Airport, 1929-1939. *Social & Cultural Geography* 7: 343-363.

Airport Industria CID (City Improvement District) 2013. Business directory [online]. Available from: www.airportcid.co.za [Accessed 01 October 2013].

Allen J & Thompson A 1997. Think global, then think again-economic globalisation in a context. *Area* 29: 213-227.

Allen R 1968. *Great airports of the world.* 2nd ed. Surrey: Ian Allan.

Anas A, Arnott R & Small KA 1998. Urban spatial structure. *Journal of Economic Literature* XXXVI: 1426-1464.

Andranovich GD & Riposa G 1993. *Doing urban research*. California: Sage.

Andrew HR & Bailey R 1996. The contribution of airports to regional economic development. In proceedings of the European transport conference held 01 January 1996, Uxbridge, United Kingdom. Available from: http://abstracts.aetransport.org/paper/index/id/300/confid/2 [Accessed 14 October 2015].

Aoyama Y, Murphy J & Hanson S 2011. *Key concepts in economic geography*. London: Sage.

Appold SJ 2015. The impact of airports on US urban employment distribution. *Environment and Planning A* 47: 412-429.

Appold SJ & Kasarda JD 2010. Looking in all the wrong places? Catalytic effects in the context of product cycle theory. In Knippenberger U & Wall A (eds) *Airports in cities and regions: Research and practise*, 15-29. Karlsruhe: Karlsruher Institut für Technologie (KIT) Scientific Publishing.

Appold SJ & Kasarda JD 2013. The airport city phenomenon: Evidence from large US airports. *Urban Studies* 50: 1239-1259.

Ardilly P & Tillé Y 2006. *Sampling methods: Exercises and solutions*. New York: Springer.

Asheim BT 1990. How to confuse rather than guide students: A review of Holt-Jensen's geography-history and concepts. *Progress in Human Geography* 14: 281-292.

Babbie E 2001. *The practice of social research*. 9th ed. Belmont, CA: Wadsworth.

Backstrom CH & Hursh-César G 1981. *Survey research*. 2nd ed. New York: John Wiley.

Banister D & Berechman J 2003. *Transport investment and economic development*. London: Routledge.

Barkley DL & McNamara KT 1994. Manufacturers' location decisions: Do surveys provide helpful insights? *International Regional Science Review* 17: 23-47.

Barnes TJ 2003. The place of locational analysis: A selective and interpretive history. *Progress in Human Geography* 27: 69-95.

Barnes T & Gregory D 1997. Space, spatiality and spatial structure. In Barnes T & Gregory D (eds) *Reading human geography. The poetics and politics of inquiry*, 232-243. London: Arnold.

Beavon K & Larsen P 2014. Sandton central, 1969-2013: From open veld to new CBD? In Harrison P, Gotz G, Todes A & Wray C (eds) *Changing space, changing city: Johannesburg after apartheid*, 370-394. Johannesburg: Wits University Press.

Beckmann M 1968. *Location theory*. New York: Random House.

Bednarek JRD 2000. City planning and municipal airports, 1927-40. *Planning Perspectives* 15: 349-375.

Bednarek JRD 2001. *America's airports: Airfield development*, 1918-1947. Texas: Texas A&M University Press.

Benell DW & Prentice BE 1993. A regression model for predicting the economic impacts of Canadian airports. *The Logistics and Transportation Review* 29: 139-158. [Online] Available from: www.galegroup.com [Accessed 14 October 2011].

Benzimra L 1973. *Historical characters: Leonardo da Vinci*. Singapore: McGraw-Hill Far Eastern Publishers.

Berechman J 1995. Transport infrastructure investment and economic development. In Banister D (ed) *Transport and urban development*, 17-35. London: E & FN Spon.

Berry BJL 1964. Cities as systems within systems of cities. *Papers and Proceedings of the Regional Science Association* 13: 147-163.

Beyers WB & Fowler CS 2013. Economic structure, technological change and location theory: The evolution of models explaining the link between cities and flows. In Hall PV & Hesse M (eds) *Cities, regions and flows*, 23-41. Oxon: Routledge.

Bhat VK 2010. Feeder airport city. A spatial model to foster equitable regional planning. In Knippernberger Ute & Wall Alex (eds) *Airports in cities and regions: Research and practice*, 31-42. Proceedings of the 1st international colloquium on airports and spatial development held 10 July 2009.

Bird J 1983. Gateways: Show recognition but irresistible rise. *Tijdschrift voor Economische en Sociale Geografie* 79: 297-303.

Blanton W 2004. On the airfront. *Planning* 70: 34-35.

Blaug M 1979. The German hegemony of location theory: A puzzle in the history of economic thought. *History of Political Economy* 11: 21-29.

Blaut JM 1972. Spaces and process. In Davies WKD (ed) *The conceptual revolution in Geography*, 42-51. London: University of London Press.

Boschma R 2005. Proximity & innovation: A critical assessment. *Regional Studies* 39: 61-74.

Boudeville J-R 1966. *Problems of regional economic planning*. Edinburgh: Edinburgh University Press.

Bowen JT 2008. Moving places: The geography of warehousing in the US. *Journal of Transport Geography* 16: 379-387.

Bowen JT & Leinbach TR 2003. Air cargo services in Asian industrialising economies: Electronic manufacturers and the strategic use of advanced producer services. *Papers in Regional Science* 82: 309-332.

Bremner N 2001. The limits of scale? Methodological reflections on scalar structuration. *Progress in Human Geography* 25: 591-614.

Buttler F 1975. *Growth pole theory and economic development*, translated from *Entwicklungspole und räumliches Wirtschaftswachstum* by Cuthbert-Brown J. Lexington, Massachusetts: Lexington Books. (Original work published in 1973 in German).

Button K, Lall S, Stough R & Trice M 1999. High-technology employment and hub airports. *Journal of Air Transport Management* 5: 53-59.

Campbell J 1974. A note on growth poles. *Growth and Change* 5: 43-45.

Capello R 2009. Space, growth and development. In Capello R & Nijkamp P (eds) *Handbook of regional growth and development theories*, 33-52. Cheltenham: Edward Elgar.

Cape Metropolitan Planning Committee 1980. Manufacturing employment in the Cape meropolitan area: An analysis of employment in the manufacturing industries of the Cape metropolitan area during 1976-1977.

Cape Times 2015. Freedom to connect: Cape Town to Wonderboom Airport (Pretoria). 10 August: 5.

Cape Town Chamber of Commerce 2014. Company directory [online]. Cape Town: Cape Town Chamber of Commerce. Available from: www.capechamber.co.za [Accessed 01 May 2014].

Cape Town City Council 1992. Towards a draft metropolitan spatial development framework. Notes from a work: December 7/8, 1992. Cape Town: Town Planning Branch.

CDE (The Centre for Development and Enterprise) 1997. The East Rand: Can South Africa's workshop be revived? CDE Research. Policy in the making. The big cities series. CDE Research No.5, June. Johannesburg: the Centre for Development and Enterprise.

Central City Improvement District & Cape Town Partnership 2012. The state of Cape Town central city report 2012. Cape Town: Central City Improvement District and Cape Town Partnership.

Chapman K & Walker D 1987. *Industrial location: Principles and policies*. Oxford: Basil Blackwell.

Christaller W 1966. *Central places in southern Germany*, translated from *Die Zentralen Orte in Süddeutschland* by Baskin CW. Englewood Cliffs: Prentice Hall. (Original work published in 1933 in German).

Christaller W 1972. How I discovered the theory of central places: A report about the origin of central places. In English PW & Mayfield RC (eds) *Man, space, and the environment: Concepts in contemporary human geography*, 601-610. New York: Oxford University Press.

Cidell J 2006. Air transportation, airports, and the discourses and practices of globalization. *Urban Geography* 27: 651-663.

City of Cape Town Municipality 1983. Cape Town metropolitan transport area: People, employment and land in the eighties. Cape Town: City of Cape Town.

City of Cape Town Municipality 2002. MSDF review/ New city SDF. Phase 1: Spatial analysis, trends and implications. Cape Town: City of Cape Town Municipality.

City of Cape Town Municipality 2010. Base data (GIS shapefiles).

City of Cape Town Municipality 2013. Draft 2013-2018 integrated transport plan. Cape Town: City of Cape Town Municipality.

City of Cape Town Municipality 2014. State of Cape Town 2014 [Online]. Cape Town: City of Cape Town. Available from: https://www.capetown.gov.za/en/stats/CityReports/Documents/SOCT%2014%20report%20complete.pdf [Accessed 09 July 2015].

City of Johannesburg Municipality 2013. Corridors of freedom: Re-stitching our city to create a new future [online]. Johannesburg: City of Johannesburg Municipality. Available from: http://www.corridorsoffreedom.co.za/attachments/article/1/corridors%20of%20freedom_s.pdf [Accessed 12 July 2015].

Coase RH 1937. The nature of the firm. *Economica, New Series* 4: 386-405.

Cockbain TGE 1994. Early history of aviation in the Eastern Cape province. *Scientia Militaria* 24: 44-48.

Coe NM 2011. Unpacking globalization: Changing geographies of the global economy. In Leyshon A, Lee R, McDowell L & Sunley P (eds) *The SAGE handbook of economic geography*, 89-101. London: Sage.

Coffey W J 1981. *Geography: Towards a general spatial systems approach*. London and New York: Methuen.

Conventz SCM 2010. New office space at international hub airports. Evolving urban patterns at Amsterdam and Frankfurt/M. In Knippernberger U & Wall A (eds) *Airports in cities and regions: Research and practice,* 57-67. Proceedings of the 1st international colloquium on airports and spatial development held July 2009.

Conway M 1993. *Airport cities 21: The new global transport centers of the 21st century*. Atlanta: Conway Data.

Corpataux J & Crevoisier O 2007. Economic theories and spatial transformations: Clarifying the space-time premises and outcomes of economic theories. *Journal of Economic Geography* 7: 285-310.

Couclelis H & Gale N 1986. Space and spaces. *Geografiska Annaler. Series B. Human Geography* 68: 1-12.

Creswell JW 2009. Research design: *qualitative, quantitative, and mixed methods approaches*. 3rd ed. Thousand oaks: Sage.

Creswell JW & Clark VLP 2007. *Designing and conducting mixed methods research*. Thousand Oaks: Sage.

Crevoisier O 1996. Proximity and territory versus space in regional science. *Environment and Planning* A 28: 1683-1697.

Crosby M 2012. Aerotropolis urban growth? A case study of King Shaka International Airport. Master's dissertation. Durban: University of Kwa-Zulu Natal. Department of Geography and Environmental Management.

Dandekar HC 1998. Global space meets local space in the twenty-first century. In Dandekar HC (ed) *City, space, and globalization: An international perspective,* 5-14. Proceedings of an International Symposium held 26-28 February 1998. Michigan: The University of Michigan.

Daniels PW 1982. An exploratory study of office location behaviour in Greater Seattle. *Urban Geography* 3: 58-78.

Darwent DF 1969. Growth poles and growth centres in regional planning-a review. *Environment and Planning A* 1: 5-32.

de Freitas F 1968. *Airports of South Africa*. Johannesburg: Da Gama.

de Jong B, Suau-Sanchez & Droß M 2008. The underestimated airport region: reflecting on planning policies in the airport regions of Amsterdam, Barcelona and Munich. Aerlines magazine, Airport & planning policy: e-zine edition 41. [Online] Available from: www.aerlines.nl [09 May 2012].

Delaney G 1988. Electronics multinationals in the Cork region and Limerick/Shannon. *Irish Geography* 21: 101-103.

Del Casino VJ Jr, Grimes AJ, Hanna SP & Jones JP 2000. Methodological frameworks for the geography of organizations. *Geoforum* 31: 523-538.

Demarcation Board 2012. Boundary data: Provinces, districts and local municipalities (GIS shapefiles) [online]. Available from: http://www.demarcation.org.za/index.php/downloads/boundary-data/boundary-data-main-files/province [Accessed 10 July 2015].

de Vaus DA 1995. *Surveys in social research.* 4th ed. London: Routledge.

Dicken P 2004. Geographers and 'globalization': (Yet) another missed boat? *Transactions of the Institute of British Geographers* 29: 5-26.

Dicken P & Lloyd PE 1990. *Location in space: Theoretical perspectives in economic geography*. New York: Harper Collins Publishers.

Dicken P, Peck J & Tickell A 1997. Unpacking the global. In Lee R & Wills J (eds) *Geographies of economies*, 158-166 London: Arnold.

Dickinson HD 1969. Von Thünen's economics. *The Economic Journal* 79:894-902.

Dillman DA 2007. *Mail and internet surveys: The tailored design method*. 2nd ed. New Jersey: John Wiley & sons, Inc.

Donaldson R, Ferreira S & Spocter M 2012. Growth potential of towns in the Western Cape. Qualitative phase: Unlocking latent potential and recommendations for appropriate interventions for regional development. Cape Town: Western Cape Provincial Government.

Duncan OD, Cuzzort RP & Duncan B 1961. *Statistical geography: Problems in analysing areal data*. Illinois: The Free Press.

Dunn EC 2007. Of pufferfish and ethnography: Plumbing new depths in economic geography. In Tickell A, Sheppard E, Peck J & Barnes T (eds) *Politics and practice in economic geography*, 82-92. California: Sage.

Dunning JH & Norman G 1983. The theory of the multinational enterprise: An application to multinational office location. *Environment and Planning A* 15: 675-692.

Dunning JH & Norman G 1987. The location choice of offices of international companies. *Environment and Planning A* 19: 613-631.

Dwyer C & Limb M 2001. Introduction: Doing qualitative research in Geography. In Limb M & Dwyer C (eds) *Qualitative methodologies for Geographers*, 1-20. London: Arnold.

East Rand Chamber of Commerce 2014. East Rand Chamber of Commerce and Industry datadex [online]. Nigel: Chamberlink. Available from: www.chamberlink.co.za [Accessed 07 April 2014].

Eicker K 2009a. Cradle City's promising design: Precedent for sustainability. *Urban Green File* 14: 20-25.

Eicker K 2009b. Sungate, Windhoek: Here comes the sun. *Building Africa* 9: 26-30.

Ekurhuleni Municipality 2005. Ekurhuleni growth and development strategy 2025. Ekurhuleni: Ekurhuleni Municipality.

Ekurhuleni Municipality 2013. Ekurhuleni aerotropolis planning and land use guidance document. Ekurhuleni: Ekurhuleni Metropolitan Council.

Ekurhuleni Municipality 2015a. Land use and zoning base data (GIS shapefiles).

Ekurhuleni Municipality 2015b. Ekurhuleni 25 year aerotropolis master plan: Part 6: Land use plan [online]. Ekurhuleni: City of Ekurhuleni. Available from:

http://www.ekurhuleni.gov.za/2626-aerotropolis-master-plan/file [Accessed 18 January 2016].

Essletzbichler J 2011. Locating location models. In Leyshon A, Lee R, McDowell L & Sunley P (eds) *The SAGE Handbook of Economic Geography*, 23-38. London: Sage.

Fainstein SS 2005. Cities and diversity: Should we want it? Can we plan for it? *Urban Affairs Review* 41: 3-19.

Fair TJD 1956. *A planning survey of the Southern Transvaal: The Pretoria-Witwatersrand-Vereeniging area*. Pretoria: The Government Printer, Union of South Africa.

Federal Aviation Administration 1967. *The airport: Its influence on the community economy*. Washington: Federal Aviation Administration.

Fehribach FA, Rutherford RC & Eakin ME 1993. An analysis of the determinants of industrial property valuation. *The Journal of Real Estate Research* 8: 365-376.

Fingleton B & McCann P 2007. Sinking the iceberg? On the treatment of transport costs in new economic geography. In Fingleton B (ed) *New directions in economic geography*, 168-203. Cheltenham: Edward Elgar.

Freestone R 2009. Planning, sustainability and airport-led urban development. *International Planning Studies* 14: 161-176.

Freestone R & Baker D 2011. Spatial planning models of airport-driven urban development. *Journal of Planning Literature* 26: 263-279.

Friedmann J & Alonso W 1964. Part 1. Space and planning introductory note. In Friedmann J & Alonso W (eds) *Regional development and planning: A reader*, 17-20. Cambridge, Massachusetts: The Massachusetts Institute of Technology Press.

Fujita M 1999. Location and space-economy at half a century: Revisiting Professor Isard's dream on the general theory. *The Annals of Regional Science* 33: 371-381.

Fujita M 2012. Thünen and the New Economic Geography. *Regional Science and Urban Economics* 42: 907-912.

Fujita M & Krugman P 1995. When is the economy monocentric?: Von Thünen and Chamberlin unified. *Regional Science and Urban Economics* 25: 505-528.

Fujita M & Krugman P 2004. The new economic geography: past, present and the future. *Papers in Regional Science* 83: 139-164.

Fujita M, Krugman P & Venables AJ 2001. *The spatial economy: Cities, regions, and international trade*. Massachusetts: The Massachusetts Institute of Technology Press.

Fujita M & Mori T 1996. The role of ports in the making of major cities: Self-agglomeration and hub-effect. *Journal of Development Economics* 49: 93-120.

Fujita M & Mori T 2005. Frontiers of the New Economic Geography. Discussion Paper No. 27. Kyoto: Institute of Economic Research, Kyoto University.

Galvin V 2010. Coordinating spatial development in airport regions. Embeddedness and experimentation at Paris Orly and Amsterdam Schiphol. *Aerlines* 48: 1-5.

GAO (Government Accountability Office of the United States) 2013. National airspace system: Airport-centric development. Washington, DC: GAO.

Garner BJ 1967. Models of urban geography and settlement location. In Chorley RJ & Haggett P (eds) *Models in geography*, 303-360. London: Methuen & Co.

Garretsen H & Martin R 2010. Rethinking (new) economic geography models: Taking geography and history more seriously. *Spatial Economic Analysis* 5: 127-160.

Gatrell A 1983. *Distance and space: a geographical perspective*. New York: Oxford University Press.

Geyer HS 2002. The fundamentals of urban space. In Geyer HS (ed) *International handbook of urban systems: Studies of urbanization and migration in advanced and developing countries*, 3-18. Cheltenham: Edward Elgar.

Geyer HS 2006. Introduction: The changing global economic landscape. In Geyer HS (ed) *Global regionalization: Core peripheral trends*, 3-38: Cheltenham: Edward Elgar.

Geyer HS 2007. The evolving urban economic landscape: Trends in the past and present, from local to global. In Geyer HS (ed) *International handbook of urban policy, Volume 1: Contentious global issues*, 38-58. Cheltenham: Edward Edgar.

Giuliano G 1989. New directions for understanding transportation and land use. *Environment and Planning A* 21: 145-159.

Giuliano G & Small K 1991. Subcentres in the Los Angeles region. *Regional Science and Urban Economics* 21: 163-182.

Giuliano G & Small K 1999. The determinants of growth of employment subcentres. *Journal of Transport Geography* 7: 189-201.

Glassner MI 1996. *Political geography*. 2nd ed. New York: John Wiley & Sons.

Goetz AR & Rodrigue J-P 1999. Transport terminals: new perspectives. *Journal of Transport Geography* 7: 237-240.

Goldschagg P 2007. Airport noise in South Africa-prediction models and their effect on land-use planning. Doctoral dissertation. Stellenbosch: Stellenbosch University, Department of Geography and Environmental Studies.

Gordon A 2008. *Naked airport: A cultural history of the world's most revolutionary structure*. Chicago: The University of Chicago Press.

Gottlieb A 1971. Land use controls for airport planning. *The Urban Lawyer* 3: 266-276.

Guide Plan Committee for the Cape Metropolitan Area 1984. Cape metropolitan area draft guide plan. Volume 1. Cape Town: Guide Plan Committee.

Haggett P 1965. *Locational analysis in human geography*. London: Edward Arnold.

Haggett P 1967. Three pioneers in location theory: Review. *The Geographical Journal* 133: 357-359.

Haggett P & Chorley RJ 1967. Models, paradigms and the new geography. In Chorley RJ & Haggett P (eds) *Models in geography*, 19-41. London: Methuen & Co.

Hall PV & Hesse M 2013. Reconciling cities and flows in geography and regional studies. In Hall PV & Hesse M (eds) *Cities, regions and flows*, 3-20. Oxon: Routledge.

Hanly D 2015. An investigation into the application of the aerotropolis strategy to the Cape Town International Airport from a global south urban planning perspective. Master's Dissertation. Cape Town: School of Architecture, Planning and Geomatics.

Hanson S 2000. Transportation: Hooked on speed, eyeing sustainability. In Sheppard E & Barnes TJ (eds) *A companion to economic geography*, 468-483. Oxford: Blackwell Publishers.

Harré R 1979. *Social being: A theory for social psychology*. Oxford: Basil Blackwell.

Harrington JW & Warf B 1995. *Industrial location. Principles, practice, and policy*. London and New York: Routledge.

Harvey D 1966. Theoretical concepts and the analysis of agricultural land-use patterns in geography. *Annals of the Association of American Geographers* 56: 361-374.

Harvey D 1967. Models of the evolution of spatial patterns in human geography. In Chorley RJ & Haggett P (eds) *Models in geography*, 549-608. London: Methuen & Co.

Harvey D 1969. *Explanation in Geography*. London: Edward Arnold.

Harvey D 1996. *Justice, nature & the geography of difference*. Cambridge: Blackwell.

Hesse M 2013. Cities and flows: re-asserting a relationship as fundamental as it is delicate. *Journal of Transport Geography* 29: 33-42.

Hetherington NS 1999. The Langley and Wright aero accidents. Two responses to early aeronautical innovation and government patronage. In Launius RD (ed) *Innovation and the development of flight*, 18-51. Texas: Texas A&M University Press.

Higgins B 1971. The Montreal Airport site: The spatial multiplier and other factors affecting its selection. *Growth and Change* 2: 14-22.

Higgins B 1983. From growth poles to systems of interactions in space. *Growth and Change* 14: 3-13.

Higgins B 1988. Francois Perroux. In Higgins B & Savoie DJ (eds) *Regional economic development: Essays in honour of Francois Perroux*, 31-47. Boston: Unwin Hyman.

Higgins B & Savoie DJ 1997. *Regional development theories and their application*. New Jersey: Transaction Publishers.

Hoare AG 1974. International airports as growth poles: A case study of Heathrow Airport. *Transactions of the Institute of British Geographers* 63: 75-96.

Hoare AG 1975. Foreign firms and air transport: The geographical effect of Heathrow Airport. *Regional Studies* 9: 349-367.

Hodgson GM 2006. What are institutions? *Journal of Economic Issues* 40: 1-25.

Holt D, Steel DG, Tranmer M & Wrigley N 1996. Aggregation and ecological effects in geographically based data. *Geographical Analysis* 28: 244-261.

Hoover EM 1948. *The location of economic activity*. New York: McGraw-Hill Book Company, Inc.

Hotelling H 1929. Stability in competition. *Economic Journal* 39: 41-57.

Howitt R 1998. Scale as a relation: musical metaphors of geographical scale. *Area* 30: 49-58.

Hubbard HV, McClintock M & Williams FB 1930. Havard city planning studies. Volume 1: Airports-their location, administration and legal basis. Havard: Havard University Press. Available from: https://archive.org/stream/airportstheirloc031892mbp/airportstheirloc031892mbp_djvu.txt [accessed 29 June 2015].

Hudson JC & Fowler PM 1972. The concept of pattern in geography. In English PW & Mayfield RC (eds) *Man, space, and the environment: Concepts in contemporary human geography*, 545-549. New York: Oxford University Press.

ICAO (International Civil Aviation Authority) 1985. *Airport Planning Manual: Part 2-Land use and environmental control*. Montréal: ICAO.

Isard C & Isard W 1945. Economic implications of aircraft. *The Quarterly Journal of Economics* 59: 145-169.

Isard W 1956. *Location and space-economy*. Cambridge, Massachusetts: The Massachusetts Institute of Technology Press.

Isard W 1960. *Methods of regional analysis: An introduction to regional science*. Cambridge, Massachusetts: The Massachusetts Institute of Technology Press.

Isard W 1969. *General theory: Social, political, economic and regional, with particular reference to decision-making analysis*. Cambridge, Massachusetts: The Massachusetts Institute of Technology Press.

Isard W 1971. On relativity theory and time-space models. *Papers of the Regional Science Association* XXVI: 7-24.

Isard W 1975. *Introduction to regional science*. New Jersey: Prentice-Hall, Inc.

Isard W & Reiner TA 1966. Regional science: Retrospect and prospect. *Papers of the Regional Science Association* XVI: 1-16.

Jacobs J 1969. *The economy of cities*. London: Jonathan Cape.

Janelle DG 1969. Spatial reorganization: A model and concept. *Annals of the Association of American Geographers* 59: 348-364.

Johnston RJ 1986a. *Philosophy and human geography. An introduction to contemporary approaches*. 2nd ed. London: Edward Arnold.

Johnston RJ 1986b. *On human geography*. Oxford: Basil Blackwell.

Johnston RJ 1989. Extending the research agenda. *Economic Geography* 65: 338-347.

Johnston RJ 1991. *Geography and geographers: Anglo-American human geography since 1945*. 4th ed. London: Edward Arnold.

Johnston R 2009. Geography and the social sciences. In Clifford N, Holloway SL, Rice SP & Valentine G (eds) *Key concepts in geography*, 46-65. 2nd ed. London: Sage.

Karlsson C 2008. Introduction. In Karlsson C (ed) *Handbook of research on cluster theory*, 1-19. Cheltenham: Edward Elgar.

Karlsson J, Ludders RJ, Wilde D, Mochrie D & Seymour C 2008. Airport economic impact methods and models. A synthesis of airport practice. Airport Cooperative Research Program (ACRP) Synthesis 7. Washington, DC: Transportation Research Board.

Karsner D 1997. Aviation and airports: the impact on the economic and geographic structure of American Cities, 1940s-1980s. *Journal of Urban History* 23: 406-436.

Kasarda JD 1998. The global transpark: Infrastructure for industrial advantages. *Urban land* 57: 107-110.

Kasarda JD 2009. Airport cities. *Urban Land* 68: 56-60.

Kasarda JD & Lindsay G 2011. *Aetrotropolis: The way we'll live next*. London: Penguin Group.

Keat R & Urry J 1975. *Social theory as science*. London and Boston: Routledge & Kegan Paul.

Keeble DE 1967. Models of economic development. In Chorley RJ & Haggett P (eds) *Models in geography*, 243-302. London: Methuen & Co.

Keeble DE 1968. Airport location, exporting, and industrial growth. *Town and Country Planning* 36: 209-214.

Kesselring S 2009. Global transfer point. The making of airport in the mobile risk society. In Cwerner S, Kesserling S & Urry J (eds) *Aeromobilities*, 39-59. USA and Canada: Routledge.

Klug N, Rubin M & Todes A 2014. The north-western edge. In Harrison P, Gotz G, Todes A & Wray C (eds) *Changing space, changing city: Johannesburg after apartheid*, 418-436. Johannesburg: Wits University Press.

Knippenberger U 2010. Airport-region governance. Conundrums of airports and regional coherence. In Knippenberger U & Wall A (eds) *Airports in cities and regions: Research and practise*, 101-111. Proceedings of the 1st international colloquium on airports and spatial development held 9-10 July 2009.

Knippenberger U 2015. Airports and their regions: A reciprocal affair of spatial conflicts and economic development. In Conventz S & Thierstein A (eds) *Airports, cities and regions*, 86-101. Oxon: Routledge.

Kramer JHT 1988. The airport of Schiphol: Economic and spatial impact. *Tijdschrift voor Economische en Sociale Geografie* 79: 297-303.

Krugman P 1991. Increasing returns and economic geography. *The Journal of Political Economy* 99: 483-499.

Krugman P 1998. What's new about the new economic geography? *Oxford Review of Economic Policy* 14: 7-17.

Krumme G 1970. Location theory. In Bacon P (ed) *Focus on geography: Key concepts and teaching strategies*, 3-37. Washington: National Council for the Social Studies.

Lasuen JR 1969. On growth poles. *Urban Studies* 6: 137-161.

Lasuen JR 1973. Urbanisation and development: The temporal interaction between geographical and sectoral clusters. *Urban Studies* 10: 163-188.

Launius RD. 1999. Introduction. Patterns of innovation in aeronautical technology. In Launius RD (ed) *Innovation and the development of flight*, 3-17. Texas: Texas A&M University Press.

Leahy WH & McKee DL 1972. A Schumpeterian view of the regional economy. *Growth and Change* 4: 23-25.

Leedy PD & Ormrod JE 2010. *Practical research*: *Planning and design*. 9th ed. New Jersey: Pearson.

Leyshon A 2011. Towards a non-economic, economic geography? From black boxes to the cultural circuit of capital in economic geographies of firms and managers. In Leyshon A, Lee R, McDowell L & Sunley P (eds) *The SAGE handbook of economic geography*, 383-397. Los Angeles: Sage.

Lichfield N 1973. Economic consequences of airport development. In Davis JS (ed). *Airports for the 80s*, 155-161. Proceedings of the Fourth World Airports Conference held 3-5 April 1973. London: The Institution of Civil Engineers.

Lösch A 1954. *The economics of location*, translated from *Die räumliche Ordnung der Wirtschaft* by Woglom WH. New Haven: Yale University Press. (Original work published in 1940 in German).

Lovering J 1999. Theory led by policy: The inadequacies of the 'new regionalism'. *International Journal of Urban and Regional Economics* 23: 379-395.

Lowther B, Lowther KE, Sehbai DS & Tunney CJ 1970. *Encyclopaedia Apollo, Volume 1: A-Bab*. Singapore: McGraw-Hill Far Eastern Publishers.

Luke R & Walters J 2010. The economic impact of South Africa's international airports. *Journal of Transport and Supply Chain Management* 4: 120-137.

Mail & Guardian 2013a. Ekurhuleni ready to roll out the red carpet for the ACE 2013 conference. 19-25 April: 34.

Mail & Guardian advertising supplement 2013b. Mangaung: Transforming into an aerotropolis. 11-17 October: 3.

Mail & Guardian 2013c. Ekurhuleni: Moving towards a world class city. 8-14 November: 44-45.

Malina R & Wollersheim C 2009. The regional impact of airports: How can we measure it? Aerlines magazine, economic impact of airports: e-zine edition 44. [Online] Available from: www.aerlines.nl [Accessed 20 August 2011].

Malmberg A & Maskell P 2002. The elusive concept of localization economies: towards a knowledge-based theory of spatial clustering. *Environment and Planning A* 34: 429-449.

Mangaung Municipality 2014. Mangaung metropolitan municipality integrated city development grant. Built environment performance plan, 2014/15. Bloemfontein: Mangaung Municipality. [Online] Available from http://mfma.treasury.gov.za/Documents/02.%20Built%20Environment%20Performance%20Plans/2014-15/MAN%20Mangaung/MAN%20Mangaung%20BEPP%202014-15.pdf [Accessed 01 July 2015].

Markusen A 1999. Fuzzy concepts, scanty evidence, policy distance: The case for rigour and policy relevance in critical regional studies. *Regional Studies* 33: 869-884.

Marshall A 1920. *Principles of economics: An introductory volume*. 8th ed. London: Macmillan and Co.

Masefield PG 1968. The modern airport-and its future. *Journal of the Royal Society of Arts* 116: 783-804.

Maskell P 2001. The firm in economic geography. *Economic Geography* 77: 329-344.

Massey D 1985. New directions in space. In Gregory D & Urry J (eds) *Spatial relations and spatial structures*, 9-19. Hampshire: Macmillan.

Massey D 1999a. Space-time, 'science' and the relationship between physical geography and human geography. *Transaction of the Institute of British Geographers* 24: 261-276.

Massey D 1999b. Cities in the world. In Massey D, Allen J & Pile S (eds) *City worlds*, 99-156. London: Routledge.

Massey D 2005. *For space*. London: Sage.

Massey D & Meegan R 1985. Postscript: Doing research. In Massey D & Meegan R (eds) *Politics and method: Contrasting studies in industrial geography*, 169-174. London: Routledge.

McCann P 2002. Classical and neoclassical location-production models. In McCann P (ed) *Industrial location economics*, 3-31. Massachusetts: Edward Elgar.

McCann P & Shefer D 2004. Location, agglomeration and infrastructure. *Papers in Regional Science* 83: 177-196.

McMaster RB & Sheppard E 2004. Introduction: Scale and geographic inquiry. In Sheppard E & McMaster RB (eds) *Scale and geographic inquiry. Nature, society, and methods*, 1-22. Massachusetts; Blackwell.

McMillen DP & McDonald JF 1998. Suburban subcentres and employment density in metropolitan Chicago. *Journal of Urban Economics* 43:157-180.

Meier RL 1974. *Planning for an urban world*. Massachusetts: The Massachusetts Institute of Technology Press.

Merrifield A 1993. Place and space: A Lefebvrian reconciliation. *Transactions of the Institute of British Geographers* 18: 516-531.

Mestre V 2008. Effects of aircraft noise: Research update on selected topics. A synthesis of airport practice. Airport Cooperative Research Program (ACRP) synthesis 9. Washington, DC: Transportation Research Board.

Mouton J 2001. *How to succeed in your master's & doctoral studies*. Pretoria: Van Schaik Publishers.

Murphy PR & Wood DF 2004. *Contemporary logistics*. 8th ed. New Jersey: Learson Prentice Hall.

Nchemanyi JN 2006. Community perceptions on noise pollution generated by aircraft in Cape Town. Master's thesis. Cape Town: Cape Peninsula University of Technology.

Neary JP 2001. Of hype and hypolas: Introducing the new economic geography. *Journal of Economic Literature* 39: 536-561.

Nel EL & Rogerson CM 2013. Special economic zones in South Africa: Reflections from international debates. *Urban Forum* 24: 205-217.

Neuman WL 2000. *Social research method: Qualitative and quantitative approaches*. 4th ed. Needham Heights, MA: Allyn and Bacon.

North DC 1990. *Institutions, institutional change and economic performance*. Cambridge: Cambridge University Press.

North DC 1996. Economic performance through time: the limits of knowledge. Econ papers. [Online] Available from: http://129.3.20.41/eps/eh/papers/9612/9612004.pdf [Accessed 5 July 2012].

Nunn S, Drew K & Carl S 1996. Strategic planning behavior and interurban competition for airport development. *Journal of the American Planning Association* 62: 427-441.

Nystuen JD 1996. Identification of some fundamental spatial concepts. In Agnew J, Livingstone DN & Rogers A (eds) *Human geography: An essential anthology*, 590-599. Oxford: Blackwell.

OECD (Organisation for Economic Co-operation and Development) 1975. *Airports and the environment*. Paris: OECD.

OECD (Organisation for Economic Co-operation and Development) 2008. OECD territorial reviews: Cape Town, South Africa. Paris: OECD.

OECD (Organisation for Economic Co-operation and Development) 2011. The Gauteng city-region, South Africa. [Online] Available from: https://books.google.co.za/books?id=mnjWAgAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false. [Accessed 22 May 2015].

Olsson G 1965. Distance and human interaction. A migration study. *Geografiska Annaler Series B Human Geography* 47: 3-43.

Ottaviano GIP & Thisse J-F 2005. New economic geography: What about the N? *Environment and Planning A* 37: 1707-1725.

Páez A & Scott DM 2004. Spatial statistics for urban analysis: A review of techniques with examples. *GeoJournal* 61: 53-67.

Palander T 1935. *Beitrage zur Standortstheorie*. Uppsala: Almqvist & Wiksells Boktryckeri.

Panzar JC & Willig RD 1981. Economies of scope. *American Economic Review* 71: 268-272.

Parr JB 1999. Growth-pole strategies in regional economic planning: A retrospective view. Part 1. Origins and advocacy. *Urban Studies* 36: 1195-1215.

Parr JB 2002. Missing elements in the analysis of agglomeration economies. *International Regional Science Review* 25: 151-168.

Paterson JL 1984. *David Harvey's geography*. New Jersey: Barnes & Noble Books.

Peet R 1998. *Modern geographical thought*. Oxford: Blackwell Publishers.

Peet R, Chatterjee I & Hartwick E 2011. Making sense of globalization: Hegemonic and counter-hegemonic geographies. In Leyshon A, Lee R, McDowell L & Sunley P (eds) *The SAGE Handbook of Economic Geography*, 75-88: London: Sage.

Percoco M 2010. Airport activity and local employment: Evidence from Italy. *Urban Studies* 47: 2427-2443.

Perroux F 1950a. Economic space: Theory and applications. *Quarterly Journal of Economics* 64: 89-104.

Perroux F 1950b. The domination effect and modern economic theory. *Social Research* 17: 188-206.

Perroux F 1955. Note sur la notion de la "pole de croissance". *Economie appliquée* 7: 307-320

Perroux F 1988. The pole of development's new place in a general theory of economic development. In Higgins B & Savoie DJ (eds) *Regional economic development: Essays in honour of Francois Perroux*, 48-76. Boston: Unwin Hyman.

Pillay D, Archary K & Panday A 2011. A preliminary study of the effects of aircraft noise on families who reside in close proximity to an airport. *S Afr Fam Pract*. 53: 361-365.

Pirie G 2010. Trajectories of north-south city inter-relations: Johannesburg and Cape Town, 1994-2007. *Urban Studies* 47: 1985-2002.

Pirie G 2013. Transport geography in South Africa. *Journal of Transport Geography* 31: 312-314.

Plummer P & Sheppard E 2007. A methodology for evaluating regional political economy. In Fingleton B (ed) *New directions in economic geography*, 250-276. Cheltenham: Edward Elgar.

Polenske KR 1988. Growth pole theory and strategy reconsidered: Domination, linkages, and distribution. In Higgins B & Savoie DJ (eds) *Regional economic development: Essays in honour of Francois Perroux*, 91-111. Boston: Unwin Hyman.

Polenske KR 2008. Clustering in space versus dispersing over space. In Karlsson C (ed) *Handbook of research on cluster theory*, 133-149. Cheltenham: Edward Elgar.

Porter ME 1990. The competitive advantage of nations. New York: Free Press.

Porter ME 2000. Location, competition, and economic development: Local clusters in a local economy. *Economic Development Quarterly* 14: 15-34.

Pred A 1967. Behavior and location: Foundations for a geographic and dynamic location theory. Lund Studies in Geography. Ser. B. Human Geography No 27. Lund: The Royal University of Lund.

Pred A 1975. Diffusion, organisational spatial structure, and city-system development. *Economic Geography* 51: 252-268.

Pred A 1977. *City-systems in advanced economies: Past growth, present processes and future development options*. London: Hutchinson & Co.

Pred AR & Törnqvist GE 1973. Systems of cities and information flows. Lund Studies in Geography. Ser. B. Human Geography No 38. Lund: The Royal University of Lund.

Prins M 2009. Landing an airport? Airport development and strategic land use planning in the EU. Aerlines magazine, Airport planning: e-zine edition 43. [Online] Available from: www.aerlines.nl [Accessed 12 August 2011].

Prosperi DC 2007. Airports as centres of economic activity: empirical evidence from three US metropolitan areas. Proceedings of the REAL CORP 007 held 20-23 May 2007. Vienna. [Online] Available from www.corp.at [Accessed 09 May 2011].

Prosperi DC 2008. MIA: Miami International Airport or Miami innovation area. Proceedings of the REAL CORP 008 held 19-21 May 2008. Vienna. [Online] Available from www.corp.at [Accessed 20 June 2013].

Richardson GB 1972. The organisation of industry. *The Economic Journal* 82: 883-896.

Richardson HW 1973. *Regional growth theory*. London: The Macmillan Press.

Robbins G & Velia M 2013. From time definite to time critical? Challenges facing airfreight and port growth in Durban. In Hall PV & Hesse M (eds) *Cities, regions and flows*, 170-187. Oxon: Routledge.

Roeseler WG 1971. Airport development districts: The Kansas City experience. *The Urban Lawyer* 3: 254-262.

Rogerson CM 1998. High-technology clusters and infrastructure development: International and South African experiences. *Development Southern Africa* 15: 875-905.

Runeson G & Skitmore M 2008. Scientific theories. In Knight A & Ruddock L (eds) *Advanced research methods in the built environment*, 99-110. West Sussex: Blackwell.

Samuelson PA 1954. The transfer problem and transport costs, II: Analysis of effects of trade impediments. *The Economic Journal* 64: 264-289.

Samuelson PA 1983. Thünen at two hundred. *Journal of Economic Literature* XXI: 1468-1488.

Savage M & Duncan S 1990. Space, scale and locality: A reply to Cooke and Warde. *Antipode* 22: 67-72.

Sawicki DS 1973. Studies of aggregated areal data: Problems of statistical inference. *Land Economics* 49: 109-114.

Sayer A 1979. Epistemology and conceptions of people and nature in Geography. *Geoforum* 10: 19-43.

Sayer A 1982. Explaining manufacturing shift: A reply to Keeble. *Environment and Planning A* 13: 119-125.

Sayer A 1985a. The difference that space makes. In Gregory D & Urry J (eds) *Spatial relations and spatial structures*, 49-66. Hampshire and London: Macmillan.

Sayer A 1985b. Industry and space: A sympathetic critique of radical research. *Environment and Planning D: Society and Space* 3: 3-29.

Sayer A 1985c. Realism and geography. In Johnston R (ed) *The future of geography*, 159-173. London: Methuen.

Sayer A 1992. *Method in social science: A realist approach*. 2nd ed. London: Routledge.

Sayer A 2000. *Realism and social science*. London: Sage.

Sayer A & Morgan K 1985. A modern industry in a declining region: links between method, theory and policy. In Massey D & Meegan R (eds) *Politics and method: Contrasting studies in industrial geography*, 147-168. London: Routledge.

Schlaack J 2010. Defining the Airea. Evaluating urban output and forms of interaction between airport and region. In Knippernberger U & Wall A (eds) *Airports in cities and regions*: *Research and practise*, 113-125. Proceedings of the 1st international colloquium on airports and spatial development held 9-10 July 2009.

Schuman CWE 1975. A guide plan for the growth of metropolitan Cape Town. Maps-Figures-Diagrams. University of Cape Town, Department of Urban & Regional Planning.

Scott AJ 2000. Economic geography: The great half-century. *Cambridge Journal of Economics* 24: 483-504.

Sealy KR 1955. London's airports and the geography of airport location. *Geography* 40: 255-264.

Sheppard E 2000. Geography or economics? Conceptions of space, time, interdependence, and agency. In Clark GL, Feldman MP & Gertler MS (eds) *The Oxford handbook of economic geography*. Oxford: Oxford University Press.

Sheppard E 2002. The spaces and times of globalisation: Place, scale, networks, and positionality. *Economic Geography* 78: 307-330.

Sheskin IM 1985. *Survey research for geographers*. Washington, DC: Association of American Geographers.

Shields R 1992. A truant proximity: Presence and absence in the space of modernity. *Environment and Planning D: Society and Space* 10: 181-198.

Shukla V & Waddell P 1991. Firm location and land use in discrete urban space. A study of the spatial structure of Dallas-Fort Worth. *Regional Science and Urban Economics* 21: 225-253.

Simmie J 2008. The contribution of clustering to innovation: From Porter I agglomeration to Porter II export base theories. In Karlsson C (ed) *Handbook of research on innovation and clusters*, 19-32. Cheltenham: Edward Elgar.

Simon HA 1962. New developments in the theory of the firm. *American Economic Review* 52: 1-15.

Sit V 2004. Global transpark: New competitiveness for Hong Kong and South China based on air logistics. *Geografiska Annaler. Series B, Human Geography* 86: 145-163.

Sivitanidou R 1996. Warehouse and distribution facilities and community attributes: An empirical study. *Environment and Planning A* 28: 1261-1278.

Small ML 2011. How to conduct a mixed methods study: Recent trends in a rapidly growing literature. *Annual Review of Sociology* 37: 57-86.

Smith DM 1971. *Industrial location: An economic geographical analysis*. New York: John Wiley & Sons.

Smith DM 1977. *Patterns in human geography*. Middlesex: Penguin Books.

Smith RHT, Taaffe EJ & King LJ 1968. Introduction: Locational analysis in economic geography. In Smith RHT, Taaffe EJ & King LJ (eds) *Readings in economic geography*, 13-14. Chicago: Rand McNally.

Sohn J 2004. Information technology in the 1990s: More footloose or more location-bound. *Papers in Regional Science* 83: 467-485.

Soja EW 1989. *Postmordern geographies: The reassertion of space in critical social theory*. London and New York: Verso.

South Africa (Republic of) 1956. *South Africa 1:50 000 Sheets 2628AA Johannesburg; 2628AB Benoni*. (Raster map). Pretoria: Trigonometrical Survey Office.

South Africa (Republic of) 1961. South Africa aerial photograph sheet 438 (Photograph scan): Cape Town. Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 1962. *South Africa 1:50 000 Sheet 3318DC Bellville*. (Raster map). Pretoria: Director - General of Surveys.

South Africa (Republic of) 1966. South Africa aerial photograph sheet 550 (Photograph scan): Cape Town. Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 1975. *South Africa 1:50 000 Sheets 2628AA Johannesburg; 2628AB Benoni*. (Raster map). Pretoria: Director - General of Surveys.

South Africa (Republic of) 1981. *South Africa 1:50 000 Sheet 3318DC Bellville*. (Raster map). Cape Town: Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 1983. *South Africa 1:50 000 Sheet 3318DC Bellville*. (Raster map). Cape Town: Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 1984. *South Africa 1:50 000 Sheets 2628AA Johannesburg; 2628AB Benoni*. (Raster map). Cape Town: Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 1993. Airports Company Act, Act 44 of 1993.

South Africa (Republic of) 1996a. Constitution of the Republic of South Africa, Act 108 of 1996. *Statutes of the Republic of South Africa-Constitutional law*. [Online] Available

from: http://www.gov.za/sites/www.gov.za/files/images/a108-96.pdf [Accessed 01 July 2015].

South Africa (Republic of) 1996b. National small business Act, Act 102 of 1996. [Online] Available from: https://www.thedti.gov.za/sme_development/docs/act.pdf [Accessed 24 August 2015].

South Africa (Republic of) 1996c. *South Africa 1:50 000 Sheets 2628AA Johannesburg; 2628AB Benoni*. (Raster map). Cape Town: Chief Directorate of Surveys and Land Information.

South Africa (Republic of) 1996d. *South Africa 1:50 000 Sheet 3318DC Bellville*. (Raster map). Cape Town: Chief Directorate of Surveys and Land Information.

South Africa (Republic of) 2002. Consideration of an area as an industrial development zone (IDZ): Johannesburg International Airport (JIA) IDZ. Notice No 152 (Department of Trade and Industry). *Government Gazette* Volume 440, No 23084. Pretoria: Government Printer. [Online] Available from: http://www.gov.za/sites/www.gov.za/files/23084_0.pdf [Accessed 04 July 2015].

South Africa (Republic of) 2003. *South Africa 1:50 000 Sheet 3318DC Bellville*. (Raster map). Cape Town: Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 2004. *South Africa 1:50 000 Sheets 2628AA Johannesburg; 2628AB Benoni*. (Raster map). Cape Town: Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 2008. Companies Act, Act 71 of 2008. *Government Gazette of South Africa* 32121, 9.4.2009.

South Africa (Republic of) 2010. *South Africa 1:50 000 Sheets 3318CD Cape Town; 3318DB Paarl; 3318DC Bellville; 3318DD Stellenbosch; 2628 Johannesburg*. (Raster map). Cape Town: Chief Directorate of National Geo-spatial Information.

South Africa (Republic of) 2014a. Manufacturing Development Act (187/1993): Application for IDZ designation and operator permit for the Dube TradePort Industrial Development Zone: For public comment. Notice No 336 (Department of Trade and Industry). *Government Gazette* Volume 587, No 37610. Pretoria: Government Printer. [Online] Available from: http://www.dubetradeport.co.za/SiteFiles/488/37610_5-5_TradeInd.pdf [Accessed 09 January 2016].

South Africa (Republic of) 2014b. Granting of operator permit to the Dube TradePort Corporation. Notice No 525 (Department of Trade and Industry). [Online] Available from:http://www.gpwonline.co.za/Gazettes/Gazettes/37793_1-7_TradeIndustry.pdf [Accessed 09 January 2016].

South Africa (Republic of) 2014c. Integrated Urban Development Framework: Draft for discussion [online]. Pretoria: Department of Cooperative Governance and Traditional Affairs. Available from: http://www.cogta.gov.za/sites/cogtapub/IUDF%20Library/FINAL%20DRAFT%2001%20OCTOBER%202014%20IUDF.pdf [Accessed 19 January 2016].

South Africa (Republic of) 2014d. Aerial photograph sheet 3318DC. (Raster image). Cape Town: Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 2015a. Aerial photograph sheet 2628AA & AB. (Raster image). Cape Town: Chief Directorate of Surveys and Mapping.

South Africa (Republic of) 2015b. National airports development plan. Pretoria: Department of Transport.

South Africa (Republic of) 2015c. White paper on national civil aviation policy. Pretoria: Department of Transport.

South African Cities Network 2012. Secondary cities in South Africa: The start of a conversation. Background report [online]. Available from: http://sacitiesnetwork.co.za/wpcontent/uploads/2014/07/secondary_cities_in_south_africa.pdf [Accessed on 22 December 2015].

South African Cities Network 2013. 2013 state of city finances (addendum) [online]. Available from:http://www.sacities.net/images/stories/2013/pdfs/2013addendum_state_city_finance.pdf [Accessed 09 July 2015].

South African Cities Network 2014. Outside the core: Towards an understanding of intermediate cities in South Africa [online]. Available from: http://sacitiesnetwork.co.za/wp-content/uploads/2014/12/2nd-Report-SACN-Secondary-Cities-Report_web.pdf [Accessed 22 December 2015].

South African Reserve Bank 2010. Selected historical rates [online]. Available from: https://www.resbank.co.za/Research/Rates/Pages/SelectedHistoricalExchangeAndInterestRates.aspx [Accessed 02 January 2015].

Stam E 2007. Why butterflies don't leave: Locational behaviour of entrepreneurial firms. *Economic Geography*, 83: 27-50.

Standards South Africa 2003. *SANS 10117: South Africa national standard: Calculation and prediction of aircraft noise around airports for land use planning*. Pretoria: Standards South Africa.

Standards South Africa 2008. *SANS 10103: South African national standard: The measurement and rating of environmental noise with respect to annoyance and to speech communication*. 6th ed. Pretoria: Standards South Africa.

Statistics South Africa 1990. *Standard industrial classification of all economic activities (SIC)*. Pretoria: Statistics South Africa.

Statistics South Africa 2012a. *Standard industrial classification of all economic activities (SIC)*. 7th ed. Pretoria: Statistics South Africa.

Statistics South Africa 2012b. Census 2011 municipal factsheet [online]. Pretoria: Statistics South Africa. Available from: http://www.statssa.gov.za/census/census_2011/census_products/Census_2011_Municipal_fact_sheet.pdf [Accessed 02 July 2012].

Steel DG & Holt D 1996a. Analysing and adjusting aggregation effects: The ecological fallacy revisited. *International Statistical Review* 64: 39-60.

Steel DG & Holt D 1996b. Rules for random aggregation. *Environment and Planning A* 28: 957-978.

Storper M 2011. From retro to avant-garde: A commentary on Paul Krugman's 'the new economic geography, now middle-aged'. *Regional Studies* 45: 9-15.

Struyk RJ & James FJ 1975. *Intrametropolitan industrial location: The pattern and process of change*. Lexington, Massachusetts: Lexington Books.

Swanepoel PA 2012. The land development impact of OR Tambo International Airport on surrounding industrial areas. Master's mini-dissertation. Pretoria: University of Pretoria, Department of Town and Regional Planning.

Taylor M 1996. Industrialisation, enterprise power, and environmental change: An exploration of concepts. *Environment and Planning A* 28: 1035-1051.

Taylor M & Asheim B 2001. The concept of the firm in economic geography. *Economic Geography* 77: 315-328.

Taylor MJ & Thrift NJ 1982. Industrial linkage and the segmented economy: 1. Some theoretical proposals. *Environment and Planning* A 14: 1601-1613.

Taylor PJ 2009. World cities: Organizational networking and the global urban hierarchy. In Geyer HS (ed) *International handbook of urban policy, Volume 2: Issues in the developed world,* 74-102. Aldershot: Edward Elgar.

Thrift N 2009. Space: The fundamental stuff of geography. In Clifford N, Holloway SL, Rice SP & Valentine G (eds) *Key concepts in geography,* 85-95. 2nd ed. London: Sage.

Tidswell V 1978. *Pattern and process in human geography*. Slough: University Tutorial Press.

Tobler WR 1970. A computer movie simulating urban growth in the Detroit region. *Economic Geography* 46: 234-240.

Todes A & Watson V 1984. Growth pole theory and regional development in South Africa: Results of a survey in selected growth areas. Paper prepared for the Carnegie Conference (second Carnegie inquiry into poverty and development in South Africa), Cape Town.

Tounsi A 2014. In ACI (Airports Council International) World Report, September [online]. Montréal: ACI. Available from: www.aci.aero/media/ca929c67-6fa8-4d8a-bff4-19b52cbd472f/-GJvjA/News/World%2520Report/ACI-World-Report-September-2014.pdf [Accessed 07 July 2015].

Transportation Research Board 2004. *Transit-oriented development in the United States: Experiences, challenges, and prospects.* Transit Cooperative Research Program Report 102. Washington: Transportation Research Board.

Trudon 2012a. The phone book: Cape Peninsula 2012/2013. Johannesburg: Trudon.

Trudon 2012b. Yellow Pages: Cape Peninsula 2012/2013. Johannesburg: Trudon.

Trudon 2013. Yellow Pages business database [online]. Johannesburg: Trudon. Available from: www.yellowpages.co.za [Accessed 17 April 2013].

Tuan Y-F 1979. Space and place: Humanistic perspective. In Gale S & Olsson G (eds) *Philosophy in geography*, 387-427. Dordrecht: D. Reidel Publishing Company.

Twomey J & Tomkins J 1995. Development effects at airports: A case study of Manchester Airport. In Banister D (ed) *Transport and urban development*, 187-211. London: E & FN Spon.

Ullman EL 1941. A theory of location for cities. *American Journal of Sociology* 46: 853-864.

Unwin T 1992. *The place of geography*. Essex: Longman.

Urry J 2009. Aeromobilities and the global. In Cwerner S, Kesserling S & Urry J (eds) *Aeromobilities*, 25-38. New York: Routledge.

Vahaly J 1976. The location of service and office activities in Nashville-Davidson County, 1970. *Land Economics* 54: 479-492.

Valentine G 2001. At the drawing board: Developing a research design. In Limb M & Dwyer C (eds) *Qualitative methodologies for Geographers*, 41-54. London: Arnold.

Van Boxtel M & Huys M 2005. Unravelling decision making about the future developments of Amsterdam Airport Schiphol. Paper prepared for the 45th European Regional Science Association held 23-27 August 2005, Amsterdam.

Van der Merwe JH & Von Holdt DS 2005. Aircraft noise management through controlled-area demarcation in South Africa: its application at Cape Town International Airport. *South African Journal of Science* 101: 400-408.

Van der Merwe JH & Von Holdt DS 2006. Environmental footprint of aircraft noise exposure at Cape Town International Airport. *South African Geographical Journal* 88: 177-193.

Van Geenhuizen M & Nijkamp P 2007. Cities and footlooseness: In search of place-bound companies and effective location policies. *Environment and Planning C: Government and Policy* 25: 692-708.

Van Wijk M 2007. Airports as cityports in the city-region. Doctoral thesis. Utrecht: Utrecht University.

Van Wijk M 2008. Development of airport regions: varieties of institutions in Schiphol and Frankfurt. Aerlines magazine, Airports: e-zine edition 40 [Online]. Available from: www.aerlines.nl [Accessed 12 August 2011].

Van Wyk M 2013. The Kempton Park Website: Directory [online]. Available from: www.kemptalk.com [Accessed 12 June 2013].

Van Zyl GN 1981. The location of manufacturing industry in the metropolitan area 'Die vestiging van vervaardigings-bedrywe in die Kaapse Metropolitaanse gebied'. Proceedings of the Planning in the Cape Metropolitan area. Transport, land use, housing and other important issues. The South African Institute of Town and Regional Planners.

Vaughn CL 1979. *Franchising: Its nature, scope, advantages, and development.* 2nd ed. Lexington, Massachusetts: Lexington Books.

Venables AJ 1996. Equilibrium locations of vertically linked industries. *International Economic Review* 37: 341-359.

Von Holdt D 2003. GIS mapping and analysis of aircraft noise at Cape Town International airport. Master's thesis. Stellenbosch: Stellenbosch University, Department of Geography and Environmental Studies.

Von Thünen JH 1966. *Von Thünen's The isolated state*, translated from *Der isolierte staat* by Wartenberg CM. Oxford: Pergamon press. (Original work published in 1826 in German).

Vowles TM 2006. Geographic perspectives of air transportation. *The Professional Geographer* 58: 12-19.

Walker AR & Baker DC 2010. A planning support system for airport city development. In proceedings of the 14th air transport research society conference held 6-9 July, Porto, Portugal.

Walker AR & Stevens NJ 2008. Airport city development in Australia: Land use classification and analyses. Proceedings of the 10th TRAIL Congress and Knowledge Market held 14-15 October 2008, Rotterdam, the Netherlands.

Warffemius PMJ 2007. Modelling the clustering of distribution centres around Amsterdam Airport Schiphol. Location endowments, economic agglomeration, locked-in logistics

and policy implications. Doctoral dissertation. Delft: The Netherlands TRAIL Research School.

Weber A 1929. *Theory of the location of industries*, translated from *Über den Standort der Industrien* by Friedrich CJ. Chicago: The University of Chicago Press. (Original work published in 1909 in German).

Weisbrod G 1991. Economic impacts of improving general aviation airports. *Transportation Quarterly* 45: 67-83.

Wells AT 2000. *Airport Planning and Management*. New York: McGraw Hill.

Wells HG 1903. *Anticipations of the reaction of mechanical and scientific progress upon human life and thought*. London: Methuen & Co.

Werlen B 1993. *Society, action and space: An alternative human geography*, translated from *Gesellschaft, Handlung und Raum* by Walls G. London: Routledge. (Original work published in 1988 in German).

Wesgro 2013. City of Cape Town district fact sheet [online]. Cape Town: Wesgro. Available from: http://wesgro.co.za/publications/publications/2013-city-of-cape-town-fact-sheet [Accessed 07 October 2013].

White HP & Senior ML 1983. *Transport geography*. New York: Longman.

William Cheek & Associates 2006. Prescott airport economic impact study. [Online] Available from: http://www.prescott-az.gov/_d/airport_econ_impact_2006.pdf [Accessed 12 March 2012].

Williams SW 1981. Realism, Marxism and human geography. *Antipode: A Radical Journal of Geography* 13: 31-38.

Wilson A 1980. Theory in human geography: A review essay. In Brown EH (ed) *Geography yesterday and tomorrow*, 201-215. Oxford: Oxford University Press.

Wolfson RJ 1958. The economic dynamics of Joseph Schumpeter. *Economic Development and Cultural Change* 7: 31-54.

Yeung HWC 2000. Organizing 'the firm' in industrial geography 1: Networks, institutions and regional development. *Progress in Human Geography* 24: 301-315.

Yin RK 2009. *Case study research: Design and methods*. Los Angeles: Sage.

Zietsman D & Vanderschuren M 2014. Analytic hierarchy process assessment for potential multi-airport systems – the case of Cape Town. *Journal of Air Transport Management* 36: 41-49.

PERSONAL COMMUNICATIONS

Chabane S 2015. Member and manager of human resources and administration, Synthecon. Interview on 14 August.

de Villiers A 2015. Finance, Mentor freight services. Interview on 11 August.

Engar A 2013. Specialist projects, Ekurhuleni metropolitan municipality. Email on 08 May 2013 about the list of businesses that registered on the municipal website as being aerotropolis related.

Flayser C 2013. Commercial manager of regional airports, Airports Company South Africa. Email on 09 May 2013 about OR Tambo International Airport terminals' tenant list.

Kuhn Y 2015. Service manager, Coldex. Interview on 17 August.

Makhetha P 2015. Airport planning, Airports Company South Africa. Email on 17 July 2015 about passenger numbers and cargo volumes handled at ACSA managed airports.[54]

Mills N 2015. Atlantic forwarding. Interview on 19 August.

Mqilingwa C 2015. Finance, Pro Med computer services. Interview on 11 August.

Rowe D 2015. AJM engineering. Interview on 11 August.

Salgado A 2015. Director, Alman's dried fruit & nuts. Interview on 12 August.

Streak I 2015. General manager of Johannesburg operations, Micor global logistics solutions. Interview on 12 August.

Thethiwe L 2013. Airports Company South Africa. Email on 15 June 2013 about Cape Town International Airport terminals' tenant list.

Van Rensburg JJ 2015. Manager, Dove's Nest guest house. Interview on 12 August.

[54] The information from Makhetha was mostly in the form of raw statistics, and the researcher manipulated the data as required. As such, any errors in the interpretation of the information provided are not to be attributed to Makhetha.

APPENDICES

APPENDIX A

Letter of introduction

UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot · your knowledge partner

Geografie en Omgewingstudie
Geography and Environmental Studies

21 May 2014

Dear Manager/Organizer

Mr Masilonyane Mokhele (Student number 17380944-2013) is a doctoral student in the Department Geography and Environmental Studies at Stellenbosch University. He is registered for the doctoral Programme Geography and Environmental Studies. He is currently working on his research titled:

Spatial economic attributes of airport-centric developments at Cape Town and Johannesburg

The views and experiences of establishments, such as yours, are a crucial part of the research. It would be a great help if the head or representative of your establishment could spend a short time assisting the student with the necessary information.

Yours faithfully

Prof SLA Ferreira
Departmental Chair
Tel no +27 21 808 3105
E-mail slaf@sun.ac.za

APPENDIX B

Questionnaire for the survey interviews

Name of interviewer: _____

Date & time of interview: _____

Name of firm: _____

Street [physical] address of firm: _____

Name of respondent: _____

Position of respondent in the firm: _____

Q1 What (business) activities do your organisation engage in?
(Indicate the activities of your company. Select and/or add relevant categories)

a. Manufacturing	
b. Transportation, storage, logistics and related activities	
c. Wholesale and Retail	
d. Other (describe)	

Q2 Is your company a franchise?

a. Yes	

Q3 Does your company have any of the following structures: head office & branch; parent & subsidiary; or multiple offices?
(If not answered Q3a, go to Q5 then Q9)

a. Yes	

Q4 Is your location a head office, parent, branch, subsidiary or other?
(if 'other' please describe)

a. Head office	
b. Parent	
c. Branch	
d. Subsidiary	
e. Other (describe)	

Q5 When was this company established on the site?

a. Provide year	

If branch, subsidiary or part of multiple offices, when was head office/parent/first office established?

b. Provide year	

Q6 Where is the head office/parent located?
(if answered Q4c or Q4d)

a. Location of parent	
b. Location of head office	

Q7 How many (*other*) branches/subsidiaries/offices do your company have?

a. Provide number	

Q8 Where are the (*other*) branches/subsidiaries/offices of your company located?

a. Name of city or location	
b. Name of city or location	
c. Name of city or location	
d. Name of city or location	
e. Name of city or location	

Q9 How many people are employed by your company, at this location?
('at this location' used for those who answered Q3a)

a. Provide number	

Q10 Has your company been part of a business merger, takeover or acquisition?
(if not answered Q10a or Q10b, go to Q12)

a. Merger	
b. Acquisition/takeover	

Q11 When did the merger(s), takeover(s) or acquisition(s) occur?

Provide year	
Provide year	

Q12 Does your company own the premises (i.e. buildings and/or land) occupied at this location?

a. Yes	

Q13 Prior to the current location, where was your company located?
(if answered Q13b, go to Q15)

a. Provide name	
b. Always located here	

Q14 Why did your company move from the previous location?
(if answered Q13a)

Provide reason(s)	

Q15 Why did your company choose to locate at the current location?	Provide reason(s)	
Q16 Do you have business interactions/do business with the neighbouring companies?		
a. in or around ORTIA/CTIA	**a.** Yes	
Q17 Does your company use the services of other companies as sub-contractors? located		
	a. in or around ORTIA/CTIA	
	b. elsewhere in city	
	c. in the region	
	d. elsewhere in the country	
	e. outside South Africa	
Q18 Does your company sub-contract its services to other firms?		
	a. in or around ORTIA/CTIA	
	b. elsewhere in city	
	c. in the region	
	d. elsewhere in the country	
	e. outside South Africa	
Q19 Does your company make use of OR Tambo/Cape Town International Airport? (if not answered Q19a, go to Q21)	**a.** Yes	
Q20 For what purpose does your company use OR Tambo/Cape Town International Air (Select and/or add relevant categories)	**a.** Air passenger services	
	b. Cargo/air freight	
	c. Other (specify)	
Q21 Does you firm ship directly or through couriers and freight forwarders? (if answered Q20b)	**a.** Forwarders	
	b. Directly	
Q22 Does your firm make use of other airports in the region? *(applicable only to the Johannesburg case study)*	**a.** Lanseria	
	b. Rand	
	c. Wonderboom	
	d. Grand central	
	e. Other (specify)	
Q23 For what purpose does your use the airport mentioned above	**a.** Air passenger services	
	b. Cargo/air freight	
	c. Other (specify)	
Q24 Does your company have business relationships/or do business with companies located at or next to other airports in South Africa? (if not answered Q24a, go to Q26)	**a.** Yes	
Q25 Please provide names of the airport(s)	Provide name(s)	
Q26 Does your company have business relationships/or do business with companies located at or around airports outside the Republic of South Africa	**a.** Yes	
Q27 Please provide names of the airport(s) (if answered 26a)	Provide name(s)	