Economic Specialisation and Diversity in South African Cities

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ABSTRACT

According to Naudé and Krugell (2003a) South Africa's cities are too small, dispersed, and over concentrated. In South Africa, households in the country's urban areas have average incomes almost thrice as high as the households in rural areas. More than 70% of South Africa's GDP is produced in only 19 urban areas (Naudé and Krugell 2003b). In Naudé and Krugell (2003a) it is stated that the rank-size rule shows that South Africa's urban agglomerations are too small and the cities mainly offer urbanization economies rather than localization economies. The main focus of this study will be looking at the specialization and diversity of South African cities. The aim is to determine whether certain cities should specialise in certain sectors, which they are currently involved in or should they add to their city and become more diverse and specialize in other sectors in order to promote economic growth. Many believe that a city which is more diverse would grow faster than a city specialising in a certain and thus be more beneficial to the economy than a specialized city would. This paper would like to address this phenomenon with regard to South African cities

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Summary

The main objective of the study was to determine whether South African cities should be more specialized in an industry or whether they should be the more diversified in order to promote economic growth. South Africa needs much higher economic growth rates than the current rate to meet the needs of the more than 30 per cent of the population that is unemployed. Growth also has to be more widely dispersed, beyond the major metropolitan areas and a few tourism-driven coastal areas. A large burden is being carried by these magisterial districts to promote economic growth. In South Africa economic activity tends to lump together and this could possibly cause implications for the country such as low growth, poverty and inequality that is significant in South Africa today. South Africa is also faced with increasing unemployment and a high percentage of uneducated inhabitants.

The method of research would comprise of two sections namely the literature survey and the empirical study. The theory highlights a number of important discussions with regard to the forming of agglomerations and illustrates how this study fits into the geographical economics framework. The work of many well known economists were analysed with regard to the forming of agglomeration and the best measures to determine the factors contributing to growth of an agglomeration and effectively the economy. Duranton and Puga (1999) suggest the simplest way to measure a city's specialisation in a given sector is to quantify the share of this sector in local employment. Different approaches include the Ellison and Glaeser (1997) specialisation index and Middelfart-Knarvik, Overman, Redding and Venables' (2000) use of a Krugman specialisation index. This study, however, follows Mukkala (2004), his study examines the relationship between agglomeration economies and regional productivity in the manufacturing sector in Finland.

This study follows an empirical approach to determine whether South Africa's cities and towns – specifically the fast growers – have specialised or diversified economies. This may in turn indicate whether they are offering specialisation or urbanisation economies, and inform local policies for growth and development. The empirical analysis had been separated into two distinguishable sections, that being the calculation of the location quotient and the regression analysis. The location quotient had been obtained from Mukkala (2004). Out of 354 magisterial districts in South Africa only 66 appeared to be specialised in a selected industry, that being the manufacturing industry. When comparing the concentrated (specialised) magisterial districts to the non-concentrated magisterial districts (diversified), it was the non-concentrated magisterial districts that proved to be the fastest growing magisterial districts in South Africa. Magisterial districts that have diverse economies seem to grow faster than magisterial districts that have activities concentrated in the manufacturing sector.

In the Regression Analysis rainfall, distance to Johannesburg (to the main market) and capital stock are shown to be significant determinants of GVA growth. The location quotient proved to be insignificant thus indicating that the specialization of an industry in a specific magisterial district may not cause the district to grow faster or for that matter contribute towards economic growth as significantly as expected.

Chapter 1

Introduction, problem statement and motivation

1.1 Introduction

A particular characteristic of economic activity across South Africa is its spatial lumpiness. Six cities, namely Johannesburg, the East Rand Metropole (Ekurhuleni), Durban (eThikwini), Cape Town, Pretoria (Tshwane metropole) and Port Elizabeth (Nelson Mandela metropole) dominate the economic landscape. Until recently, economic science has been silent on explaining why economic activity in South Africa tends to lump together as it does, and what this implies for the challenges of low growth, poverty and inequality that face South Africa, and particularly local government, today. This may, however, be changing.

Recent studies have shown that the rank-size rule indicates that South Africa's urban agglomerations are too small and the cities mainly offer urbanisation economies rather than localisation economies. These studies have also discovered that the H-measure of concentration reflects a dispersion of agglomerations, which may be inefficient (Naude' and Krugell, 2003a).

New developments in the field of geographical economics and availability of data mean that economists are beginning to focus on cities as drivers of economic growth and development. Work in this field has shown that living standards as measured by income and literacy, for example, tend to be higher in urban areas and urbanised economies than in rural areas. *"In South Africa, households in urban areas have average incomes almost thrice as high as the households in rural areas"* (Naude' and Krugell, 2003b:1).

The benefits of being located in a city are due to localisation economies and urbanisation economies. Localisation economies refer to the benefits a firm receives from being with other firms in the same industry. Henderson (1995:1068) stated that *"Localisation economies refer to the benefits a firm receives from being with other firms in the same industry. Urbanisation economies refer to the benefits of overall scale and diversity"*. Cities are therefore important for economic growth because they provide the

dynamic information spillovers that are important for innovation. The lumpiness of economic activity in South Africa may benefit economic development. Naude' and Krugell (2003b:3) state that *"The benefits of cities are that they reduce the transport costs for people, goods and ideas, and are necessary to capture the returns from specialisation"*

Lately, there has been a large amount of emphasis on local economic development issues as well as spatial development in policy debates and the popular press. McCarthy and Bernstein (2005) recently emphasised the importance of cities for the country's economy and also discussed the importance of smaller towns and magisterial districts. They argue that the localities that grow do so due to natural resources, technology, lifestyles that attract entrepreneurs, and effective local governance. Adding to this, Bernstein and McCarthy (2005) believe that growth should be widely dispersed to all magisterial districts and not only to major metropolitan areas and tourism-driven coastal areas.

The local determinants of growth and development and the important role of cities are also receiving attention in academic circles, specifically in the guise of geographical economics. The significance of geography is not one of determinism. There are benefits from nearby and intense economic interactions, thus there is a possibility of establishing new centres of activity. Theoretical models of agglomeration explore the roles of congestion, immobile factors, and market size in spatial growth and development.

Being in a city means more people, factors of production, a bigger market, and spillovers. According to Naude' and Krugell (2003b) approximately 70% of South Africa's GDP is produced in 19 urban areas. Thus, South Africa is very dependent on the urbanised areas to drive the economy forward. Being in an urban area leads to positive spillovers. There are more people, thus a greater amount of potential labour. With more people in an urban area, land rent would subsequently start to rise and labourers would demand a higher remuneration for working. Growth in cities takes place through localised or urban economies. According to Fujita and Thisse (1996) the city specialisation changes over time, creating a geographically diverse pattern of economic

development. The question this study would like to address is: Should South African urban areas/districts be more specialised in a selected industry or should these urban districts be more diverse with regard to industries, in order to promote economic growth?

This study wishes to examine the specialisation and diversity of South African cities. The analysis concerns not only the eight major metropolitan areas, namely Johannesburg, Pretoria, Durban, Cape Town, Port Elizabeth, East Rand (Ekurhuleni), Emfuleni (Vaal Triangle) and Msundizi (Pietermaritzburg), but of all the magisterial districts within South Africa. According to Naude' and Krugell (2003b), South Africa's eight metropolitan cities contain approximately 30% of South Africa's total population, and, in total, 55% of South Africa's GDP. However, eight cities within the country cannot drive the country's economy on their own; all magisterial districts play a crucial role. Magisterial districts should act as nodes or points of development between the major metropolitan areas.

Other than the big eight cities discussed, there are another 11 "metropolitan cities", which stand out in terms of population density, economic contribution, strategic location, economic function, and destination for rural-urban migration. Naude' and Krugell (2003b) believe these metropolitan cities would, in all likelihood, see high population growth, as well as economic growth; in the near future; as well as serving a useful purpose to the regional government and acting as rural service nodes. Taken together with the 8 big cities there are therefore 19 cities and towns that form the economic backbone of the South African economy. According to Naude' and Krugell (2003b) these metropolitan areas contribute 70% of South Africa's GDP and contain over 40% of its population. These metropolitan areas are also the first-choice candidates for the location of additional urban renewal and growth nodes aimed as fast-tracking urban economic growth in South Africa.

With this in mind, urban spillovers and externalities play an important role in the determination of the location of industries. Agglomerations of economic activity and the forces that drive local economic growth have been explained in terms of both specialisation and diversity of cities. So-called Marshall-Arrow-Romer externalities and Porter externalities favour specialisation for growth. MAR externalities are due to

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knowledge sharing, learning and innovation between firms in the same industry, and Porter externalities are industry-specific knowledge spillovers. On the other hand, Jacobs externalities exist where knowledge spillovers occur between firms of different industries. Again, proximity and spillovers are important, but here the diversity of a city would aid local economic growth. Glaeser, Kallal, Scheinkman and Shleifer, (1992) discuss these respective theories and sides with the opinion of Jacobs that the diversity of a city is preferred to promote growth.

Brakman, Gerretsen and Van Merrewijk (2001:129) stated that "The empirical analysis of the geographical concentration of industries tries to show whether or not particular industries are geographically clustered. As such, the concentration of industries does not need to tell us anything about the distribution of the overall manufacturing activity across space, that is to say it does not necessarily provide information on the degree of agglomeration. On the contrary, there may be geographical concentration without agglomeration."

The method of research comprises a literature survey and empirical study. The literature survey examines different theories of the location of production and illustrates how this study fits into the geographical economics framework. Chapter 2 discusses various theories of Von Thünen (1826), which remain a benchmark model for urban and regional economics to this day. The Central Place Theory argues that locations that differ in centrality determine the type of goods that the location provides. The roles of intermediaries and transport costs are emphasised in chapter 2 as well as part of the so-called core model to Geographical Economics developed by Krugman (1991). The emphasis of chapter 2 is on economies of scale as well as transport costs and how these factors affect the forming of agglomerations.

The empirical analysis follows Duranton and Puga (1999), who suggest that the simplest way to measure a city's specialisation in a given sector is to quantify the share of this sector in local employment. For example, Midelfart-knarvik, Overman, Redding and Venables (2000) conducted an empirical study on the degree of specialisation, concentration and agglomeration for the existing European countries. Empirical approaches use concentration indices to measure the extent of agglomeration. Ellison

and Glaeser (1997) using the dartboard approach, found that many industries in the United States are only slightly concentrated, and some of the most extreme cases of concentration are likely due to natural advantages. This research examines South African cities and follows the work of Mukkala (2004), which explores the relationship between agglomeration economies and regional productivity in the manufacturing sector in Finland. From the results, Mukkala (2004) supports the notion that regional specialisation rather than diversification drives growth.

1.2) Problem Statement

Being in a city means more people, factors of production, a bigger market and more spillovers. According to Naude' and Krugell (2003b), approximately 70% of South Africa's GDP is produced in 19 urban areas. Thus South Africa is very dependent on the urbanised areas to drive the economy forward. The question is whether growth in cities takes place through localisation economies or urbanisation economies. In other words: Should South African urban areas/districts be more specialised in a selected industry or should these urban districts be more diverse with regard to industries, in order to promote economic growth?

1.3) Motivation

This study considers the specialisation and diversity of South African cities as drivers of local economic growth. The analysis is not only of the eight major metropolitan areas, but of all the magisterial districts within South Africa. However, eight cities within the country cannot drive the country's economy on their own; all magisterial districts play a critical role. More magisterial districts may act as nodes or points of development between the major metropolitan areas.

1.4) Objectives

- To provide an overview of Geographical Economics, the factors that contribute to the forming of agglomerations and drive local growth.

- To review previous empirical methodologies related to concentration, agglomeration and specialisation and the results thereof.

- To make use of measures of concentration and agglomeration to determine whether South African cities should be more specialised or diversified in certain industries in order to promote economic growth.

- To obtain reliable results from this study and to make policy recommendations as to the way forward for South African cities and their respective industries to promote economic growth for the country.

1.5) Method

The study will comprise a literature survey and an empirical study. In the empirical study, a location quotient is calculated by using a formula proposed by Mukkala (2004). The location quotient is used to determine whether or not a magisterial district is specialised in a particular industry. This calculated location quotient is then used in the regression models to test whether or not concentration in manufacturing contributes towards economic growth in magisterial districts.

1.6) Outline of the study

This study is structured as follows. Chapter 2 discusses various theories regarding economic geography and explains how this study fits into the literature. In the third chapter, more recent theories regarding spatial complementarities are discussed. In the fourth chapter, the specialisation and diversity of South African cities are discussed and the empirical analysis and results are presented. Chapter 5 presents the conclusion and recommendations.

Chapter 2

Review of geographical economic theory

2.1 Introduction

Cities are important for growth and development. Cities are agglomerations of economic activity and there are a number of theories that explain agglomeration. This study focuses on two of the main driving forces of agglomerations; these being economies of scale and transport costs. The analysis of agglomeration aims to contribute to the main question of this study, which is whether certain cities should be more specialised or more diversified in order to promote economic growth. This chapter outlines the theories and models that have emphasised the importance of agglomeration for economic growth.

The Monocentric City Model is the starting point of the chapter. It originated with Von Thünen (1826), and remains a benchmark model for urban and regional economics. This theory has no increasing returns to scale, but the emphasis here is on the role of transport costs and the distance to the local market, which affect the price of the goods produced

Building on the Monocentric City Model, the following section places emphasis on the role that economies of scale play in the formation of agglomerations. The Central Place Theory argues that locations that differ in centrality determine the type of goods that the location provides. The provision of the goods is determined by increasing returns to scale, while the location is relevant because consumers are faced with transport costs. Because of transport costs, the population clusters closer together, and an agglomeration is formed. Being close together, the importance of economies of scale is observed.

One of the most important sections of this chapter is that of agglomeration and economies of scale (section 2.3). It starts by adding more insight to the concepts of internal and external economies of scale as well as their importance in this study. More importantly, in section (2.3.2.1) the emphasis is on knowledge, learning and innovation. This paper refers to three very important views on external economies, namely those of

MAR, Porter, and Jacobs. Externalities explain how knowledge sharing and learning fosters agglomeration. The differences between the types of external effects may also help explain whether a locality should become more specialised or diversified in order to promote economic growth.

The role of intermediaries is also emphasised. Fujita and Thisse (1996) believe that if agglomeration doesn't take place through spillovers, external economies of scale and the influence of transport costs, the driving force behind agglomeration could be the role of intermediaries. Infrastructure plays a big role here, too.

The last section of the chapter focuses on the so-called core model of geographical economics. The core model was a simple model developed by Krugman in 1991. It takes into account economies of scale as well as transport costs, which generate a so-called "home-market effect". It tries to answer when and why manufacturing becomes concentrated in a few regions, leaving others relatively undeveloped.

2.2 Cities in urban and regional economics

The role of the cities could vary from manufacturing to the financial sector or from farming to mining. Cities are the hub of the economic activity in the area, and the suburbs, districts, and surrounding towns feed off the city. The surrounding areas are dependent on the existence of the city. The city not only provides services, a variety of goods, and opportunities for the surrounding areas, but acts as a central place. This section discusses the Monocentric City model and Central Place Theory as explanations of the location of production in space.

2.2.1 Monocentric City Model

Before discussing the relevance of economies of scale for cities and other forms of agglomeration, this model first discusses a situation in which no increasing returns to scale exist. This model is the monocentric city model, which originated with Von Thünen

(1826) and remains a benchmark model for urban and regional economics. The Monocentric City Model illustrates the role of transport costs in determining the location of economic activity.

According to Brakman *et al.* (2001), the monocentric city model assumes the existence of a featureless plain, perfectly flat and homogenous in all respects. In the middle of this plain, there is a city. Outside the city, farmers grow crops and then sell the produce to the city. There are positive transport costs associated with getting the farmers' products to the city. This, however, differs for the various crops, therefore the prices of these crops also differ. It is logical that each farmer would want to be as close as possible to the city in order to minimise transport costs. For each type of crop, there is a bid-rent curve that indicates, according to the distance to the city, how much farmers are willing to pay for the land.
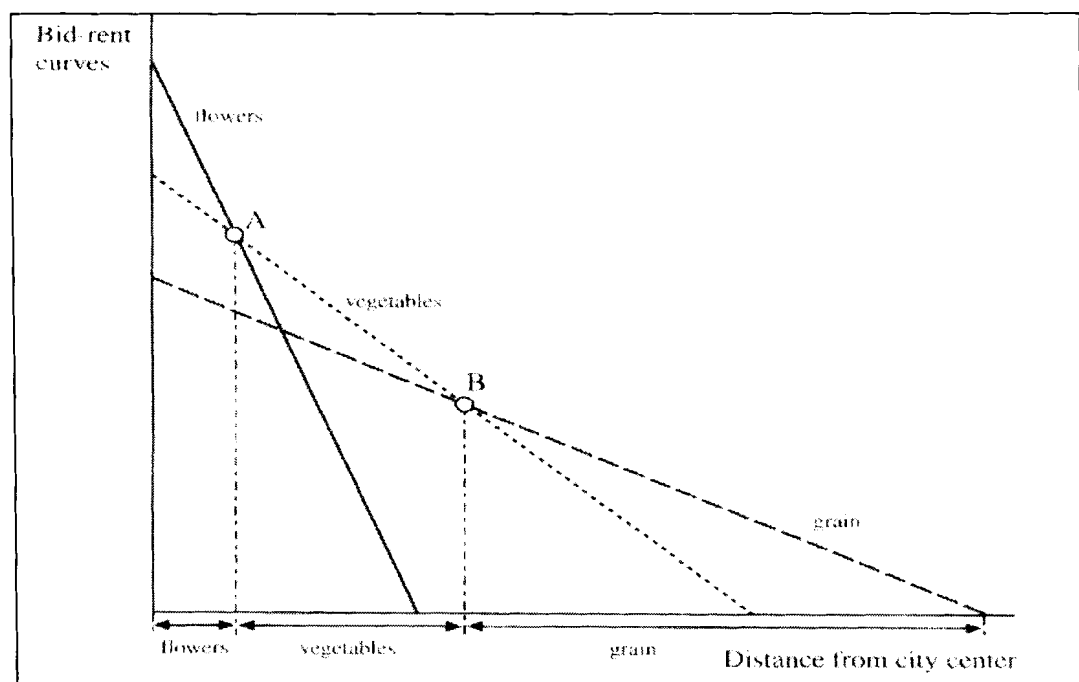
Fig 2.1 Bid-Rent Curve (Brakman *et al.*, 2001:25)

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Since the bid-rent curves differ from crop to crop as a result of different prices of those crops in the city and different transport costs, the farmers of a particular type of crop are able to outbid their competitors that they are willing to pay more, for any given distance from the city.

Figure 2.1 shows that as one moves away from the city centre, at first the flower producers outbid the other two groups of farmers. Between points A and B the vegetable producers are willing to pay the highest rents and to the right of B (furthest point from the city), grain producers would pay the highest rent. This results in a concentric circle pattern of land use around the city, as shown in figure 2.2.
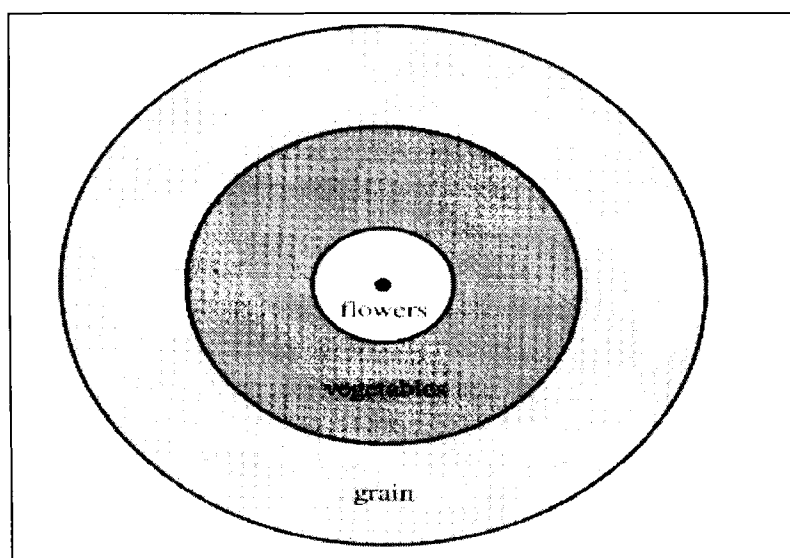
Fig 2.2 Concentric Pattern of Land Use (Brakman *et al.*, 2001:25)

Alonso (1964), took the Von Thünen model and replaced the city with a central business district and then replaced the farmers with commuters. Here the commuters travelled from their homes to the city and each commuter would derive utility from the living space but also faces transport costs. Land rents are higher near the city centre and fall with distance. This bid-rent approach can thus be applied, and the competition for land amongst the commuters implies an efficient allocation of land. The efficiency of land allocation in the monocentric model hinges on the assumption that there are no externalities of location.

Anas, Arnott, and Small (1998) believe that there are a number of facts about spatial structure that are in accordance with the monocentric model. First, population density declines with distance from the central business areas. Second, almost every major city in the Western World decentralised in the twentieth century (people started to locate further away from the city centre), which could be linked to a fall in transport costs. Again land rents are highest near the centre and decrease with distance from the centre.

Brakman et al. (2001) believe that there are limitations to this model. First, the model does not take into account the interactions between the city itself and other existing cities; it can't deal with the urban system. Second, the model takes the existence and location of the city as given and focuses on the location of the farmers or commuters outside the city. To deal with these limitations, urban economics have long recognised that theories of clustering require some type of increasing returns to scale.

If one had to move closer to the city to minimise transport costs, the land rent increases the closer you get to the city centre. With today's transport costs, people can afford to stay further away from the city centres, thus giving rise to extended city centres as well as the formation of new suburbs or villages on the outer limits of the city. The monocentric city model discusses one half of the factors that influence agglomerations. The next section looks at the importance of the interaction of cities as well as the location of smaller towns/cities and villages. The role of economies of scale will be emphasised in the Central Place Theory.

2.2.2 Central Place Theory

According to Brakman et al. (2001) regional economics is based on neo-classical economic theory. Regional economics analyses the spatial organisation between economic systems, and accounts for the uneven distribution of economic activity across space. In the central place theory, the main emphasis is on the role played by economies of scale.

Imagine an uneven distribution of identical consumers across a standardised plane. According to Brakman et al. (2001), the central place theory argues that locations

differ in centrality and this determines the type of goods that the location provides. The provision of the goods is determined by increasing returns to scale, while the location is relevant because consumers are faced with transport costs. To minimise these costs, consumers want access to nearby suppliers of goods. Some types of goods are more accessible than others – bread and television sets for example. In the case of bread, the economy can support many relatively small locations where bakers could supply bread. On the other hand there are only a few locations where electronic firms can sell television sets, which people buy less frequently. In order to minimise transport costs, both these industries are rather evenly distributed over space. The result is a hierarchy of locations in which the city performs all functions (television sets and bread), but the village only performs one, bread. This is illustrated in figure 2.3 where the equidistant (equal distance) central place is surrounded by six equidistant smaller cities, which together form a hexagon
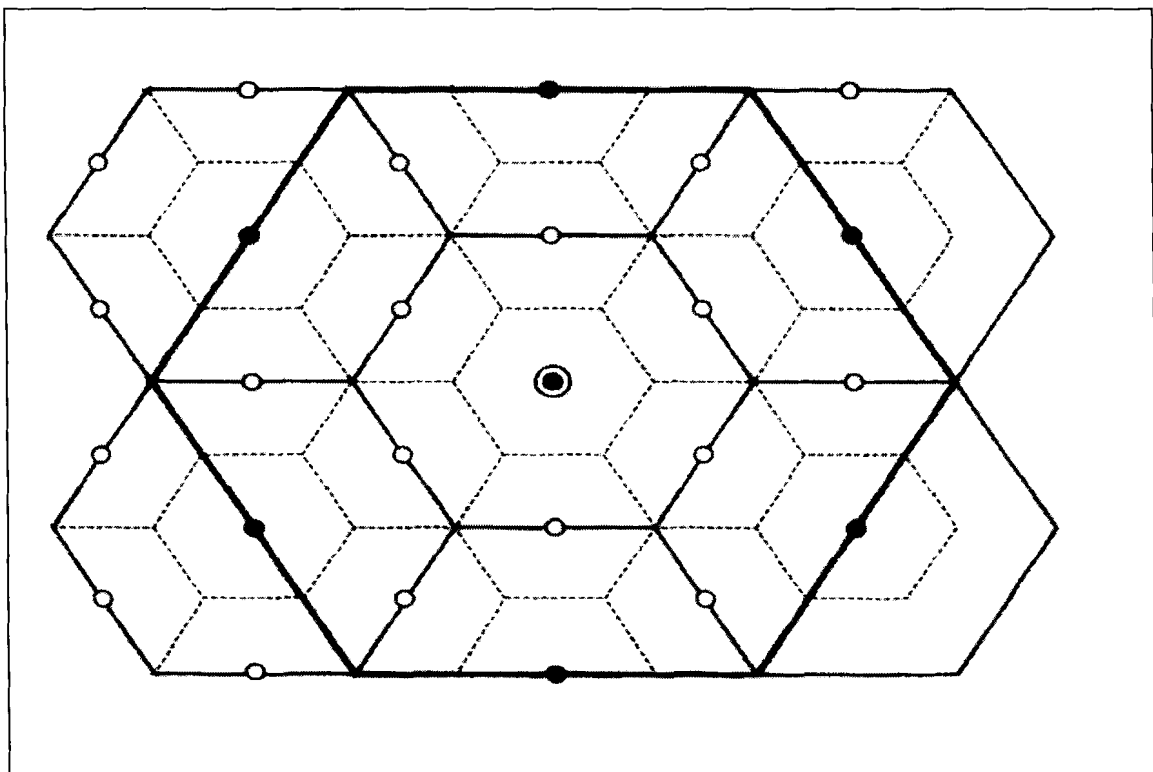
Fig 2.3 Central Place Theory (Brakman et al., 2001:33)

With reference to figure (2.3), the large city is in the centre of the diagram. The small city is represented by the darker, coloured-in black circle and the village is represented by the black circle which is not coloured (the hollow circle).

The central place theory has an important advantage because it deals explicitly with the location of economic activity. The problem with this approach is that the economic motivation behind consumers' and firms' decisions remains unclear. To achieve increasing returns at firm level requires some form of imperfect competition, which is absent.

The central place theory, specifically the geographical version, is still found in most introductory textbooks on economic geography and is needed in a more descriptive story. Regional scientists and economic geographers have been aware of the limitations of this version of the central place theory. In spite of the shortcomings of this model, the section that follows will explain the role and the existence of economies of scale and how they would contribute to agglomeration.

2.3 Agglomeration and economies of scale

Economies of scale are one of the most important factors that give rise to agglomeration. However, economies of scale cannot drive agglomeration on their own. The focus of the theory is the importance of economies of scale, transport costs and, later on, the significance of technological spillovers and their influence on agglomeration. This is the most significant part of the chapter and the emphasis of this section is placed on knowledge, learning, and innovation as sources of spillovers. The rest of this section looks at the economies of scale, market for intermediaries, infrastructure, and labour mobility. This section starts off by explaining the concept of economies of scale.

2.3.1 Internal economies of scale

The term economies of scale refers to situations in which an increase in the level of output produced implies a decrease in the average cost per unit of output for the firm.

If one had to sketch a graph representing this phenomenon, one could imagine it to be a negative (downward) sloping average cost curve. In order to explain the reason or cause behind the fall in average costs, Scitovsky (1954) made a distinction between internal and external economies of scale.

Economies of scale can be defined as a situation in which the level of output is increased, resulting in an overall decrease in the average cost of production, per unit, for the firm or sector respectfully.

Brakeman *et al.* (2001) believe that in the case of internal economies of scale, the decrease in average costs is caused by an increase in a firm's level of production. If a firm produced more, at lower average costs, it could increase its profit and have an advantage over other firms. The firm could even reduce its price in order to increase sales. Thus, internal economies of scale typically occur in the presence of imperfect competition.

2.3.2 External Economies

External economies of scale can be defined as the decrease in average cost while the output production level increases for the sector/industry as a whole, whereas the internal economies were for the firms alone. As a result, the average cost decreases for the sector/industry as a whole. Scitovsky (1954) then went further and divided the external economies into two categories, namely pure and pecuniary external economies.

Pure external economies are the increase in the sector/industry output that changes the technological relationship between output and input for each individual firm in the industry/sector. Pure external economies therefore have an impact on the firm's production function. A popular example is that of information spillovers. "*An increase in industry output increases the stock of knowledge through positive information spillovers for each firm, leading to an increase in output at the firm level.*" Brakeman *et al.* (2001:27). Here the market structure can be perfectly competitive because the size of the individual firms doesn't matter.

In contrast, Brakman *et al.* (2001) believe that pecuniary external economies are transmitted by the market through price effects for the individual firm, which may alter its output decision. Two examples, again based on Marshall, are the existence of a large local market for specialised inputs and labour market pooling. A large industry can support a market for specialised intermediate inputs and a pool of industry-specific skilled workers, which benefits the individual firm. Contrary to pure external economies, these spillovers do not affect the technological relationship between inputs and output (the production function).

Pecuniary externalities are present in the geographical economics literature in the form of the love-of-variety effect in a large local market. The price effect is critical to pecuniary externalities and can only occur with imperfect competition. This corresponds to the imperfect competition requirement for internal economies of scale.

Spillovers or externalities are essential for external economies. The concept of spillovers is sometimes used only for pure external economies. Pecuniary external economies are normally referred to as a case of market interdependence. External economies can be practical at a higher level of aggregation than the firm. In the modern trade theory and modern growth theory, it can also be the economy as a whole.

There is empirical support for the idea that industry-specific spillovers are important for cities (see, for example Henderson, Kuncoro & Turner, 1995; Beardsell & Henderson, 1999; Black & Henderson, 1999a). These industry-specific external economies are known as localisation economies as opposed to urbanisation economies. Urbanisation economies are economies that apply to firms across industries and capture the notion of positive spillovers of a firm as a result of total economic activity in a city.

Thus the important point to make about external economies and cities is that of proximity. Just being located in an agglomeration may provide benefits in terms of knowledge and innovation, a thick labour market, and access to intermediates, that firms receive without having to pay for it. The following section focuses on information spillovers as drivers of agglomeration and growth.

2.3.2.1 Knowledge, Learning and Innovation

This section focuses on three very well known types of external economies that are associated with knowledge, learning and innovation. These are Marshall-Arrow-Romer, Porter, and Jacobs externalities. Marshall-Arrow-Romer will be referred to as MAR externalities. These different externalities have different implications for whether a region or country should have more diversity or greater specialisation in order to promote economic growth in that region.

"Technological spillover is the process whereby innovation and improvements occurring in one firm increases the productivity of the other firms without full compensation" Glaeser et al. (1992:1127). Within this framework, knowledge or information spillovers are a result of people being in the same area or city taking part in the same or different industries. Innovation, techniques, learning and information is passed from one to the other without them paying for the benefit.

The focus is on three types of externalities, that of Marshall-Arrow-Romer, Porter, and Jacobs. *"When one looks at the Marshall-Arrow-Romer theories, their externalities are those of knowledge spillovers between firms in an industry. Marshall (1890) believes that the concentration of an industry in a city helps knowledge spillovers between firms and therefore of that industry and the city"* Glaeser et al. (1992:1127). MAR externalities would occur in the presence of local monopoly because they allow for the internalisation of the external economies.

Porter and MAR believed that industries should locate themselves geographically together in order to benefit from each other by means of knowledge spillovers that would occur between firms and workplaces. Porter and MAR were also under the impression that regionally specialised industries; in the same location; would benefit from each other by means of knowledge spillovers, thus improving their industry and eventually growing faster than those same industries which are isolated from similar industries in production.

Porter and MAR both believe that the most influential technological externalities occur within the industry. They back the assumption that regional specialisation is good for the growth of the industries and the cities in which they are located. MAR is in favour of the idea of local monopoly being good because it allows internalisation of

externalities. Porter, however, will argue that local competition is good because it promotes innovation.

Jacobs (1969) was of the opinion that the most influential "knowledge" is sourced from outside the main industry. The diversity of a geographic location (city) would favour growth and development more than a specialised geographic location would. In simple terms, Jacobs thus favoured the diversification of a geographic location. Jacobs also believed in local competition because it speeds up the acceptance and use of technology. Jacobs (1969) believed that interaction between people in the same city helps one innovate. When one is without the opportunity to benefit from spillovers, it causes the people to improve their own method of thinking and innovation and there would then be no incentive for people to pay high rents just to work within a specialised city. With people and industries being in close proximity or at the same location would lead to a rapid transfer of information. Knowledge spillovers occur between people living in the same city. Knowledge spillovers transfer more easily between people in the streets than between people trying to share knowledge across oceans or continents.

"By testing empirically in which cities industries grow faster, as a function of geographic specialisation and competition, one can determine which externalities are important for growth. We also find that industries grow faster in cities in which firms in those industries are smaller than the national average size of firms in that industry" (Glaeser et al., 1992:1129)

Glaeser *et al.* (1992) stated that city industries grow faster when the rest of the city is less specialised and therefore agrees with Jacobs' view of city diversity promoting growth as knowledge spills over between industries. These theories disagree with that of MAR, and partially disagree with that of Porter.

Cities grow because people in cities interact with each other, either on their own or in sectors, and learn from these interactions. They pick up knowledge without paying for it. Interaction between these people is ensured by their proximity in a city. These proximities make externalities or spillovers particularly large in a city. Cities grow faster than rural areas in which externalities are less important because people interact less.

Glaeser *et al.* (1992) couldn't find significant evidence that specialisation or within-industry knowledge spillovers promote growth. If these spillovers are particularly obvious within geographical locations, this evidence could be harmful MAR and Porter's theories. Glaeser *et al.* (1992) did find that at city-industry level, specialisation is harmful, competition is healthy, and diversification within a city helps employment and growth. They found no support for the hypothesis that cities specialising in certain industries grow faster on average. Instead, they concluded that if external economies are important, it is probably more important to have a variety of diversified industries in the cities.

This leads to question of why are so many cities concentrating in certain industries and not diversifying in order to promote growth? The answer to this is that there are many other externalities that influence a city's specialisation and the formation of cities other than those of knowledge spillovers and externalities. Marshall (1890) believed that some firms locate near to each other in order to also share inputs, resources and specialised labour.

2.3.2.2 Infrastructure

After spillovers from knowledge, learning, and innovation, spillovers from infrastructure may be a second source of pure externalities. The role of infrastructure in agglomeration and local growth may be explained using the following model.

Imagine a good that is made available to consumers through a facility located in the city. Fujita and Thisse (1996) state that consumers face transport costs $T(r)$ to have access to the public service. In the attempt to reduce the access costs, consumers agglomerate around the place where the public facility is built in the same way as around the business district. Let $g = g(G, N)$ be the quantity of public goods where G stands for public expenditure and N for the mass of users. If the public good is pure, then g is independent of N and, without loss of generality it may be assumed that $g = G$. If the local public good is congestible, then an additional consumer has a negative impact on the welfare of others, in which case g is a strictly decreasing function of the mass N of users.

The whole population in the economy is formed by N identical consumers whose income is Y. This income is earned in a perfectly competitive industry under constant returns to scale. The utility function of a consumer is

$$U[s,z,g(G,N)] \tag{1}$$

When the consumer resides at distance r from the city centre, the budget constraint is given by

$$z + sR(r) = Y - T(r) - \theta(r) \tag{2}$$

In which R(r) denotes the land rent existing at distance r and $\theta(r)$ any tax subsidy received by a consumer at distance r. This tax depends only upon the consumer's location because consumers are identical other than their distance to the facility.

Fujita and Thisse (1996) suppose that the local public good is pure and that the results presented can be generalised to the case in which the lot size is variable. It is convenient to assume that the lot size used by each consumer is fixed and normalised to one. If N consumers live in the city, at the corresponding residential equilibrium they is evenly distributed around the city centre overall [-N/2, N/2]. G is the level of public expenditure. From the equity of the utility level across consumers and from the consumer budget in which s = 1, equilibrium consumption of the composite good z*, and an equilibrium land rent R*(r) exists such that:

$$z^* = Y - R^*(r) - T - \theta(r) \quad re[-N/2, N/2] \tag{3}$$

Thus given G and R*(r), maximising the utility of a consumer amounts to maximising the consumption z* as given by (3). On the urban fringe, one obtains

$$F(r) = T(N/2) + \theta(N/2) - T(r) - \theta(r) = RA, re[-N/2, N/2] \tag{4}$$

Where R_A is the agricultural land rent. According to Fujita and Thisse (1996) the amount of land available in the whole economy is assumed to be sufficiently large for the numbers of cities determined to be feasible. The next analysis is a case of a single city and identifies conditions under which confiscating the aggregate differential land rent is used to finance the public good, known as the George Henry Theorem.

2.3.2.2.1 The Henry George Theorem

Fujita and Thisse (1996) considered a group of individuals who choose to form an urban community to benefit from a local public good. The quantity of public good G is assumed to be fixed. To this end, the government first buys the land for the city from farmers at the agricultural rent RA. The government knows that if the competitive residential equilibrium is efficient, it may allow a competitive land market to determine the consumers' residential allocation and the consumption of the composite good within the city. In order for the government to find resources to finance this public good, the city government can confiscate the differential land rent created by the establishment of the public facility. The government can levy a tax $\theta(r) \geq 0$ that may vary with consumers' locations. The government is also entitled to choose the city population size N.

The city government understands that it is wasteful to have vacant land within the city and that the consumers must be symmetrically distributed about the public facility. Focusing on the right-hand side of the city, this implies that

$$R*(r) - R_A \geq 0 \quad r \in [0, N/2] \tag{5}$$

And

$$R*(N/2) = RA \tag{6}$$

Because each consumer's budget constraint is given by $Y \ T(r) + \theta(r)$, the equilibrium land rent must be such that

$$R*(r) = Y - z * - T(r) - \theta(r) \quad r \in [0, N/2] \tag{7}$$

The city government is subject to the city budget constraint

$$2 \int_0^{N/2} \theta(r) dr + 2 \int_0^{N/2} [R*(r) - R_a] dr \geq G \tag{8}$$

as well as to (5), (6) and (7)

Let ADR be the aggregate differential land rent when there are N consumers

$$ADR \equiv 2 \int_0^{N/2} [R*(r) - R_A] dr \tag{9}$$

And denote by TTC (N) the total transport cost incurred by the N consumers

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$$TTC(N) = 2 \int_0^{N/2} T(r)dr \tag{10}$$

Substituting (7) into (8) and using the equality yields

$$NY = Nz*TTC(N) + g + NR_A \tag{11}$$

And thus

$$z* = \frac{TTC(N) + G + NR_A}{N} \tag{12}$$

According to Fujita and Thisse (1996), the optimal utility level corresponding to G is reached when the per capita cost G/N + TTC (N)/N + R_A is minimised with respect to N. The trade off can now be seen as: if the population size rises, the per capita transport cost of the public good G/N decreases. Because (12) does not involve θ (•), without loss of generality θ (r) may be set equal to zero for all r as long as (5) and (6) are met, Fujita and Thisse (1996). Any positive or transfer is automatically reflected in the equilibrium land rent defined by (7) In this case, using (6), (7) becomes

$$R*(r) = T(N/2) - T(r) + R_A \tag{13}$$

And hence, ADR depends only upon N:

$$ADR(N) = 2 \int_0^{N/2} [T(N/2) - T(r)]dr \tag{14}$$

Which is strictly increasing in N. Furthermore, evaluating (7) at the urban fringe shows that

$$z*(N) = Y - T(n/2) - R_A \tag{15}$$

Which strictly decreases with N. Consequently, maximising $z*(N)$ under the budget constraint (8), which is now rewritten $ADR(N) \geq G$, implies that the optimal population size $N^o(G)$ must satisfy the condition

$$ADR[N^o(G)] = G \tag{16}$$

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Thus, Fujita and Thisse (1996:140) conclude that *"Given any level of expenditure on a pure public good; the aggregate differential land rent equals public expenditure size is chosen to maximise the utility level of the city's residents."*

Fujita and Thisse (1996) state that, in urban public finance, this result is known as the Henry George theorem based on the suggestion for a confiscatory tax on pure rents made in 1879. It is worth stressing that the statement above does not depend on the structure of preferences, and holds regardless of the quantity of public good supplied within a city. The land tax proposed by George also has the advantage of being levied on land, which is supplied inelastically so that no distortion is introduced in the price system.

According to Fujita and Thisse (1996) the aggregate differential land rent exceeds expenditure on the public good in a city with a population above the optimal size: too large a number of consumers leads to increasing land rent at each urban location. By contrast, expenditure on the public good exceeds the aggregate land rent in a city with a population below the optimal size: too small a number of consumers makes the land rent too low at each urban location. In this case, a tax is needed to finance the public good.

It can be shown that the Henry George theorem remains valid when the lot size is variable (hence, the population density now decreases as one moves away from the public facility) as well as in the presence of locational amenities.

"When the local public good is pure, an urban system is efficient if and only if it is a free-entry equilibrium of the city market. At both outcomes, public good in each city is solely financed by the aggregate differential land rent" (Fujita and Thisse, 1996:146)

Fujita and Thisse (1996) state that for land value maximisation to yield efficiency, the city must include all the beneficiaries of its fiscal policy within its border. To avoid uncounted spillovers, cities must be sufficiently large; something that may require the takeover of suburban communities. Local governments and communities will resist, precisely because their independence allows them to free ride on the city's provision of public goods. Capitalisation and consumer mobility go hand in hand. Land prices rise in a city because more public goods attract residents from elsewhere, which pushes inland and increases the population of the city. Meanwhile, as residents leave the other cities, the land prices there fall, providing residents more utility than they had before. In this way utility is "exported" from the city that increased its

public goods to other cities. As a result, with a small number of cities, the utility-taking assumption is no longer tenable, thus making competition more strategic.

2.3.2.3 Labour Market

According to Krugman and Venables (1995), a key difference between international economics and regional economics concerns the mobility of labour across space. In international economics it is occasionally assumed that labour isn't mobile between countries, whereas in regional economics, the opposite is assumed. In the core model of geographical economics, in section 2.4, labour is mobile between locations in the long run.

A large part of migration is economically determined. The increasing income difference per capita between rich and poor countries is one of the main forces behind economic migration. Brakman *et al.* (2001) believe that when considering the migration of labour, the flow of international migration is predominantly from countries with a relatively low GDP per capita to countries with a higher GDP per capita. Bearing this in mind, the same could hold true for the migration between regions, where labourers would move from region to region in order to obtain higher wages.

According to Brakman *et al.* (2001), migration flows are from low-wage countries to high-wage countries. This is important from a geographical economics perspective because in the core model (section 2.4), the decision of labour to move between locations is influenced by real wage differences between locations. In terms of geographical economics and the spatial wage structure, migration from "poor" to "rich" countries encourages agglomeration patterns.

Brakman *et al.* (2001) believe that the risks and costs of migration will decrease in the future, thus providing further motivation for migration. Improvements in transport and communications technology may decrease the actual costs of moving, make it easier for future migrants to be informed about the prospects of migrating. Thus labourers can move to regions where they would receive higher wages.

The Smith-Marshallian approach holds that the size and proximity of economic activity found in agglomerations ensures a thick labour market that allows for better matching between workers and jobs. The benefit which arises is when labourers wish to move to another firm, these labourers would not have to be retrained in the selected industry, it is a situation where the relocating labourer has the necessary skills in the given industry and is just relocating in order to obtain higher wages. In this approach there are two models. Duranton (1998) argues that a large market allows workers to become more specialized, and therefore, to be more efficient. On the other hand, Helsley and Strange (1990) shows that a large city allows for a better average match between heterogeneous workers and firms' job requirements and this enhances efficiency. Either way, the better matching gives rise to increasing returns as a whole.

Essentially, labour is mobile and would tend to migrate to places where the wage rate is effectively higher. At present, employment in the major cities offers greater remuneration for work done. Migration from poor to rich areas, or from rural to urban areas, encourages agglomeration patterns. In short, external economies, spillovers, the migration of labour, and transport costs are important factors that facilitate agglomeration. Spillovers only work in close proximity. However, if agglomeration doesn't take place through spillovers and it could also be caused by intermediaries, which will be discussed under the next heading.

2.3.2.4 Market for Intermediates

According to Neary (2001) agglomeration occurs not only through spillovers but also through intermediates. The models described in this chapter illustrate that agglomeration requires increasing returns and transport costs. These features are sometimes not enough; some mechanism that actually brings about agglomeration is also needed. So far, labour mobility has been assumed to be this mechanism. An alternative route is to allow for inter-industry linkages.

Neary (2001) started with a closed economy, a world in which all economic activity is concentrated at a single point. There are two sectors. Agriculture is perfectly competitive and produces a homogeneous good under constant returns to scale.

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Manufacturing is monopolistically competitive, and produces many varieties under increasing returns to scale. Each sector uses a single factor specific to it: farmers in agriculture, workers in manufacturing.

Neary (2001) assumed that labour is now permanently country-specific, in both agriculture and industry/manufacturing. Manufacturing also uses an intermediate good, which is an aggregate of the output of all manufacturing firms (both domestic and foreign). For simplicity, assume this aggregate has the same elasticity of substitution as the manufacturing sub-utility function, so the price index for intermediates facing producers in country 1 is just P_1. Intermediates are then combined with labour to form a Cobb-Douglas input, with unit cost W_1 and intermediate cost share α

$$W_1 = w_1^{1-\alpha} P_1^{\alpha} \tag{17}$$

Neary (2001) believes that production costs depend positively on the local price index P_1. The second way in which the model differs from those discussed previously is that the demand for each variety comes not only from consumers but also from firms. If, for example, the demand from country-1 consumers $\mu Y1$ which appears in every demand function must be replaced by total country-1 expenditure on manufactures E_1, given by:

$$E_1 = \mu Y_1 + \alpha n_1 p_1 q_1 \tag{18}$$

Neary (2001) believes that local consumers spend μY_1 as before; in addition the n_1 local firms spend a fraction α of their revenue $p_1 q_1$ on intermediates. The cost of the composite input W_1 replaces the wage rate in the pricing equation; but otherwise the equations for individual firms are unchanged.

$$\frac{\sigma - 1}{\sigma} p = cw \quad \text{So now it would be:} \quad \frac{\sigma - 1}{\sigma} p = cW_1 \tag{19}$$

And total country s expenditure, Es, replaces consumer expenditure μYs in the demand function (and in the corresponding demand function facing firms in country 2); but otherwise the equilibrium equations are unchanged. The demand function is illustrated as follows

$$q_1 = \phi_1 p_1^{-\sigma} \quad \text{Where:} \quad \phi_1 = \mu[Y_1 P_1^{\sigma-1} + Y_2 P_2^{\sigma-1} T^{1-\sigma}] \tag{20}$$

Matters are particularly simple if it is assumed that the agricultural wage rate is always fixed. This, in turn, fixes the manufacturing wage and gives the model a partial equilibrium flavour, but the pay off is considerable.

The results are very similar to those of the model with internationally mobile labour. In particular, the expressions for the break and sustain levels of transport costs are identical to (21) and (23), except that α, the cost share of intermediate goods, replaces μ, the budget share of manufactures.

Where previously it was:

$$T^b(\mu, \sigma) = \left[\frac{\{\sigma(1+\mu)-1\}(1+\mu)}{\{\sigma(1-\mu)-1\}(1-\mu)} \right]^{\frac{1}{\sigma-1}} \tag{21}$$

It now changes to:

$$T^b(\alpha, \sigma) = \left[\frac{\{\sigma(1+\alpha)-1\}(1+\alpha)}{\{\sigma(1-\alpha)-1\}(1-\alpha)} \right]^{\frac{1}{\sigma-1}} \tag{22}$$

And

$$\frac{q_2}{q_1} = \frac{\phi_2 p_2^{-\sigma}}{\phi_1 p_1^{-\sigma}} = H \left(\frac{p_2}{p_1} \right)^{-\sigma} = HT^{-\sigma\mu} = 1 \tag{23}$$

Changes to:

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$$\frac{q_2}{q_1} = \frac{\phi_2 p_2^{-\sigma}}{\phi_1 p_1^{-\sigma}} = H\left(\frac{p_2}{p_1}\right)^{-\sigma} = HT^{-\sigma\alpha} = 1 \qquad (24)$$

Neary (2001) believes that this is because, as equations (25) and (26) show, it is now α that determines the magnitude of the cost and demand linkages. Hence, the analysis of the model (whether diagrammatically or algebraically) proceeds essentially as in the internationally mobile labour case.

$$W_1 = w_1^{1-\alpha} P_1^{\alpha} \qquad (25)$$

And

$$E_1 = \mu Y_1 + \alpha n_1 p_1 q_1 \qquad (26)$$

Neary (2001) took two sectors, the agricultural sector (perfectly competitive) producing goods under constant returns and the manufacturing sector, which was assumed to produce under increasing returns to scale. Neary (2001) believed that intermediaries provide another channel for agglomeration while allowing for inter-industry linkages and found that the cost share of intermediate goods determines the magnitude of the cost and demand linkages.

Neary (2001) states that the role of intermediaries shows how agglomeration could occur in the absence of spillovers, increasing returns, and the influence of transport costs. The result is similar to that of the mobility of labour. The core model, which was referred to earlier in the chapter, explains how agglomeration takes place with economies of scale and transport costs.

2.4 The Core Model

The most important point considered in this section is how agglomeration is explained in terms of economies of scale and transport costs. The core model shows how a country can endogenously become differentiated into an industrialised "core" and an agricultural "periphery". Krugman (1991) believes that, in order to capture scale economies, at the same time minimising transport costs, manufacturing firms will locate where the demand is believed to be the highest, but the location of demand itself depends on the distribution of manufacturing. The core-periphery pattern depends on the share of manufacturing in national income and more importantly transport costs and economies of scale.

This section discusses an illustrative model and is designed to shed light on one of the key questions of location: Why and when does manufacturing become concentrated in a few regions, leaving others relatively undeveloped?

2.4.1 Regional Divergence

The so-called core model is based on a number of key assumptions. First, the concentration of industries in a location offers the industry labourers with industry specific skills, ensuring low unemployment and reduced labour shortages. Second, localised industries could support the production of non-tradeable specialised inputs. Third, information spillovers can give clustered firms a better production function than secluded firms.

Krugman (1991) tried to address the reasons that manufacturing would end up concentrated in a few regions of the country, while other regions play the "peripheral" role of agricultural suppliers to the manufacturing "core". He accepted the assumption that the externalities that lead to the emergence of a core-periphery pattern are pecuniary externalities associated with demand or supply linkages rather than technological spillovers.

Krugman (1991) started by supposing a country has two sectors, a manufacturing sector and an agricultural sector. The agricultural sector has constant returns to scale and immobile land. The geographical distribution of production will be determined by the

exogenous distribution of suitable land. The manufacturing sector has increasing returns to scale and only a modest use of land.

Manufacturing would take place at a limited number of sites due to economies of scale. The sites would be located where the demand is high. By producing close to the markets, transport costs are reduced. Other locations will be served by these local sites.

According to Krugman (1991), some of the demand for the manufactured goods will come from the agricultural sector and the production would form a network whose form was determined by the distribution of agricultural land. Some of the demand for manufacturing would not only come from agriculture, but from within the manufacturing sector itself. This could give rise to forward linkage. It will be more attractive to produce near a cluster or concentration of manufacturing industries because it would be cheaper to buy the goods from this locality.

Today, a higher percentage of income is spent on non-agricultural goods and services. "But now let society spend a higher fraction of their income on non-agricultural goods and services, let the factory system and eventually mass production emerge, and with them economies of large-scale production and let canals, railroads, and finally automobiles lower transport costs. Then the tie of production to the distribution of land will be broken. A region with a relatively large nonrural population will be an attractive place to produce both because of the large labour market and because of the availability of the goods and services produced there. This will attract still more population, at the expense of regions with smaller initial production, and the process will feed on itself until the whole of the nonrural population is concentrated in a few regions." Krugman (1991:6).

Krugman (1991) then went further by saying "This not entirely imaginary history suggests that small changes in the parameters of the economy may have large effects on its qualitative behaviour. That is, when some index takes into account transport costs, economies of scale, and the share of non-agricultural goods in expenditure crosses a critical threshold, population will start to concentrate and regions to diverge; once started, this process will feed on itself" (Krugman, 1991:6)

2.4.2 Two Region Model

In Krugman's (1991) model, he assumed that there are two regions and that there are two kinds of production, agriculture and manufacturing. Manufacturing has increasing returns to scale and can be located in any region. Agriculture has constant returns to scale and is fixed to the land. The utility function of all individuals in the regions was given as follows:

$$U = C_m^\mu C_A^{1-\mu} \tag{27}$$

Where C_A is consumption of the agricultural good and C_M is consumption of a manufactures aggregate. In equation (27) above, manufactures will always receive a share μ of expenditure; this share is one of the key parameters that will determine whether regions will form agglomerations or whether the region would start to spread.

Krugman (1991) clearly stated that there were two regions in the economy and that each region had two production factors. Each factor is specific to one sector. Farmers produce the agricultural goods and the unit labour requirement is unity. The farming population is immobile between regions, with a supply of $(1 - \mu)/2$ in each region. Workers may move between the regions; L_1 and L_2 are the worker supply in regions 1 and 2:

$$L_1 + L_2 = \mu \tag{28}$$

The production of an individual manufactured good i involved a fixed cost and a constant marginal cost, giving rise to economies of scale:

$$L_{Mi} = \alpha + \beta x_i \tag{29}$$

Where L_{Mi} is the labour used in producing i and x_i is the good's output. The next factor to consider is that of transport. Two assumptions were made by Krugman (1991). First, the transport of agricultural goods would be costless, thus the earnings of the farmers is the same for both regions. Second, the costs for transport for the manufactured

goods will be determined by a Samuelson iceberg effect, thus for each unit the manufacturers export, only $\tau < 1$ arrives. τ is an inverse index of transport costs. When taking the transport costs and the elasticity of demand of firms (σ) into account.

When considering the behaviour of firms, assume there are many of them each producing a single product. When taking the transport costs and the elasticity of demand of firms (σ) into account, the profit maximising price of a firm in region 1 can be:

$$p_1 = \left(\frac{\sigma}{\sigma - 1}\right)\beta\omega_1 \tag{30}$$

Here, ω_l is the wage rate of workers in region 1. Comparing the prices of representative products, we have:

$$\frac{p_1}{p_2} = \frac{\omega_1}{\omega_2} \tag{31}$$

If there is free entry of firms into manufacturing, profits must be driven to zero. Then one can assume:

$$(p_1 - \beta\omega_1)\chi_1 = \alpha\omega_1 \tag{32}$$

This means that

$$\chi_1 = \chi_2 = \frac{\alpha(\sigma - 1)}{\beta} \tag{33}$$

Thus illustrating that output per firm is the same in each region, irrespective of wage rates and relative demand. Thus the number of manufactured goods produced in each region is proportional to the number of workers so that:

$$\frac{\eta_1}{\eta_2} = \frac{L_1}{L_2} \tag{34}$$

Here the zero-profit equilibrium, $\sigma/(\sigma-1)$ is the ratio of the marginal product of labour to its average product; that is, the degree of economies of scale. *"Although σ is a parameter of tastes rather than technology, it can be interpreted as an inverse index of equilibrium economies of scale"* (Krugman, 1991:9).

2.4.3 Short-Run and Long-Run Equilibrium

In Krugman (1991), the short-run equilibrium was defined in a Marshallian way, whereby the equilibrium in which the allocation of workers between regions may be taken as given. Workers tend to move towards the region that offers them higher real wages, resulting in convergence between regions as they move closer to equality of worker/farmer ratios, or divergence as the workers all congregate in one region. To establish short-run equilibrium, Krugman (1991) looked at the demand within each region for products of the two regions. Where c_{11} is the consumption in region 1 of a representative region 1 product, and c_{12} is the consumption in region 1 of a representative region 2 product. The price of a local product is its free on board (fob) price p, the price of a product from the other region, its transport cost-inclusive price p2/τ. Thus the relative demand for representative products is:

$$\frac{c_{11}}{c_{12}} = \left(\frac{\rho_1 \tau}{\rho_2}\right)^{-\sigma} = \left(\frac{\omega_1 \tau}{\omega_2}\right) - \sigma$$

(35)

The incomes of the two regions depend on the distribution of workers and their wages. The wage rate of farmers is the numeraire, thus the incomes are:

$$Y_1 = \frac{1-\mu}{2} + \omega_1 L_1$$

(36)

And

$$Y_2 = \frac{1-\mu}{2} + \omega_2 L_2$$

(37)

From equations (36) and (37) it is assumed that $L_1 = L_2$ and $\omega_1 = \omega_2$. If labour is then shifted to region 1, the relative wage rate ω_1 / ω_2 can move either way. Krugman (1991) believes the reason is that there are two opposing effects. First, the "home market effect": other things being equal, the wage rate will tend to be higher in the larger market. Second, the extent of competition: workers in the region with the smaller manufacturing labour force will face less competition for the local farmers' market

than those in the more crowded region. In simple terms, there is a trade off between proximity to the larger market and lack of competition for the local market.

Krugman (1991) believes that in the long-run equilibrium, the third factor comes into consideration. Workers are interested in real wages, and workers in the region with the larger population will face a lower price for manufactured goods. The real wages of workers in each region are:

Region 1

$$W_1 = \omega_1 P_2^{-\mu} \tag{38}$$

Region 2

$$W_2 = \omega_2 P_2^{-\mu} \tag{39}$$

According to Krugman (1991), if wage rates in the two regions are equal, a shift of workers from region 2 to region 1 will lower the price index in region 1 and raise it in region 2. Thus, real wages rise in region 1 relative to those in region 2. This adds an additional reason for divergence or for spreading of the region.

If ω_1 / ω_2 increases with f, workers would migrate to the region that already has more workers and the result is regional divergence. Krugman (1991) states that there are two forces working towards divergence; the home market effect and the price index effect; and one working towards convergence of agglomerations, the degree of competition for the local farmers' market.

With high transport costs, the relative real wage declines as f rises. Therefore, one would expect to see regional convergence or agglomeration, with the geographical distribution of manufacturing following that of agriculture. In the case of low transport costs, one would expect to see regional divergence or spreading.

2.4.4 Conditions for Manufacturing Concentration

Indices that measure concentration, measure the level of agglomeration within a certain area. By using these indices of concentration, it would be possible to determine

whether an area has a larger concentration than another area of average stature in the same industry, and thus determining whether these areas are more specialised in a certain industry than that of the average, thus measuring the amount of agglomeration present. Concentration as well as the indices that measure concentration will be discussed in section (3.4) in more detail.

In section (3.4) the indices used to measure concentration are those of a normalised Hirschman-Herfindahl or Ellison and Glaeser (1997) index. Ellison and Glaeser's (1997) index measures the specialisation of a city in an industry in terms of the employment in the industry in the city, relative to the share of the employment in the industry nationally.

Ellison and Glaeser (1997) developed an index of concentration that has some important properties. First, the index was scaled so that it takes the value of zero only if employment is as concentrated as it would be expected to be had the plants in the industry chosen locations randomly, and is not equal to zero if employment is uniformly spread across space Second, the index was designed to simplify comparisons across industries, across countries, or over time. Differences in the size of the industry, the size distribution of plants, or the fineness of the geographic data that are available should not affect the index.

In the Ellison and Glaeser (1997) model of location choice, plants sequentially choose locations to maximise profits. Ellison and Glaeser (1997) allow for two types of agglomerative forces, which are referred to as spillovers and natural advantage. When neither natural advantages nor spillovers are present, the plants choose locations by throwing darts at an appropriately scaled map. Natural advantages captured the fact that the plants in an industry will be geographically concentrated whenever their location choices have been influenced by common factors that make some locations more desirable than others.

The second range of reasons for agglomeration captured by Ellison and Glaeser (1997), examine spillover theories as explained in section (2.3). Ellison and Glaeser (1997) use the term to refer to technological spillovers, gains from sharing labour markets, the effect of local knowledge on the location of spin-off firms, and any other

forces that might provide increased profits to firms locating near other firms in the same industry.

The Ellison and Glaeser (1997) model imposes severe limitations on the geographic scope of forces that produce localisation in two ways. First, when potential spillovers exist, they are realised only if firms choose to locate in the same geographic area. Second, the natural advantages are drawn independently for each geographic area.

Ellison and Glaeser (1997) found that concentration exceeds that which would be expected to arise randomly. Also, slight concentration was found to be widespread, but extreme concentration less so. Ellison and Glaeser (1997) conclude that concentration can be attributed to some form of external economies of natural advantage rather than to randomness.

2.5 Conclusion

To conclude this chapter, it is important to reiterate how the various factors that have been discussed contribute to the forming of agglomerations. Each individual factor plays a unique role in aiding the formation of agglomeration. This study has discussed the role of transport costs, intermediates, labour mobility, infrastructure and, most importantly, the role of external economies.

Transport costs are instrumental in the forming of agglomerations. If transport costs were high, most industries would locate themselves as close as possible to the market. The firms would like to be as close as possible to the location with the highest demand. However, being close to the market or city centre would increase the land rent as was seen in the Monocentric City Model. Labourers, on the other hand, would move to a city in order to receive higher remuneration. The labourers are willing to stay a small distance from the city centre and pay some form of transport costs. With more people flocking to cities, more suburbs and villages are established as was seen in the Central Place theory. These new suburbs form new agglomerations of their own and they, too, could present economies of scale between the suburbs.

All labourers would like a larger real income, in other words higher wages. Labourers move much more easily between regions than between countries for obvious reasons. Higher wages are usually offered in metropolitan areas, causing more labourers to flock towards the cities and therefore encourage agglomeration.

Economies of scale; specifically external economies of scale; is the most important factor that gives rise to agglomeration. External economies of scale have a huge impact on firms' production. The most significant role player here is that of spillovers. Just by being located within the same region and with the existence of external economies; spillovers lead to information and techniques regarding production being passed on from firm to firm without these firms having to pay for receiving the benefit. Firms would like to be located where spillovers are present, thus moving towards the agglomerations. Just by being located in a region where spillovers are present has an impact on the ordinary individual. The presence of externalities and spillovers within the city makes the city more productive and cost effective, in the long run it benefits the whole of society.

In Chapter 3, this study asks how cities can maximise the benefits from external economies. Do the benefits from external economies favour specialisation or diversification?

The discussion in section (2.3.2.1) showed that the type of externalities is an important part of the answer to the above question. MAR and Porter externalities favour industry specialisation in a region for firms to benefit from knowledge spillovers. Jacobs externalities, on the other hand, mean that industries that are located in areas that are diversified should grow more quickly. Jacobs believed that without the benefits of spillovers and innovation, an individual's method and initiative to think is improved.

The following chapter presents the empirical approaches to these questions.

Chapter 3

Review of empirical methodologies and results

3.1 Introduction

Chapter 2 showed that agglomerations, cities and towns foster growth through the size of their markets and economies of scale. The spillovers that benefit local economic growth stem from knowledge sharing, learning and innovation, infrastructure, diversity of intermediate inputs, and the benefits of a thick labour market. The different externalities, however, create differential conditions for localities to benefit from the above spillovers. Marshall-Arrow-Romer and Porter externalities favour industry specialisation in an area, whereas Jacobs externalities favour local diversity for fostering economic growth.

Chapter 3 outlines the empirical methods used to measure the specialisation or diversification of cities and towns. The chapter also reports the results from empirical studies on the importance of specialisation or diversification as drivers of local growth. The chapter is organised around a number of key papers from the literature.

The first of these is the work of Henderson. This chapter reviews some of Henderson's papers where he solved for optimum city size (1974); analysed whether local governments can successfully internalise local dynamic externalities (1999b) and discovered what geographic features of a city promote growth (1999a).

Other significant contributions come from the empirical work of Ellison and Glaeser. The latter being Glaeser *et al.* (1992) found that city industries grow faster when the rest of the city is less specialised. Diversity would therefore promote growth as knowledge spills over to other industries. In the second paper by Ellision and Glaeser (1997) the study measures the amount of agglomeration present in certain areas within the country.

Duranton and Puga (1999) contributed a significant paper emphasising stylised facts of both specialisation and diversity in the US. Duranton and Puga (1999) illustrated both methods for calculating specialisation and diversity measures and presented the

results. Duranton and Puga (1999) concluded that there is need for both large and diversified cities and smaller and more specialised cities.

In addition, a recent empirical study by Midelfart-knarvik *et al.* (2000) provides useful information on the degree of specialisation, concentration, and agglomeration in EU countries. Midelfart-knarvik *et al.* (2000) used the Krugman specialisation index to measure specialisation and diversity and to determine which is more influential. Midelfart-knarvik *et al.* (2000) found that EU industry remains more dispersed than that of the US and that specialisation is beneficial for growth.

The method used in this study to measure the specialisation or diversity of South African cities follows a paper written by Mukkala (2004). The primary objective of the study was to examine the relationship between agglomeration economies and regional productivity in the manufacturing sector in Finland. Special attention was paid to the analysis of two types of agglomeration economies in Mukkala's paper: localisation/specialisation (Marshall Externalities) and urbanisation/diversity (Jacobs's externalities) economies.

The discussion of the various papers is broadly organised as follows. There is a brief overview of the paper, followed by a description of the data and empirical methods used and a summary of the results and conclusions. The following section starts with a brief overview of the specialisation and diversity of places.

3.2 Specialisation and diversity.

Romer, Porter, and Jacobs developed theories regarding economic growth by emphasising the importance of spillovers in helping to promote economic growth. Knowledge spillovers are significant in cities, where people are close to each other and the communication is extensive. With the data available, Glaeser *et al.* (1992) tested these theories on the growth of industries in different cities in order to determine whether cities should specialise in a certain industry or whether they should specialise in more than one industry.

With people living within a city being in close proximity, it makes it possible for quick and accurate transfer of knowledge between people. Jacobs (1969) believes that the interaction between people living in the same city helps them innovate. Without the transfer of this information, there would be little reason for them to live in a city and to pay higher costs just to live there.

Knowledge spillovers are particularly important in the high technology and innovative sectors. Knowledge and ideas about new products and production techniques can be transferred by imitation, business interactions, inter-firm circulation of skilled employees or by informal exchanges, without monetary transactions (Saxenian, 1994). The larger the number of workers in an industry, the greater is the opportunity to exchange ideas (communication economies).

Localisation economies (specialisation economies) are characterised by the geographical concentration of a specific industry and urbanisation economies (diversity economies) by the industrial diversity of the local economic system.

MAR and Porter are of the opinion that the same industries should be geographically concentrated in order to benefit from spillovers between firms. They predict that regionally specialised industries should grow quicker than industries that are secluded geographically. If localisation economies dominate in an industry, firms are likely to cluster in those areas where the high specialisation will contribute to their growth. Jacobs is of the opinion that industries would grow faster when geographically concentrated in an area in which the industries are more diverse. Diversity economies can emerge in urban densely populated districts, whereas both urban and smaller non-urban areas can profit from specialisation. Urbanisation economies, however, will attract firms and industries that need a diversified environment to grow faster.

The sources of urbanisation economies are quite diverse. A well functioning infrastructure of transport (roads, airport) and communication offer transfer savings for firms. Furthermore, the closeness of markets and easy access to specialised services (financial, legal) facilitate the operations of firms and enable them to allocate their resources more effectively without having to provide all the required services on their own. The proximity of a great number of economic agents from different fields provides

better possibilities for face-to-face interaction. As Jacobs (1969) concludes, the urban environment yields a greater return on new economic knowledge and encourages innovation.

There are many static externalities that contribute to specialisation but not to growth. The most important is the saving on the moving of inputs. A whole industry might locate near the place of common suppliers both to reduce the cost of getting supplies and to have a closer flow of information to suppliers. Many firms producing specialised products that are subject to widely fluctuating firm demands but more stable industry demand would locate together. By doing this, it enables specialised labour to move easily between firms.

Cities are usually specialised in a few lines of work; they pursue other activities outside their main lines. This suggests that another type of externality operates within a city. Firms locate in a city because demand is high there, so they can sell some of their goods without incurring transport costs.

Empirical evidence supports the notion of specialisation supporting local growth. Midelfart-knarvik et al. (2000), along with Duranton and Puga (1999), show various methods, formulas and results regarding specialisation. Duranton and Puga (1999) believe there will always be a need for large diversified cities and for more specialised cities, but this does not imply that one type of city is economically more desirable than the other. Midelfart-knarvik et al. (2000) found that industries having a high degree of increasing returns to scale tend to locate in central regions, but this effect has diminished over time.

The case for diversity of cities has larger empirical support than has specialisation. A number of well-known papers have supported this theory. Glaeser et al. (1992) supports diversity and thus compares their findings to previous literature. Duranton and Puga (1999) are highlighted in this section again but the importance of diversity is brought to the fore.

The following section discusses empirical studies of specialisation and diversity found in the literature.

3.3 Overview of Empirical Studies

The overview of the past empirical studies considers the most important economic theories and discoveries relating to the study of South African cities. The most important studies are highlighted under the appropriate headings in the following section (3.3) and the way in which these discoveries could be implemented within a geographical economic framework.

3.3.1 The sizes and types of cities

Henderson's (1974) paper presents an equilibrium model of an economy where production and consumption occur in cities. It solves for equilibrium and optimum city sizes, and the equilibrium size can differ from the optimum. According to Henderson (1974), equilibrium sizes are determined by location or investment decisions of labourers and capital owners, each attempting to maximise their own welfare.

Henderson (1974) followed arguments made by Mills (1967). Mills assumed that urban production of traded goods occurs in a central business district (CBD). In addition to traded goods, housing is produced in the city and workers commute to the CBD from their homes.

As the city size and the area devoted to housing increases spatially, the average distance a worker commutes increases as does the congestion. The average per person commuting costs rise with city size. Efficient city size occurs where these increasing resource costs per person offset the resource savings due to scale economies in traded good production

City sizes vary because cities of different types specialise in the production of different traded goods, exported by cities to other cities or economies. If these goods involve different degrees of scale economies, cities will be different sizes because they can support different levels of commuting and congestion costs. So why do cities specialise?

According to Henderson (1974), if there are no positive production benefits or externalities from locating two industries together, locating the production of the two

goods in the same city only increases total production costs. Labourers employed in the two industries contribute to rising per person commuting costs, but mistreatment of scale economies occurs only with labour employment within each industry. If industries locate together, there is a higher average per person commuting resource cost for a given level of scale economy mistreatment or industry than if the industries were located in separate cities.

Throughout Henderson's (1974) paper, it is assumed that capital and labour are scarce resources available in fixed supply to the national economy. The economy is defined as a region or country within which these factors are perfectly mobile. Factors move between cities in the economy to equalise appropriate measures of factor rewards. Henderson deals with an economy where there is only one type of city. Each city produces and exports the same traded goods at a fixed price to other regions or countries. In return the cities import consumption goods at a fixed price.

According to Henderson (1974), optimum city size is found by maximising the welfare of participants in the economy. Equilibrium size is determined given optimisation behaviour in the investment and location decisions of capital owners and labourers. Henderson (1974) describes an abstract solution in which new cities form instantaneously. In reality, this would not happen. Say, for example, that the economy grows in one city. When it is appropriate to form a second city in the economy, the second city would start small, growing over time until the two cities were the same size. Given the reality of non-flexibility of capital, the actual population decline in the first city might be very small. Henderson (1974) believed that this would be true if growth in the economy was accompanied by technological change that increased efficient city sizes. Then the first city might not decline in size but the second city would grow more rapidly over time until the two cities were the same size.

It seems likely that land developers play a crucial role in the real world. In a more complicated model than that of Henderson (1974), developers would play a more intricate role. For example, if Henderson's (1974) model allowed for suburbs as the Mills type cities grew in size, then suburbs would allow for the release of pressure to form a completely new city due to the rising commuting costs. Henderson believed this would be

a mechanism for a completely new city to form where the suburb or the new city would be economically independent from the old city of the type in the model, without suburbs. By economically independent, it is meant there would be little cross communication between the core city and the suburb and interdependence in input an output markets would be weakened.

Black and Henderson (1999b) provide an empirical test for these theories of city sizes and types. Black and Henderson (1999b) argued that localised information spillovers promote agglomeration and human capital accumulation fosters endogenous growth. Individual city sizes grow with local human capital accumulation and knowledge spillovers, and city numbers normally increase, which they demonstrate with empirical evidence. Black and Henderson (1999b) evaluated whether local governments can successfully internalise local dynamic externalities and explored ways in which growth involves real income differences across city types and how urbanisation can foster income inequality.

3.3.1.1 Description of data

Black and Henderson (1999b) tested for the existence of production specialisation across cities in the United States, using the cluster analysis to allocate 317 metro areas to 55 city types, on the basis of 1992 metro area private employment broken into 80 two-digit industries. Black and Henderson (1999b) also examined how city sizes and human capital vary across city types. As F-tests confirm, production patterns indeed differ very significantly across these city types and sizes and educational attainments are related to city type.

3.3.1.2 Discussion

The results of Black and Henderson (1999b) involve the number and sizes of cities. During the 1900-1950 period; the average size of metropolitan areas tripled and the number of the metro areas doubled. Regardless of this growth in individual city sizes, in every decade the number of cities increased, fuelled by national urbanisation

(urbanisation increased from 40-60%) and national population growth (1.4% average per year).

For example, cities specialising in financial, business or diversified services (education, management) are significantly larger than traditional manufacturing industries. Electronics, health services and computer manufacturing type cities have much greater per capita educational attainment than food processing, primary metals and textile type cities.

In terms of the effect of urbanisation on growth, Black and Henderson (1999b) argued that urban institutions could lead to efficient growth with the internalisation of local knowledge spillovers, but the institutions faced significant problems. Black and Henderson (1999b) also commented on the effect of urbanisation on inequality. In the Black and Henderson (1999) model, there are nominal and real income inequalities across cities, but not consumption differences.

From the above evidence, Henderson and Black (1999) suggest that size does matter. They stated that the optimum city size is found by maximising the welfare of participants in the economy. Every city will have a different optimum geographical size because of the size of the population and the sizes and types of industries that exist within the city. The most important point is that cities should grow to promote economic growth but not grow bigger than the optimal city size.

3.3.2 Growth in cities

Glaeser *et al.* (1992) set out to provide an empirical answer to the question of whether a city should specialise in a certain industry or whether the city should be more diverse in order to promote economic growth. The growth theories of Glaeser *et al.* (1992) were based on MAR, Porter, and Jacobs type externalities which were highlighted in Chapter 2.

The models considered by Glaeser *et al.* (1992) emphasise the role played by externalities, specifically the role of knowledge spillovers for city growth. In these models, cities grow because the people in the city interact with one another, either in or

outside their sectors. These interactions lead to the exchange of knowledge without anyone having to pay for the benefit, thus the spillovers are external.

3.3.2.1 Description of data

Glaeser *et al.* (1992) examined industries and determined which industries in which US cities grew the fastest between 1956 and 1987. Glaeser *et al.* (1992) examined the various theories of spillovers and growth using the data set on geographic concentration and competition of industries in 170 of the largest US cities. They focused on the largest industries because one of the strong implications of growth models is that externalities in these models are sources of permanent income growth. This suggests that knowledge spillovers might occur between industries rather than within industries, thus agreeing with Jacobs' theories. The data contained statistics on employment, payroll and number of establishments. Glaeser *et al.* (1992) took the 5 smallest and 5 largest cities in the sample from 1956 and their employment in 1956 and 1987, and the 6 largest industries in each of them.

3.3.2.2 The index

The unit of observation was an industry in a city and the growth rates of these industries as a function of their measures of knowledge spillovers. Glaeser *et al.* (1992) suggest that employment growth in an industry depends on the specialisation of that industry in that city, local competition in the city industry, and city diversity. The specialisation of the industry in a city is measured by the fraction of the city's employment that this industry represents in that city, relative to the share of the whole industry in national employment:

Specialisation = <u>Industry employment in city/total employment in city</u>

$$\text{Industry employment in the US/total employment in the US} \qquad (40)$$

And competition was defined as:

Competition = $\dfrac{\text{Firms in city industry/workers in city industry}}{\text{Firms in US industry/workers in US industry}}$ (41)

If the specialisation index value is greater than unity, it means that this industry has more firms relative to its size in a particular city than it does in the rest of the country. An interpretation of this value being greater than unity is that the industry in the city is locally more competitive than it is elsewhere in the country. On the other hand, values of the competition index greater than unity can mean that firms in that industry in that city are just smaller than they are on average in the country. Employment in a city grows faster when employment in that industry in the whole of the country, grows faster.

3.3.2.3 Discussion

Glaeser *et al's* (1992) findings were based a cross section of city industries because knowledge spillovers would be easier to identify than would be the case when looking at a city as a whole. Glaeser *et al.* (1992) discovered that industries grow more slowly in cities in which they are more heavily concentrated. Glaeser *et al.* (1992) used the example of the metal industry in Georgia where it was not heavily concentrated; the industry grew from 1956-1987, whereas the metal industry declined in California where it was heavily concentrated. These results do not favour the theories that propose MAR and Porter externalities, where they believe that industries should grow faster if they are geographically concentrated.

City industries grow faster when the rest of the city is less specialised. Glaeser *et al.* (1992) support the theories of Jacobs, therefore agreeing that city diversity promotes growth as knowledge spills over between industries. The results dismiss MAR, have a mixed response with Porter, and correspond with the views of Jacobs. Like localisation externalities, urbanisation externalities explain patterns of industry location rather than growth.

The results of Glaeser *et al.* (1992) suggest that employment in an industry grows faster in a diversified city might reflect the fact that such cities are less crowded and thus cheaper to locate in. Competition for space and labour might explain these findings. The

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very existence of cities, despite the high rents, is hard to explain without externalities. If externalities matter, the evidence points against intra-industry spillovers and in favour of knowledge spillovers between sectors.

The evidence presented by Glaeser *et al.* (1992) suggests that diversity and not specialisation contributes to growth. If this were true, why is geographic specialisation so widespread? There are many reasons for regional specialisation which are not dynamic externalities that contribute to growth. The most influential is that of natural resources and transport costs.

The results presented by Glaeser *et al.* (1992) show that at city-industry level, specialisation hurts, competition helps, and that city diversity also helps employment. The results show that inter-industry knowledge spillovers are less important for growth than spillovers across industries, particularly in the case of mature cities. However, the study of Glaeser *et al.* (1992) was done during a period in the US when traditional manufacturing industries performed poorly because of import competition.

3.3.3 A dartboard approach

Ellison and Glaeser (1997) developed a model in which localised industry-specific spillovers, natural advantages, and chance all contribute to geographic concentration. The model is used to test for whether levels of concentration are greater than would be expected to arise randomly and to motivate new indices of geographic concentration.

In Ellison and Glaeser's (1997) model of location choice, plants sequentially choose locations to maximise profits. They allow for two types of agglomerative forces, which are referred to as spillovers and natural advantage. When neither the existence of natural advantages nor spillovers (location and technological) are present, the model reduces to one in which plants choose locations by throwing darts at an appropriately scaled map. "Natural advantages" are included in the Ellison and Glaeser (1997) model to capture the fact that the plants in an industry will be geographically concentrated whenever their location choices have been influenced by common factors that make some

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locations more desirable than others, for example the proximity of natural resources and a favourable climate.

The second class of explanations for agglomeration examined by Ellison and Glaeser (1997) are what they call "spillover" theories. Ellison and Glaeser (1997) use the term broadly to refer to technological spillovers, gains from sharing labour markets, the effect of local knowledge on the location of spin-off firms, and any other forces that might provide increased profits to firms locating near other firms in the same industry.

In describing this specification of spillovers, Ellison and Glaeser (1997) sometimes extend the dartboard metaphor. They imagined a two-stage process in which nature first randomly chooses to weld some of the darts into clusters representing groups of plants that are sufficiently interdependent that they will always locate together. Each cluster is then thrown randomly at the dartboard to choose a location. This metaphor indicates that it will be possible to construct an index of concentration that "controls" for differences in industry and data characteristics without knowing what combination of natural advantages or spillovers is responsible for the agglomeration of each industry.

3.3.3.1 Description of data

Ellison and Glaeser (1997) chose to focus on narrowly defined industries – the 459 manufacturing industries defined by the four-digit classifications of the Census Bureau's 1987 SIC system. Having made this decision, Ellison and Glaeser (1997) settled on the 50 states plus the District of Columbia as a geographic division.

Ellison and Glaeser (1997) looked closely at the industry-by-industry numbers and found a dominance of localisation that is striking, even in light of the comments on concentration found in Krugman (1991a). The level of raw concentration exceeds what would be expected to arise randomly in 446 of the 459 industries. The opposite of this result; that in only 13 industries are plants more evenly distributed than would be expected at random; is interesting in that it indicates that the need to be near final consumers is rarely an overwhelming force in location decisions.

3.3.3.2 The index

Ellison and Glaeser (1997) began by developing a "model-based" index of geographic concentration that has several useful properties. First, the index was scaled so that it only takes the value of zero if employment is as concentrated as it would be expected to be had the plants in the industry chosen locations by throwing darts at a map, and is not equal to zero if employment is uniformly spread across space. Second, the index was designed to ease comparisons across industries, across countries, or over time. When plants' location decisions are made as in the model, differences in the size of the industry, the size distribution of plants, or the fineness of the geographic data that are available should not affect the index.

Ellison and Glaeser's (1997) model imposes an extreme limitation on the geographic scope of forces that produce localisation in two ways. First, when potential spillovers exist, they are realised only if firms choose to locate in the same geographic area. Second, natural advantages are drawn independently for each geographic area. Ellison and Glaeser (1997) would expect that spillovers might provide some benefit also to plants locating in nearby areas.

Ellison and Glaeser's (1997) index measures the specialisation of a city in an industry in terms of the employment in the industry in the city relative to the share of the employment in the industry nationally.

$$Specialisation = \left(\frac{E_{ij}/E_j}{E_i/E_n} \right)^2 \qquad (42)$$

Where E_{ij} is the employment in industry i in city j, E_j is the total employment in city j, E_i is the employment in industry i nationally and E_n is total national employment. With perfect deconcentration, the index is zero and its highest possible value is two. The view is that, if external economies exist, they are realised only when firms locate in the same geographical area. In a study of industries and locations in the United States Ellison and Glaeser (1997) found that concentration exceeds what would be expected to arise randomly. In addition, slight concentration was found to be remarkably widespread, but extreme concentration less so. They conclude that concentration can be attributed to some form of external economies or natural advantage rather than to randomness.

3.3.3.3 Discussion

Ellison and Glaeser (1997) found the motor, computer, carpet, and other industries that researchers have used as examples of concentration are far from typical. There are a substantial number of industries that have received less attention and are similarly concentrated. Ellison and Glaeser (1997) amend an earlier conclusion that concentration is remarkably widespread to explain that slight concentration is remarkably widespread, while the more extreme concentration that has attracted attention exists in a smaller subset of industries. Ellison and Glaeser (1997) regard the fraction as a rough measure of the portion of raw concentration that is attributable to some form of spillovers or natural advantage rather than to randomness.

Ellison and Glaeser (1997) developed a model for the analysis of geographic concentration that captures both the "random" agglomeration (a dart-throwing model) that would produce and additional agglomeration caused by localised industry-specific spillovers and natural advantages. The model suggests that it is possible to control for industry characteristics in a fairly forceful manner when measuring geographic concentration, and have proposed new indices for the measurement of the localisation of industries and the relative strength of cross-industry agglomerations. While reaffirming that geographic concentration is everywhere and that there are many highly concentrated industries, the results are clearly not as strongly in favour of concentration as some previous statements. Many industries are only slightly concentrated, and some of the most extreme cases of concentration are likely due to natural advantages.

3.3.4 Diversity and specialisation in cities

Duranton and Puga (1999) contributed a significant paper to the empirical literature by emphasising stylised facts of both specialisation and diversity. They illustrated both methods and results of calculation methods of specialisation and diversity. Duranton and Puga (1999) concluded that there is need for both large and diversified cities and smaller and more specialised cities.

"The distribution of relative city sizes, individual city size rankings, and individual city specializations are stable over time." (Duranton and Puga, 1999:5). Not only were the relative city sizes very stable, but there is an abundance of the same activities in the same cities. As with city size, there are some historical exceptions involving major overhauls at the sector level. These include the flight of textile industries during the 18th century from the cities of Leiden and Haarlem in Holland to Manchester and Sheffield in the UK. A more recent example would include the successful economic restructuring of European cities formerly specialised in declining traditional activities, such as Cholet in France.

Duranton and Puga (1999) show the relationship between city size and specialisation/diversity. It is widely believed that larger cities are more diversified. There is a positive correlation between city size and the relative diversity index. *"Larger cities tend to be more diversified. There is a weak correspondence between the type of specialisation and city size"* (Duranton and Puga, 1999:4).

A large part of the recent empirical literature has focused on trying to understand what characteristics of cities may contribute to their growth or decline. Duranton and Puga state that *"Individual city growth is related to specialisation and diversity, and to relative location"*. Glaeser *et al.* (1992) also address this issue by asking whether diversity encourages growth. Looking at employment growth in cities, Glaeser *et al.* (1992) found that diversity and local competition foster urban employment growth, whereas specialisation reduces urban employment growth.

Henderson, Kuncoro, and Turner (1995) find that, while urban diversity is important for attracting new and innovative sectors, a history of similar past specialisation appears to matter more for mature industries. Production of less standardised or non-traditional items tends to be more concentrated in diversified metropolitan areas. On the other hand, production of traditional standardised items tends to be more heavily concentrated in cities that are often quite specialised in terms of the goods that are exported to other cities (Henderson, 1997a).

Setting specialisation against diversity and innovation, Duranton and Puga (1999:7) find that *"There is a high rate of plant turnover. Most innovations take place in*

particularly diversified cities and most new plants are created there. Most relocation is from diversified to specialised cities." This supports the Jacobs (1969) notion that localised diversity may favour innovation. Feldman and Audretsch (1999) use a data set of 3,969 US product innovations in 1982 for which the address of the innovating establishment can be identified and found that 96% of the innovations were made in metropolitan areas, which account for only 30% of the US population. This supports the theory that cities are the places where innovations occur. It is important to establish the main force driving the innovative process: pure city size, urban diversity, or urban specialisation.

3.3.4.1 Description of data

In their empirical work Duranton and Puga (1999) focused on cities with more than 50,000 inhabitants. The stylised facts ignore small cities and concentrate on medium-sized and large cities which may be of a different nature from smaller cities. In this section Duranton and Puga (1999) summarise and structure facts about the composition of economic activity in cities over the period 1993 to 1996. A complete description of the data is given by Delisle and Lainé (1998).

3.3.4.2 The index

According to Duranton and Puga (1999), the simplest way to measure a city's specialisation in a given sector is to quantify the share of this sector in local employment. Since different cities are specialised in different sectors, one useful measure of specialisation for comparisons across cities is the employment share of each city's largest sector. Duranton and Puga (1999) denote *sij* as the share of industry *j* in city *i*, we can define the following specialisation index:

$$ZI_i = \max_j(s_{ij})$$ (43)

Certain sectors account for a larger share of overall (e.g. national) employment than others. To correct for this, it is helpful to look at a city's relative (rather than absolute) specialisation, which can be measured as above, but dividing the share of each

sector in local employment by its share in national employment. This leads naturally to the following relative-specialisation index:

$$RZI_i = \max_j(s_{ij} / s_j)$$ (44)

where sj is the share of industry j in national employment.

Turning to the diversity section of Duranton and Puga (1999), a common measure of diversity is the inverse of a Hirshman-Herfindahl index, summing for each city over all sectors the square of each sector's share in local employment. Formally, the inverse Hirshman-Herfindahl index or diversity index is given by

$$DI_i = 1/\sum_j s_{ij}^2$$ (45)

If economic activity in the city under consideration is fully concentrated in a sector, we find $DI_i = 1$, and this index increases as activities in this city become more diverse. This index increases as the composition of activities in the city under configuration tends to mirror the diversity of the national economy. When measured in this way, diversity and specialisation are not exact opposites. A city with a main industry and a broad base of other industries can be both diversified and specialised. The most diverse cities (Atlanta) are also not very specialised in any particular sector.

3.3.4.3 The Results

In their empirical results Duranton and Puga (1999) found that amongst the most specialised cities, there are those specialised in sectors largely dependent on natural resources such as tobacco, petroleum products and leather. These are extreme cases for which the relative-specialisation index is often above 30, indicating the presence of a sector with a share in local employment 30 times larger than its share in national employment. Duranton and Puga (1999) also found highly specialised cities in manufacturing sectors which are less dependent upon local resources like textiles, industrial machinery and equipment, or transport equipment. They also found cities with a very low relative-specialisation index (Chicago) with no sector having a share of manufacturing employment larger than 1.6 times its national share.

Duranton and Puga (1999) also summarise a number of interesting facts about the composition of economic activity in cities.

Over the four years examined in the study, 258,305 new plants were created in France (representing 27.8% of the average stock over this period). At the same time, 23,281 establishments relocated to another employment area (2.5% of the average stock over this period). Of all new plants, 58.6% were created in an employment area with above-median diversity (as measured by the inverse of a Herfindal index of local employment shares of different sectors). Those numbers confirm that most creations take place in diversified cities. Regarding plant relocations, 93.9% of all relocations across employment areas departed from an employment area with above-median diversity. Two thirds of those went to locations with above-median specialisation. This implies that 61.6% of all relocations across employment areas both departed from an employment area with above-median diversity and arrived in an employment area with above-median specialisation.

3.3.4.4 Discussion

Duranton and Puga (1999) interpret the coexistence of diverse and specialised cities and conclude that the patterns of specialisation and diversity are purely random. Ellison and Glaeser (1997) show that this is highly unlikely: the distribution of economic activity in the US territory is too concentrated geographically at the level of most four-digit sectors for this to be the result of a random allocation. A second interpretation is that patterns of specialisation and diversification in cities reflect the spatial distribution of resources. Specialisation in cities is partly the result of economic interactions within a given sector (often called localisation economies), whereas diversity in cities is fostered by economic interactions across sectors (urbanisation economies).

Some cities specialise in innovating new ideas (which requires a diversified base as some of the theories reviewed suggest, and which the evidence appears to confirm), whereas other cities specialise in more standardised production (which, in turn, is better carried out in a more specialised environment). Urban systems may thus have an innate tendency to create this type of imbalance.

A major issue is the composition of economic activity in individual cities. From Duranton and Puga's (1999) review, they state that specialisation has both advantages and disadvantages. The advantages are less urban crowding and stronger localisation economies arising from the proximity of closely related producers. The disadvantages are less innovation and more exposure to risk as the fortunes of specific sectors and technologies rise or fall. There appears to be an overall need for both large and diversified cities and smaller and more specialised cities.

3.3.5 Spatial Evolution of Population and Industry in the United States.

Black and Henderson (1999a) tried to determine which geographic features of a city promote growth. They found that upward mobility is promoted by costal location, good climate and being in a region with high market potential.

Urbanisation externalities came from overall metropolitan area scale, diversity in manufacturing, and diversity within the high-tech or machinery sectors. Localisation economies relate to local own-industry scale. In the literature Glaeser *et al.* (1992) advocate Jacobs urbanisation economies, while Henderson *et al.* (1995) argue that localisation economies are relevant for all industries, and Jacobs ones just for high-tech industries. The results based on Henderson (1998) are the first known attempt to understand dynamic and static externalities from plant productivity data using panel-data methods.

3.3.5.1 Description of data

Black and Henderson (1999a) used plant level data from the US Census of Manufacturers for 1972, 1977, 1982, 1987 and 1992 to establish determinants of plant output. Measured inputs are plant inputs of labour, materials, and capital, as well as externalities from the local industrial environment. Panel-data methods are used to control for plant (entrepreneur) and city or country (production amenities) fixed effects.

3.3.5.2 The index

According to Black and Henderson (1999a), the extent of agglomeration is measured by primacy and by a normalised Hirschman-Herfindahl or Ellison and Glaeser (1997) index of concentration. The concentration index is another measure of the extent of agglomeration. It is the sum of the metropolitan areas squared, divided by deviations of each metropolitan area's share of national own-industry employment from its share of total national manufacturing employment. With perfect deconcentration, the index is zero. Its highest possible value approaches two. Given that deviations are squared, the index tends to be dominated by the two or three largest employer cities. Over time, the index increases in high-tech industries and declines in capital goods industries. One question concerns whether changes in agglomeration are related to changes to the degree of scale economies. The index of concentration for industry i in time t is

$$g_i(t) = \sum_{j=1}^{n} \left(\frac{E_{ij}(t)}{E_i(t)} - \frac{E_j(t)}{E_n(t)} \right)^2 \tag{46}$$

Where E_{ij} is industry i employment in the city j, E_i is national employment in industry i and $E_j and E_n$ are total manufacturing employment in city j and nationally.

3.3.5.3 Discussion

The results presented by Black and Henderson (1999a), suggest that the most important finding concerns localisation and MAR economies for high-tech industries. Such economies exist. They relate to two measures depending on the industry: the number of plants within the own country and the number of births of new firms in the metropolitan area (own and any other metropolitan-area counties).

Based on their empirical results, Black and Henderson (1999a) found that in cities other than those agglomerated, employment has spread out and they believe that it could be that declining transport costs and costs of upstream and downstream linkages have weakened the no scale benefits of agglomeration. Black and Henderson (1999a) also

found that mobility rates are higher for high-tech industries than for capital goods industries, even though agglomeration is greater in high-tech industries.

Black and Henderson (1999a) believe that the US relative size distribution of cities displays remarkable stability over time, with stationary transition processes. There was a modest tendency towards upper-end concentration, as the US oriented towards service activities, which are best produced in metropolitan areas. Over time, with the entry of new cities, existing cities tend to move up the size distribution quickly, with very little downward mobility of the largest metropolitan areas. Upward mobility is promoted by costal location, good climate and being in a region with high market potential.

Black and Henderson (1999a) found that, in terms of industries, individual industries with the greatest degree of scale externalities are the most agglomerated. Neither scale economies nor the extent of agglomeration discourage relative industry mobility. Individual industry mobility seems to be constrained by inter-industry linkages. High-tech industries are subject to localisation and MAR dynamic externalities, while standard machinery industries experience no externalities.

3.3.6) The Location of European Industry

Midelfart-Knarvik *et al.* (2000) conducted an empirical study on the degree of specialisation, concentration and agglomeration for the existing European Countries. Midelfart-Knarvik *et al.* (2000) focused specifically on industries and asked: how is the location of different industries evolving and which industries are becoming more or less spatially concentrated, and where are they concentrated?

3.3.6.1 Description of Data

The study analyses production data from 14 European countries and 36 industries from 1970-1997. The main data source is the OECD STAN. Production data for Ireland was added from the UNIDO database.

3.3.6.2 The indices

Midelfart-Knarvik *et al.* (2000) began by considering a key question - how specialised are EU countries? Their approach was to construct a measure that allowed them to compare each country's industrial structure with that of the average of the rest of the EU.

Midelfart-Knarvik *et al.* (2000) used the Krugman Specialisation index to measure specialisation. For each country, they calculated the share of industry k in that country's total manufacturing output (gross production value). In addition to this, they calculated the $v_i^k(t)$ share of the same industry in the production of all other countries. They then measure $\bar{v}_i^k(t)$ the difference between the industrial structure of country i and all other countries by taking the absolute values of the difference between these shares, summed over all the industries,

$$k_i(t) = \sum_k abs\left(v_i^k(t) - \bar{v}_i^k(t)\right) \tag{47}$$

$$\bar{v}_i^k(t) \equiv \sum_{j \neq i} x_i^k(t) / \sum_k \sum_{j \neq i} x_i^k(t) \tag{48}$$

In the Krugman specialisation index, or K-spec (47), the result takes zero value if country i has an industrial structure identical to the rest of the EU, and has a maximum value of two if it has no industries in common with the rest of the EU.

The Krugman specialisation index is just one measure of specialisation. There are alternative indices, such as the Gini coefficient. The Gini coefficient is defined over the relative share measures, $r_i^k(t)$

$$r_i^k(t) \equiv v_i^k(t) / \bar{v}_i^k(t) \tag{49}$$

On the concentration side, Midelfart-Knarvik *et al.* (2000) used the Gini coefficient of concentration (the Gini coefficient of the variable $s_i^k(t)$ for k = all manufacturing) to measure the degree of concentration. If all countries have the same

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amount of manufacturing, this measure is zero; if all manufacturing is in a single economy it would take value of unity. According to this measure by Midelfart-knarvik *et al.* (2000), there has been a small decrease in concentration of the overall manufacturing sector in the EU.

3.3.6.3 The Results

Midelfart-Knarvik *et al.* (2000) found that most European countries showed significant convergence of their industrial structure during the 1970s, but this trend was reversed in the early 1980s. There has been substantial divergence from the early 1980s onwards, as countries have become increasingly different from the average of the rest of the EU.

One of the most dramatic changes in industry structure has been the expansion of relatively high-technology and high-skill industries. The specialisation process has occurred more generally, with nearly all countries showing increasing difference from the early 1980s onwards.

A number of industries that were initially spatially dispersed have become more concentrated. These are mainly slow growing and unskilled labour intensive industries, whose relative contraction has been accompanied by spatial concentration, usually in peripheral low-wage economies. Amongst industries that were initially spatially concentrated, around half remained concentrated. Significant dispersion has occurred in a number of medium-technology and high-technology industries and in relatively high growth sectors, with activity typically spreading out from the central European countries.

Midelfart-Knarvik *et al.* (2000) showed that a high proportion of the cross-country variation in industrial structure could be explained by a combination of factor cost and geographical considerations. Some of the more important results are that location of industries with strong forward and backward linkages has become increasingly sensitive to the centrality or peripherality of countries. Therefore, central locations are increasingly attracting industries higher up the value added chain. Midelfart-Knarvik *et al.* (2000) also discovered that industries having a high degree of increasing

returns to scale tend to locate in central regions, but this effect has diminished over the period. Midelfart-Knarvik *et al.* (2000) stated that while the industrial structures of EU countries are diverging, those of US states are converging. Midelfart-Knarvik *et al.* (2000) found that EU industries are still less concentrated than those in the US.

Midelfart-Knarvik *et al.* (2000) discovered that there was a fall in concentration between 1970/73 and 1980/83, indicating that locations became more similar. But from 1980/83 onwards there has been a more or less steady increase, indicating divergence. Turning to individual countries, evidence shows that from 1970/73 to 1980/83 10 out of 14 countries became less specialised, while between 1980/83 and 1994/97, all countries except the Netherlands experienced an increase in specialisation.

Like the K-spec index, the Gini coefficient of specialisation indicates a general decline in specialisation from 1970/73 to 1980/83 that is followed by an increase in specialisation from 1980/83 to 1994/97. The most important point to note is that, from 1980/83 onwards, there has been a large increase in the variance of relative shares, once again indicating greater dispersion. The distribution is positively skewed and this increased over time, as would be expected if a process of clustering or extreme specialisation were taking place.

The concentration results presented by Midelfart-Knarvik *et al.* (2000) show that the majority of industries experienced decreasing concentration during the 1970s and early 1980s followed by a majority showing increasing concentration in the later 1980s. During the 1990s, the performance is more evenly balanced, although a majority became slightly less concentrated. The combination of both increased specialisation and constant or declining concentration is not necessarily a contradiction; the two trends can be reconciled as the EU member states are not equally sized, and neither are the industries. Increasing average specialisation from the early 1980s reflects the experience of (almost) all countries. But the experience of industries is much more mixed, and attempts to produce an average measure of concentration correspondingly less useful.

3.3.6.4 Discussion

Midelfart-Knarvik *et al.* (2000) concluded; it appears that they appear to have a fairly robust finding of decreasing specialisation in the 1970s. The results for exports and imports suggest that their results for production data would most likely carry over to a more disaggregated classification. From 1980 on, the data present a more mixed picture, with growing specialisation in production patterns not being reflected in changing patterns of trade. Although it was possible that the disaggregate production structure is becoming more similar even while the aggregate production structure diverges, it is more likely that the trade results do not accurately reflect underlying changing production patterns.

Midelfart-Knarvik *et al.* (2000) concluded that industries became somewhat more dispersed until the late 1980s, although there is some evidence of a reversal of this trend. The total picture masks substantial changes in the location of individual industries. Dividing industries into groups according to their concentration, results show that of those industries that were initially concentrated, a group — largely consisting of high returns to scale industries — have remained concentrated; others, including some relatively high-tech, high-skill, fast growing industries, have become more dispersed. Of those industries that were initially dispersed, the slower growing and less-skilled labour intensive ones have become concentrated in low-wage and low-skill abundant economies.

At the EU wide level, specialisation according to comparative advantage and the forces identified by new economic geography, are beneficial. That is, specialisation driven by these forces increases aggregate welfare. The results of Midelfart-Knarvik *et al.* (2000) suggest that comparative advantage and new economic geography forces are becoming increasingly significant in explaining location patterns of industries. It seems clear from the analysis of the Midelfart-Knarvik *et al.* (2000) paper that, from the early 1980s onwards, the industrial structures of EU economies have become more dissimilar. This is as would be predicted by trade theory (old and new) during a period of economic integration. What are the main features of this process of divergence?

From the results presented, Midelfart-Knarvik *et al.* (2000) believed that dispersion is driven by a combination of forces. Some industries are becoming more

geographically concentrated, others more dispersed. This fact alone tells us that there is no single process driving all industries in the same direction. This is surprising, since trade theory (old and new) generally predicts that falling trade barriers should make all industries become more geographically concentrated.

3.3.7 Agglomeration Economies in the Finnish Manufacturing Sector

Mukkala (2004) provides useful information on the role of geographical concentration and agglomeration economies in regional development. The analysis performed on specialisation and diversity economies makes it possible to evaluate whether a policy favouring a few large growth centres (diversity economies dominate) is more desirable than a policy supporting many small-scale specialised regions.

Regional concentration of population and economic activity is a common phenomenon in most developed countries, which refers to the existence of agglomeration economies. Two types of economies are usually recognised to be important: specialisation (MAR externalities) and diversity (Jacobs externalities) economies. MAR externalities refer to the geographical concentration of a specific industry and Jacobs externalities to the industrial diversity of the local system, as was explained in section (2.3.2.1). Mukkala's (2004) study examines the relationship between agglomeration economies and regional productivity in the manufacturing sector in Finland. The results support regional specialisation rather than diversification as a driver of local growth, even if some differences can be seen between the manufacturing sub-sectors.

3.3.7.1 Description of data

Mukkala's (2004) analysis is based on regional rather than firm-level data. The data covers the manufacturing sector in the 83 mainland sub-regions (NUTS 4-level) of Finland from 1995-1999. The model is estimated separately for three sub-sectors of manufacturing: (1) manufacture of food, beverages and tobacco; (2) manufacture of wood, paper and pulp, printing and publishing; and (3) manufacture of basic metal, metal products (including machinery), electrical products and transport equipment.

3.3.7.2 The index

The degree of urbanisation is measured by the proportion of the population within the region living in urban settlements. If the index value exceeds unity, it indicates that a given region is more specialised in a given sector than on the average in the country, and, alternatively, if the value is below unity, the importance of the sub-sector is weaker in the region than nationally.

Mukkala (2004) assumed that the higher the population in the region, the more diversified the economic structure of that region. In Mukkala's (2004) analysis, the regional level of urbanisation is measured by the share of the population living in built-up areas (URB). The level of specialisation is analysed by the regional location quotient (LOC). The quotient is based on the share of employment of the different sub-sectors in the regions relative to that sector's share of national employment. It is simple to compute:

$$LOC_{ij} = \frac{emp_{ij} / emp_j}{emp_{ic} / emp_c} \tag{50}$$

Where emp_{ij} is employment in manufacturing sector i in region j, emp_j is total employment in region j, emp_{ic} is national employment in sector i, and emp_c is total employment in Finland. If the value of the index exceeds unity, it indicates that the region is more specialised in a given sector than on the average in the country, and, alternatively, if the value is below unity, the sector is less represented in the region than nationally.

All the variables are calculated regionally for each of the sub-sectors. The location quotient is subsequently used in the regression analysis of the determinants of regional economic performance. Regional labour productivity (LPROD) is used as a dependent variable. It is measured by dividing the annual value added in a given region and sector (at 1995 prices) by the number of employees.

The independent variables include the capital-labour ratio (LRATIO), number of employees (LEMP) and the variables that measure the impact of localisation and urbanisation. The capital-labour ratio is calculated by dividing the capital stock of a given

region and sector (at 1995 prices) by the number of employees. The capital-labour ratio and the number of employees describe the situation of the year under examination. The capital stock is calculated as a gross value and balance figures are used as a basis instead of investment accumulation data. Dividing the basic production function by the number of employees and taking their natural logarithms forms the following estimation model:

$$LPROD\ y = constant + \alpha 1 \ * \ LRATIO_{ij}$$

$$+ (\alpha_1 + \alpha_2 - 1) * LEMP_{ij} + \alpha_3 * URB_j + \alpha_4 * LOC_{ij} + \varepsilon \qquad (51)$$

The coefficient $(\alpha_1 + \alpha_2 - 1)$ measures the deviation of the elasticity of scale $(\alpha_1 + \alpha_2)$ from constant returns. If one or other (or both) coefficients of the agglomeration variables (α_3, α_4) is positive and statistically significant, it means that productivity is higher in the regions where the urbanisation (diversity) and/or the localisation (specialisation) level is high (Mukkala, 2004).

3.3.7.3 Discussion

The results from Mukkala (2004) differ for the three sub-sectors studied but, as a whole, they support the notion that regional specialisation rather than diversification determines the productivity in a region. According to Mukkala (2004) the existence of localisation economies is an encouraging result for small regions that do not have the resources either to extend their economic activity or to diversify their production structure. Mukkala (2004) believes that a highly specialised region is heavily dependent on the success of the given sector; such regions can be very sensitive to national or global economic fluctuations. In addition, strong reliance on a given sector can prevent the creation of new economic activity in the region. It could be concluded that what is beneficial to firms is not always of benefit to the region as a whole. However, there is also some evidence of negative effects. These findings are in line with those of Henderson (1988) who also found that localisation economies dominate in the manufacturing sector.

3.4 Conclusions of empirical work

As seen in section (3.4), the most popular indices used to measure concentration are those of a normalized Hirschman-Herfindahl or Ellison and Glaeser (1997) index. Ellison and Glaeser's (1997) index measures the specialisation of a city in an industry in terms of the employment in the industry in the city relative to the share of the employment in the industry nationally. Ellison and Glaeser (1997) found that many industries are only slightly concentrated, and some of the most extreme cases of concentration are likely due to natural advantages.

From the conclusion above about specialisation and diversification of regions and cities, city authorities should follow some form of policy to promote economic growth via the cities. However, certain cities can only reach certain sizes before the city as a whole becomes ineffective and unbeneficial for growth.

3.5 Summary and Conclusion

There are many pros and cons as to whether certain cities should follow routes of either specialisation or diversity for growth and development. There is no conclusive evidence to suggest a certain type of structure that should be promoted in order to promote economic growth. To conclude this chapter, it may be useful to summarise the two approaches; specialisation and diversity; along with concentration measures, sizes of cities and the estimation of the economic specialisation and diversity of cities.

Specialisation was supported by arguments that favour MAR and Porter externalities whereby specialisation of a city is more beneficial for growth. However, the former believed that local monopoly encourages spillovers and the latter supported the idea that local competition encourages spillovers.

Duranton and Puga (1999) were not conclusive in stating whether they supported economic specialisation or diversity for growth. They simply believe there will always be a need for large diversified cities and for more specialised cities, but this does not imply that one type of city is economically more desirable than the other. Midelfart-Knarvik *et*

al. (2000) found that industries having a high degree of increasing returns to scale tend to locate in central regions in the EU, but this trend has diminished over time.

Glaeser *et al.* (1992) fully support diversity for growth. Glaeser *et al.* (1992) disagree with the views of MAR externalities. They agree with the notion of Jacobs externalities with regard to diversity, and that local competition encourages growth.

However, certain cities can only reach certain sizes before the city becomes ineffective and unbeneficial for growth. According to Henderson (1974), equilibrium sizes are determined by location or investment decisions of labourers and capital owners, each attempting to maximise their own welfare. Every city will have a different optimum size due to the size of the population and the size and types of industries that occur within the city. The most important point is that cities should grow to promote economic growth but not grow bigger than the optimal city size. Black and Henderson (1999a) stated that the optimum city size is found by maximising the welfare of participants in the economy.

Indices that measure concentration are used to measure the extent of agglomeration within a certain area or, in the case of this study, the extent of agglomeration within a city. The results determine whether a certain area or city has a larger than average concentration of a certain industry or it could tell whether the industry is the same and is similar to or is average in comparison to the rest of the cities specialising in that industry. Ellison and Glaeser (1997) found that many industries are only slightly concentrated, and some of the most extreme cases of concentration are likely due to natural advantages. Black and Henderson (1999a) suggest that the most important finding concerns the existence of localisation and MAR economies for high-tech industries. High-tech industries are subject to localisation and MAR dynamic externalities, while standard machinery industries experience no externalities.

Mukkala (2004) presents the empirical analysis that shall be used in this study to determine whether South African cities should be more specialised or diverse. The analysis performed on specialisation and diversity economies makes it possible to evaluate whether a policy favouring only a few large growth centres (diversity economies dominate) is more desirable than the policy supporting many small-scale specialised regions.

The results from Mukkala (2004) clearly show support for regional specialisation more than diversification as a driver of growth. According to Mukkala (2004) the existence of localisation economies is an encouraging result for small regions that do not have the resources either to extend their economic activity or to diversify their production structure. Mukkala (2004) believes a highly specialised region is heavily dependent on the success of the given sector; such regions can be very sensitive to national or global economic fluctuations. Strong reliance on a given sector can prevent the creation of new economic activity in the region. It could be concluded that what is beneficial to firms is not always of benefit to the region as a whole.

Each country and city has its own identity. This study's empirical analysis of South African cities will be presented in Chapter 4.

Chapter 4

Empirical analysis of specialisation and diversity of South African Cities

4.1) Introduction

The previous chapter, focused on empirical literature emphasising the importance of externalities, spillovers, concentration, and city size together with the roles these factors played in agglomeration. In Chapter 4, this study will determine whether South African cities should follow diversity or specialisation of local economies to promote economic growth.

Spatial development and local economic development issues concerning cities are currently receiving much attention in South Africa. In a recent article in the Business Day by Bernstein and McCarthy (2005), the importance of cities as well as smaller towns is stressed in terms of aiding economic growth. It is not surprising that South Africa needs much higher economic growth rates to meet the needs of the more than 30% of the population that is unemployed. Growth also has to be more widely dispersed, beyond the major metropolitan areas and a few tourism-driven coastal areas. Bernstein and McCarthy (2005) argue that the localities that grow, do so due to natural resources, technology, lifestyles that attract entrepreneurs, and effective local governance.

This chapter emphasises the condition and current state of South Africa as a spatial economy. In section 4.2; there is an extensive discussion of the history, geography, and economy of South Africa to illustrate the country's current situation and policies. The South African Cities Network, an institution established to promote cities in the country and to serve as a link between cities, is also discussed in this chapter, illustrating its role as well as its success stories.

The empirical analysis of South African cities is presented in Chapter 4 and can be broken down into two parts. The first section calculates a location quotient, which was formulated by Mukkala (2004); as mentioned in section (3.3.7). The location quotient indicates whether a certain area is more specialised in a particular industry compared to

the rest of the magisterial districts in South Africa. Once the location quotient has been calculated, the quotient will be used as a variable in the regression analysis of the determinants of sub-national economic growth.

4.2) South African Cities

Section (4.2) discusses the history of the country and how the country with emphasis placed on geography as well as the economy. Past and current conditions of South Africa are discussed as well as their importance relating to the study of the specialisation and diversity of South African cities.

4.2.1) Geography

South Africa is on the Southern tip of the African continent. South Africa is bordered by the Atlantic Ocean on the west and by the Indian Ocean on the south and east. The neighbouring countries are Namibia in the north-west, Zimbabwe and Botswana in the north, and Mozambique and Swaziland in the north-east. The kingdom of Lesotho is enclosed within the eastern part of South Africa.

South Africa is divided into nine provinces, the Western Cape, Eastern Cape, Northern Cape, North West, Free State, KwaZulu-Natal, Gauteng, Limpopo, and Mpumalanga. Prior to 1994 when South Africa became democratic, there were four provinces: Cape Province, Natal, Orange Free State, and Transvaal. During apartheid rule, approximately 13% of the country's land area was set aside for blacks in independent territories to allow them self-government and cultural maintenance. These homelands were used to give the white government greater control and to exclude blacks from the political process. Gazankulu, Kangwane, KwaNdebele, KwaZulu, Lebowa, and QwaQwa were national homelands that existed under South African sovereignty. Transkei, the first homeland (1963), Bophuthatswana, Ciskei, and Venda were all granted "independence" by the early 1980s and existed as republics, although none were recognised internationally. With the end of white minority rule in 1994, the homelands were abolished.

According to Stats SA (2004), South Africa has a population of approximately 47,279,837 (growth rate: –0.3 per cent), a birth rate of 18.5 per 1000, a mortality rate of 61.8 per 1000, a life expectancy of 43.3 years and a literacy rate of 86%. South Africa's administrative capital is Pretoria, its legislative capital is Cape Town and its judicial capital is Bloemfontein. The population (47,279,837) of South Africa is 75% black (African), 13% white (European), with 9% people of mixed white and black descent known as "Coloured" and 3% of Asian (mostly Indian) background. These ethnic divisions were rigidly enforced under the policy of apartheid.

4.2.2) Economy

According to a secondary source Fact Monster (2004) states that until about 1870, the economy of the region was almost entirely based on agriculture. With the discovery of diamonds and gold in the late 19th century, mining became the foundation for rapid economic development. In the 20th century, the country's economy was diversified, so that by 1945 manufacturing was the leading contributor to the gross national product (GNP). By the 1990s, services contributed almost 60% of the GNP, while industry contributed over 35% and agriculture only about 4%.

Fact monster (2004) states that South Africa has a two-tiered economy; one resembling other developed countries and the other with only the most basic infrastructure (i.e. Third World). It is therefore a productive and industrialised economy that exhibits many characteristics associated with developing countries, including a division of labour between formal and informal sectors, and uneven distribution of wealth and income. The main industrial centres are Johannesburg, Cape Town, Port Elizabeth, Durban, Pretoria, and the East Rand (Ekurhuleni). The principal manufactures include processed food, beverages (including wine), textiles, clothing, forest products, chemicals, iron and steel, metal products, machinery, and motor vehicles. South Africa is a world leader in the production of gold, diamonds, aluminosilicates, chromium, manganese, vanadium, and platinum.

The country has good road and rail networks. The chief seaports are Durban, Cape Town, Port Elizabeth, East London, Saldanha Bay, Richards Bay and Mossel Bay,

where natural gas is now extracted offshore. The Orange River Project, a major hydroelectric and irrigation scheme began in 1963 in central South Africa and was fully operational by the mid1980s.

According to Fact Monster (2004) South Africa's' main imports are machinery, transport equipment, consumer goods, chemicals, petroleum and petroleum products, industrial raw materials, and foodstuffs. The chief exports are manufactured goods, precious metals, chemicals, arms, foodstuffs, and diamonds. The principal trade partners are Germany, the US, Great Britain, and Japan. South Africa carries on a large-scale foreign trade and generally maintains a favourable trade balance. It is a member of the Southern African Development Community. South Africa is the dominant member of the local Southern African Customs Union (with Botswana, Lesotho, Namibia and Swaziland); it has also joined the Southern African Development Community and the Organization of African Unity.

Disapproval of apartheid policies and increasing social unrest in the 1970s and 80s led to the withdrawal of investments by some members of the international business community. A number of nations (EU members, Japan, and the US) imposed sanctions on South Africa, banning new investment and selected South African exports. These trends were reversed with the political changes of the 1990s. Tourism began to make a comeback, and now contributes significantly to the economy. Some advanced technological industries have also emerged in recent years. In the service sector, both financial services and tourism have expanded rapidly and both are now mainstays of the South African economy.

Fact Monster (2004) states that the transition to a democratic, non-racial government, begun in early 1990, stimulated a debate on the direction of economic policies to achieve sustained economic growth while addressing the socio-economic disparities caused by apartheid. The Government of National Unity's initial plan to address economic growth and inequality was the Reconstruction and Development Program (RDP). The RDP was designed to create programmes to improve the standard of living for the majority of the population by providing housing, basic services, education, and health care.

The government of South Africa demonstrated its commitment to open markets, privatisation, and a favourable investment climate with its establishment of the Growth, Employment and Redistribution programme (GEAR), which had mixed results. It brought greater financial discipline and macroeconomic stability, but has failed to succeed in some areas.

Formal employment continued to decline, and despite the ongoing efforts towards black empowerment and signs of a black middle class and social mobility, the country's wealth remains unequally distributed along racial lines, (Gini=0.77). South Africa's budget reforms, such as the Medium-Term Expenditure Framework and the Public Finance Management Act, have created transparency and predictability and are widely celebrated. Trade liberalisation has progressed substantially since the early 1990s. The Government has since designed a scheme under which major economic assets will be transferred to 'black empowerment entities' over a 10-year period (Quarterly Economic Review, 09/2005).

According to the Quarterly Economic Review (updated 22/09/2005) issued by the South African Reserve Bank, the economy performed somewhat sluggishly in the past, but was expected to pick up in 2005. Inflation is currently 4.2% (SARB, 2005), and the annual economic growth a moderate 3.5%. Few inroads have been made into the high level of unemployment, officially at 26%. Perhaps the greatest long-term problem, considering its potential impact on the workforce, is the very high level of HIV/AIDS infection in the country.

4.2.2.1) Trade and Investment

According to Traveldocs (2004), South Africa has rich mineral resources. It is the world's largest producer and exporter of gold and platinum and exports a significant amount of coal. During 2000, platinum overtook gold as South Africa's largest foreign exchange earner. The value-added processing of minerals to produce ferroalloys, stainless steels, and similar products is a major industry and an important growth area. The country's diverse manufacturing industry is a world leader in several specialised sectors, including railway rolling stock, synthetic fuels, and mining equipment and machinery.

Primary agriculture accounts for about 4% of the gross domestic product. Major crops include citrus and deciduous fruits, corn, wheat, sugarcane, tobacco and wine. South Africa has many developed irrigation schemes and is a net exporter of food.

South Africa's transport infrastructure is well developed, supporting both domestic and regional needs. Johannesburg International Airport serves as a hub for flights to other southern African countries. The domestic telecommunications infrastructure provides modern and efficient service. In 1997, Telkom, the South African telecommunications provider, was partially privatised and entered into a strategic equity partnership with a consortium of two companies, including SBC, a US telecommunications company. The government is presently evaluating a proposal to establish a second network operator to compete with Telkom. Three cellular companies, Vodacom, MTN and CellC, provide service to over 9 million subscribers.

South Africa's GDP is expected to increase gradually during the next few years, and the government recently revised its 2005 estimated growth upward to 4.3%. Annual GDP growth between 1994 and 2004 averaged 3.0%. In 2003, real GDP growth slowed to a rate of 2.8%, but increased to 3.7% in 2004 (traveldocs.com). The government estimates that the economy must achieve growth at a minimum of 6% to offset unemployment, which is estimated at 26%.

South Africa is a member of the World Trade Organization (WTO). US products qualify for South Africa's most-favoured-nation tariff rates. South Africa eligible for benefits under the African Growth and Opportunity Act (AGOA), and most of its products can enter the US market duty free. South Africa has delimitated most import permits except on used products and products regulated by international treaties. South Africa remains committed to the simplification and continued reduction of tariffs within the WTO framework and maintains active discussions with that body and its major trading partners.

4.2.3) South African Cities Network

The South African Cites Network is a non-profit organisation established in October 2002 with multiple purposes. Among these are the promotion of good

governance of cities, the study and analysis of the challenges facing South African cities, and the promotion of a share-learning partnership between cities. The SACN is an established network of South African cities and partners that encourages the exchange of information, experience and best practices on urban development and city management. It was established as an initiative of the Minister for Provincial and Local Government and nine city municipalities, in partnership with the South African Local Government Association (SALGA). The SACN does not represent the cities, but is rather a knowledge-management and information body that works for their benefit. The cities contribute to SACN, with additional funding from government and foreign donors.

SACN analyses the strategic challenges facing South African cities, particularly in the context of global economic integration and national development. The SACN collects, analyses and applies the experience of large city government in a South African context. This Network promotes a shared-learning partnership between different spheres of government to support the governance of South African cities.

The activities of the SACN are disseminated to update leaders on current and emerging changes and trends in urban policy across the world and in South Africa. The SACN promotes innovation and strategic thinking between cities and other spheres of government. The SACN fosters cooperation and exchange of best practice and strengthens linkages between cities, towns and rural areas.

The SACN operates from within the context of developmental local government and integrated governance. It focuses on the full scope of the urban management process. This includes promoting sustainable cities, economic growth, poverty reduction, urban renewal, good governance, integrated land management, service delivery, and city development strategies. The SACN's focus areas are the City Development Strategy, Productive Cities Strategy, Inclusive Cities Strategy, Well Governed Cities and Sustainable Cities.

In 2004, the SACN published a report called the *State of the Cities Report*, which collates a range of indicators from the nine cities that are part of the network: Johannesburg, Cape Town, Buffalo City (greater East London), eThekwini (Durban),

Nelson Mandela (greater Port Elizabeth), Mangaung (greater Bloemfontein), Msunduzi (Pietermaritzburg), Ekurhuleni (the East Rand) and Tshwane (greater Pretoria).

The report does three things. It consolidates available data from many sources into a "statistical almanac" covering the nine SACN cities. First, it analyses key trends that affect the cities, and ways in which these trends are likely to evolve over time and the challenges and opportunities that will arise. Second, the report assesses how city stakeholders are responding to change, and acknowledges the important efforts that city leaders and decision makers are already making. Third, the report speculates on how various trends may unfold, and what the likely medium to longer-term outcome of these trends may be. Through this, the report hopes to set an agenda for further research, planning, and action necessary for strategic planning.

The State of the Cities Report highlighted some demographic features. The size of cities grew rapidly after apartheid ended, with population growth of around 4,4% during the period 1991 to 2001. Growth has slowed considerably in the 1996 to 2001 period. Not all the nine SACN cities are growing at the same rate. Four of the cities are growing at a rate of 1,4% annually, while some cities are growing at a extremely fast rate of 8 % per year, and others are depopulating at a rate of 3% per year. Current growth trends can be explained by migration. Surprisingly, permanent migration to the cities has been relatively small, balanced by migration from urban to rural areas. At the same time, city-to-city migration is increasing.

According to the 2004 State of the Cities Report (2003), the impact of HIV/Aids on urban centres is not yet noticeable, although cities may be worse affected if late stage Aids drives migrants back to rural areas to seek family care and more dignified deaths. The fertility of women between the ages of 25 and 34 years may be affected by Aids.

The State of the Cities Report also cited economic challenges facing cities and rural areas. Unemployment rates vary between cities but, while the average unemployment rate in the nine cities is 3,31% below the national average, some cities reflect unemployment rates far higher than most rural areas.

The State of the Cities Report (SACN 2004) shows a surprising 8,3% decline in employment amongst professionals between 1996 and 2001, possibly driven by

emigration. A lack of skills is becoming "chronic". In 2001, only 26,9% of the residents of the nine cities had matriculated and only 11,9% had any form of tertiary education.

A negative conclusion of the report is that the nine SACN cities are more unequal today that they were ten years ago. A positive finding is that more households are receiving "an acceptable level of service" than they did ten years ago. This is often not noticeable because of migration to the cities. For example, the number of households using electricity for lighting increased by 928 368 between 1996 and 2001, but at the same time of the number of households increased over that period.

The State of the Cities Report outlines a number of challenges for South African cities: Cities with fast-growing populations will have to manage those people by assimilating new residents, providing services, and managing informal settlements. Although local authorities can't influence economic fundamentals, they can direct the nature of responsiveness of city services, prioritise city infrastructure, and lead economic development partnerships.

Cities need bold, practical interventions in which each stakeholder is prepared to think outside the box of their traditional powers and functions, and work collectively to accomplish agreed city strategies. Andrew Boraine, chairperson of the SACN, wishes national, provincial, and local governments would work together more closely. Boraine believes that South Africa's poverty reduction programmes are far too fragmented and that integrated approaches are needed for public transport and for skills development.

Against the background set out in section (4.2), discussing the current state of affairs in South Africa, it is obvious that South Africa has the correct measures, policies, infrastructure and people in place to govern the country in such a way that South Africa will become an important part of the world's economy. However, cities (urban system) should be used to promote and accelerate the growth of the country in order to benefit not only the people living in the cities but to 's raise the economic standard of living and lifestyle of the rest of the country. Cities should be used as a driving force within the country to strengthen the country as well as the economy.

4.2.4) The Urban system

The main point made in section 4.2.4 is the importance of South African cities for economic growth, not only the largest and most powerful ones but the smaller and lesser-known towns and districts all of which are contributing to the South African economy in their unique way.

South Africa has eight cities with population densities greater than 400 persons per square kilometre. These cities are shown in table 4.1 below.

Table 4.1: SA Cities with Population Density > 400 persons per km²

CITY	Population 2004	Population Density 2004	Population 1996
City of Johannesburg	884,478	1,088.35	815,119
Ethekwini	650,878	2,447.18	602,174
City of Cape Town	212,094	1,088.35	193,874
Msunduzi	682,031	624.33	601,831
Ekurhuleni	456,233	1,961.52	384,098
Tshwane	825,868	762.06	756,592
Emfuleni	606,954	700.08	504,698
Nelson Mandela	899,932	650.61	809,884
TOTALS	5,218,468	9,322.48	4,163,572

[Source of data: REF (Global Insight) 2005]

All the cities listed in table 4.1, with the exception of Emfuleni are part of the SACN, discussed in section (4.2.3). Six of the eight cities presented in table 4.1 fall under, and are controlled by, a metropolitan council, again with the exception of Emfuleni and Msundizi. In these eight metropolitans, there are approximately 15 million people residing in the cities collectively, making up about 40% of the country's population.

Johannesburg, Tshwane, Msunduzi, Ethekwini and Nelson Mandela have the largest populations. The validity of the data for the population of the City of Cape Town's is questionable. Note that in the case of Cape Town in table 4.1 does not include suburbs within the city that are governed by a magisterial council. The table shows that there are instances when population, absolute size, and population density differ: Nelson

Mandela Metropolitan (Port Elizabeth) has the largest population, but its density (650 persons per km^2) is lower than that of Emfuleni whose population is lower.

According to Naudé and Krugell (2003b), approximately 98% of the volume of South Africa's exports is conveyed by sea. Three of the largest cities in South Africa are port cities, through which much of South Africa's international trade moves, those cities being Nelson Mandela Metro, Cape Town, and Durban (eThekwini). Cape Town is close to the port of Saldanha and Durban is close to the port of Richards Bay. These ports are crucial in the exporting of steel and coal respectively. Distances to harbours and airports, and the cost of transport, can be significant obstacles to growing the urban economy outside of these six large cities. Naudé and Krugell (2003) believe that South Africa's port cities, together with towns and cities in close proximity to international ports, will experience the fastest economic growth in future.

According to Naudé and Krugell (2003b), there are another eleven "metropolitan cities" in the making that would probably see high population growth, as well as economic growth, in the future. Many of these eleven cities also function as important regional government and rural service nodes. The most important are Mangaung (Bloemfontein), Mogale City (on the West Rand), Rustenburg (on the N4 route to Pretoria), Richards Bay (Umhlathuzi), The Vaal Triangle (Emfuleni), Sasolburg, Buffalo City (East London) with its Coega Industrial Development Zone (IDZ), the combined cities of Potchefstroom and Klerksdorp, Kimberly, Polokwane and Nelspruit (on the N4 Maputo Development Corridor). To Naude and Krugell (2003), these urban areas stand out in terms of population density, economic contribution, strategic location, economic function, and as a destination for rural-urban migration.

Naudé and Krugell (2003b) found that there are, therefore, 19 cities and towns that form the economic backbone of the South African economy, contributing 70% of South Africa's GDP and containing over 20% of its population. They are also the first choice candidates for the location of additional urban renewal and growth nodes aimed at fast-tracking urban economic growth in South Africa.

Naudé and Krugell (2003b) believe there are a number of secondary cities in South Africa that fulfil an important role as either location for government services, or in

servicing a rural area. Examples include Mafikeng, Newcastle, Upington, Musina, Ulundi, and George. These places face significant challenges in economic development, as many of their economies have been contracting over the past few years. Few have the inherent potential to sustain and grow employment-intensive manufacturing or tourism whilst, at the same time, their informal urban populations have increased significantly.

Naudé and Krugell (2003b) found that in many of the smaller rural towns, especially in KwaZulu-Natal, Eastern Province, and parts of Limpopo Province as well as some of the secondary cities in South Africa (e.g. Newcastle), the boundaries between urban and rural are increasingly being blurred by rural-densification. It is estimated that rural densification is taking place on a much larger scale than urban concentration. Naudé and Krugell (2003b) believe this poses a fundamental challenge to many smaller municipalities and secondary cities in South Africa along whose perimeters this rural densification is taking place, since the population in rural dense areas is not a traditional rural population as is usually understood, and may not be demographically stable.

Against this background, it is clear that South African cities and towns can and must play a leading role in addressing the challenges of economic growth, unemployment, poverty, and inequality in South Africa. There are numerous ways of examining this possible role. This study focuses on the importance of spatial complementarities and the following section asks whether cities and towns should be more specialised or more diversified.

4.3) Empirical Analysis

The empirical analysis can be broken down into two parts; the calculation of the location quotients and the regression analysis. The calculation of the location quotient follows the study of Mukkala (2004), where a measure was described to calculate whether a certain magisterial district or city is more specialised in a certain sector than the rest of the magisterial districts in South Africa. Once these location quotients have been calculated, the results can be put into the regression analysis as an explanatory variable in order to determine whether specialisation in manufacturing is a significant determinant of economic growth at sub-national level.

4.3.1) Location Quotients

Analysis of spatial complementarities and the extent of the specialisation and diversity of South Africa's cities is somewhat limited by the availability of data. A lack of data on employment and plants at sub-national level precludes approaches such as those of Ellison and Glaeser (1997) or Black and Henderson (1999). Specifically, only limited sectoral disaggregation is possible. This study therefore follows the approach of Mukkala (2004), who calculates a regional location quotient for Finland.

The location quotient is related to the approach followed by Ellison and Glaeser (1997), and is based on the share of employment of the different sub-sectors in regions, relative to those sectors' share of national employment.

$$LOC = \frac{emp_{ij}/emp_j}{emp_{ic}/emp_c}$$
(52)

Where emp_{ij} is employment in manufacturing sector i in region j, emp_j is total employment in region j, emp_{ic} is national employment in sector i and emp_c is total employment. If the value of the index exceeds unity, it indicates that the region is more specialised in a given sector than the national average and if the value is less than unity, the sector is less represented in the region than it is nationally.

This location quotient was calculated for South Africa using data from Global Insight's Regional Economic Focus (REF). Employment in manufacturing in 354 magisterial districts was used along with total employment in the districts, manufacturing employment at the national level, and total employment at the national level. Some of the results are presented in table 4.2.

Table 4.2:   Location quotient and city statistics

City	Population 04	Urbanisation Rate	Total Employment	Location Quotient (04)
Johannesburg	884,478	98.4%	909,190	1.02
Cape Town	212,094	99.8%	335,874	1.36
Port Elizabeth	899,932	87.1%	246,964	1.71

Durban	650,878	100.0%	572,127	1.68
Botshabelo	205,645	100.0%	22,791	2.00
Goodwood	367,564	100.0%	117,987	2.20
Malmesbury	131,095	75.4%	41,051	2.01
Temba	375,687	12.3%	39,166	2.29
Kliprivier	231,640	63.1%	36,090	2.15
Newcastle	363,466	80.5%	67,094	2.05
Eshowe	252,930	16.5%	28,846	2.58
Highveld Ridge	193,823	90.6%	66,269	2.00
Waterval Boven	11,154	77.1%	4,536	2.06
Uitenhage	225,604	91.9%	39,372	2.25
Vanderbijlpark	606,954	94.8%	87,568	2.47

As illustrated in the table above, the results are mixed. The cities that were expected to be significant, such as Johannesburg, Cape Town, Port Elizabeth and Durban are all present; however they touched just above unity for their location quotients. The surprise here is from little-known entities that few would have expected. Eshowe in KwaZulu-Natal has the largest location quotient, i.e. concentration in employment in manufacturing. All the unknowns ranging from Botshabelo to Temba have reached a quotient of 2 at some period from 1996 to 2004.

Cities such as Pretoria, Bloemfontein and Rustenburg do not have much concentration of employment in manufacturing and do not show up in the table. Ekurhuleni, also known as the East Rand, comprises a number of urban settlements such as Alberton, Benoni, Boksburg, Germiston, Kempton Park, Brakpan, Nigel and Springs. All these settlements had significant figures greater than unity. Others show up as something of a surprise.

Botshabelo is a town in the Free State Province only 60 km from the provincial capital, Bloemfontein. Botshabelo is the single largest monument to apartheid planning in the region, and owes its existence to apartheid subsidies exceeding R80 million per annum in 1996. According to the REF statistics, the most prominent sectors, represented in terms of gross value added (GVA), are textiles, clothing and leather goods, and retail trade and repair of goods.

Table 4.2 shows two interesting localities in the Western Cape, that of Goodwood and Malmesbury. Malmesbury is known for its wine farms and, unsurprisingly, has significant GVA in agriculture. Goodwood, on the other hand, is within the City of Cape Town's limits. Grand West Casino is located near to or within Goodwood, but most significant value added statistics come from the fuel, petroleum, chemical and rubber products, food, beverages, and tobacco products sectors.

There are a number of localities in KwaZulu-Natal in the table, including Kliprivier, Newcastle, and Eshowe. Newcastle shows significant GVA in the manufacturing of metal products. There is also coal mining in the area. Eshowe's manufacturing lies most prominently in metal products as well as fuel, petroleum, and chemical and rubber products, while Kliprivier also shows significant value added in fuel, petroleum, and chemical and rubber products, while textiles, clothing and leather goods come a close second.

Some surprises show up in the province of Mpumalanga - those of Highveld Ridge and Waterval Boven. Highveld Ridge comprises Secunda, eMbalenhle, Trichard, Kinross, Evander and Leande. Sasol has profit centres located in Secunda, thus gross value added is specifically in fuel, petroleum, chemical and rubber products, as well as in mining of coal. The mining of gold is also prominent in Evander and Leande. Highveld Ridges' location quotient has dropped below 2 in recent times, but had a location quotient above 2 for the majority of the period, this being the reason that Highveld Ridge was included in this section. Waterval Boven is known as a tourist destination in Mpumalanga. Nevertheless, GVA statistics show the importance of coal mining as well as wood and wood products in the area.

Other areas that show significant concentration of employment in manufacturing are Temba in the North West Province, Vanderbijlpark in Gauteng and Uitenhage in the Eastern Cape. Temba borders the North West province and Northern Province and is located close to the Carousel Casino and Entertainment World. In terms of gross value added, the fuel, petroleum, chemical and rubber products, as well as the metal products sector, make large contributions to the local economy. Vanderbijlpark is located in the Vaal area in Gauteng and specialises in the extraction and processing of metals.

ISKOR/Mittal Steel comes to mind, specialising in the processing of metal and is located within this magisterial district. Uitenhage shows significant figures in transport equipment and specialises in the production of motor vehicles. Volkswagen motors is located in this magisterial district and contributes significantly.

These results show that there are a number of places (66 altogether) that are currently marked by a concentration in employment in manufacturing and may be said to be offering localisation economies for growth and development. These places present a varied profile. They are both large and small, and marked by high and low levels of urbanisation with diverse economic and social profiles. Not all the places that have high location quotients have been fast growers, nor are all the fast growers specialised in manufacturing. A number of questions remain as to the specialisation and diversity of South Africa's cities and the importance of this for growth and development.

4.3.1.1) Concentrated vs. Non-concentrated Magisterial Districts

This section draws a comparison between the magisterial districts that are concentrated and those magisterial districts that are not concentrated, and examines their economic growth performances. The data used were sourced from Global Insight's Regional Economic Focus. The location results from 1996 and 2004 were used to determine whether magisterial districts have become more specialised or more diverse in the manufacturing sector over the period. The growth rate is that of the average growth for the period 1996-2004, which is presented in table 4.3 as "growth". A total of 354 districts were considered, and these were ranked according to the rate at which the magisterial district grew over the period 1996-2004. The fastest growing magisterial district was given the Ranking of 1st and the slowest or last-placed magisterial district was ranked 354th (ascending order). Table 4.3 contains a list of all the magisterial districts having a location quotient greater than unity for the years 1996-2004.

Table 4.3: Concentrated Magisterial Districts

City	Prov	Manufacturing Location 96	Manufacturing Location 2004	Growth	Rank
Wonderboom	GAU	1.44	1.54	3.6%	29
Johannesburg	GAU	1.03	1.03	3.6%	32
Alberton	GAU	1.69	1.78	3.9%	22
Benoni	GAU	1.17	1.17	2.7%	59
Boksburg	GAU	1.32	1.40	4.7%	13
Germiston	GAU	1.94	1.89	1.6%	137
Kempton Park	GAU	1.58	1.69	4.6%	14
Brakpan	GAU	1.17	1.28	3.7%	26
Nigel	GAU	1.63	1.75	4.4%	18
Springs	GAU	1.60	1.69	3.0%	51
Krugersdorp	GAU	1.27	1.28	1.9%	111
Roodepoort	GAU	1.04	1.12	3.7%	27
Vereeniging	GAU	1.25	1.15	2.2%	87
Vanderbijlpark	GAU	2.55	2.47	0.9%	199
Botshabelo	OFS	2.06	1.97	2.0%	108
Sasolburg	OFS	1.66	1.91	4.0%	20
Temba	NWP	2.08	2.29	3.0%	49
Durban	KZN	1.69	1.68	3.3%	37
Inanda	KZN	1.50	1.50	2.8%	55
Pinetown	KZN	1.67	1.80	3.8%	25
Chatsworth	KZN	1.21	1.26	3.2%	43
Camperdown	KZN	1.76	1.73	1.3%	159
Pietermaritzburg	KZN	1.15	1.05	1.7%	130
Umzinto	KZN	1.19	1.21	0.2%	264
Alfred	KZN	1.04	1.18	1.1%	176
Kranskop	KZN	1.10	1.01	0.3%	251
New Hanover	KZN	1.36	1.68	1.7%	131
Estcourt	KZN	1.40	1.15	-1.7%	335
Kliprivier	KZN	2.00	2.15	1.4%	154
Newcastle	KZN	1.96	2.06	2.5%	67
Eshowe	KZN	2.32	2.59	1.8%	121
Lower Umfolozi	KZN	1.10	1.23	7.1%	3
Mthonjaneni	KZN	1.12	1.15	-0.7%	311
Mtunzini	KZN	1.14	0.96	-2.2%	344
Lower Tugela	KZN	1.20	1.34	1.4%	146
Bellville	WC	1.57	1.37	1.7%	127
Goodwood	WC	2.22	2.20	3.0%	52
Cape	WC	1.50	1.37	2.1%	97
Wynberg	WC	1.22	1.03	1.4%	150

Kuilsrivier	WC	1.55	1.20	-0.7%	308
Paarl	WC	1.44	1.35	1.6%	134
Stellenbosch	WC	1.11	1.06	2.6%	60
Strand	WC	1.01	0.80	0.1%	271
Wellington	WC	1.06	1.19	4.7%	11
George	WC	0.99	1.10	5.5%	7
Knysna	WC	0.90	1.08	5.3%	8
Mosselbay	WC	1.20	1.41	3.9%	23
Montagu	WC	1.08	1.24	3.9%	21
Malmesbury	WC	2.02	2.01	1.4%	147
Vredenburg	WC	1.77	1.99	3.8%	24
Piet Retief	MPU	0.99	1.03	-0.1%	281
Highveld Ridge	MPU	1.32	1.86	3.6%	35
Waterval Boven	MPU	1.22	2.07	3.6%	33
Witbank	MPU	1.30	1.10	1.9%	110
Barberton	MPU	0.88	1.20	1.3%	156
Nelspruit	MPU	0.87	1.00	3.6%	30
Pelgrimsrus	MPU	0.67	0.91	1.2%	175
KwaMhlanga	MPU	1.63	1.78	3.0%	47
East London	EC	1.55	1.41	0.7%	217
King Williams Town	EC	1.22	1.17	2.4%	70
Port Elizabeth	EC	1.74	1.72	3.1%	46
Uitenhage	EC	2.21	2.25	2.5%	64
Mdantsane	EC	1.27	1.18	1.6%	136
Zwelitsha	EC	1.73	1.88	2.3%	75
Butterworth	EC	1.43	1.25	1.3%	158
Lusikisiki	EC	0.92	1.09	1.1%	178

From the evidence presented in table 4.3, the province of KwaZulu-Natal has the greatest number of concentrated magisterial districts, followed by the Western Cape and Gauteng. Not all the magisterial districts that were expected to show up in the table were present. For example, Pretoria, was a fast grower over the period, but it has a diverse economy. Some little-known entities proved to be particularly specialised in the manufacturing sector at sub-national level, such as KwaMhlanga. In order to determine whether specialised or diverse magisterial districts grow faster, this information, together with their respective growth rates and location quotients would have to be taken into consideration.

4.3.1.1.1) Fastest Growers but Non-concentrated Magisterial Districts

A total of 288 out of 354 magisterial districts appeared to have a location quotient below unity, thus suggesting that they are less concentrated in the manufacturing sector.

Table 4.4: Best Performing Non-concentrated Magisterial Districts

City	Province	Location 96	Location 04	Growth Rate	Rank
Phalabora	LIMP	0.24	0.11	8.2%	1
Volksrust	MPU	0.23	0.31	8.0%	2
Randburg	GAU	0.80	0.83	6.7%	4
Warmbad	LIMP	0.26	0.36	6.4%	5
Rustenburg	NWP	0.42	0.56	6.1%	6
Waterberg	LIMP	0.35	0.53	4.9%	9
Pretoria	GAU	0.76	0.76	4.8%	10
Sekhukhuneland	LIMP	0.13	0.08	4.7%	12
Tulbagh	WC	0.63	0.89	4.5%	15
Cullinan	GAU	0.63	0.63	4.4%	16

Based on chapter 2, it would seem that that the more concentrated magisterial districts would be those benefiting from MAR and Porter externalities, and would subsequently be growing faster than those not concentrated. The evidence, however, suggests that in the South African case Jacobs (1969) could be correct in supporting diversity to promote economic growth. Phalabora for example has a location quotient of 0.11 for the period 1996-2004, but this was the fastest growing magisterial district over the same period. This could be an indication that diversification should be preferred to specialisation in order to promote economic growth?

The magisterial districts not concentrated in manufacturing contained 7 of the top 10 fastest growers and 12 of the top 20 fastest growers. The non-concentrated magisterial districts lost out in the rankings from top 20-40 where the concentrated magisterial districts caught up and the numbers were eventually equal in the top 50 fastest growing magisterial districts at 25 districts apiece. The lowest placed non-concentrated Magisterial District is Dannhauser in the province of KwaZulu-Natal. Dannhauser had a growth rate of -7.7% for the period 1996-2004 and a location quotient of 0.48 for the year 2004.

4.3.1.1.2) Fastest Growing and Concentrated Magisterial Districts

A total of 66 out of 354 magisterial districts have a location quotient greater than unity, thus suggesting that they are more concentrated in manufacturing than the average magisterial district.

Table 4.5: Fastest Growing and Concentrated Magisterial Districts.

City	Province	Location 96	Location 04	Growth Rate	Rank
Lower Umfolozi	KZN	1.1	1.23	7.1%	3
George	WC	0.99	1.1	5.5%	7
Knysna	WC	0.9	1.08	5.3%	8
Wellington	WC	1.06	1.19	4.7%	11
Boksburg	GAU	1.32	1.4	4.7%	13
Kempton Park	GAU	1.58	1.69	4.6%	14
Nigel	GAU	1.63	1.75	4.4%	18
Sasolburg	OFS	1.66	1.91	4.0%	20
Montagu	WC	1.08	1.24	3.9%	21
Alberton	GAU	1.69	1.78	3.9%	22

Table 4.5 shows that the fastest growers are not necessarily those magisterial districts that are more concentrated than the average for the rest of the country's magisterial districts.

Only 3 of the top 10 fastest growers were concentrated magisterial districts. Lower Umfolozi, had the highest ranking of 3rd, George was ranked 7th and Knysna was ranked 8th .The concentrated magisterial districts made up 8 of the top 20 fastest growers, including those districts in the top 10. The lowest-ranked concentrated Magisterial district is Mtunzini in KwaZulu-Natal Province, being ranked 344th and having a growth rate of -2.2% , over the period 1996-2004, with a location quotient of 0.96 for the year 2004. As in the case of Highveld Ridge, Mtunzini was included because, for the majority of the period, it had a location quotient greater than unity and this has subsequently decreased

From the results of the location quotients that have been calculated, a magisterial district does not have to specialise in a certain industry to grow more quickly than the average magisterial district in the country. There is a strong indication that magisterial districts that are not concentrated (more diverse) grow more quickly than those

magisterial districts that are concentrated (more specialised). However, no conclusion can be drawn from the evidence presented by location quotients alone. There could be other factors than concentration influencing the growth of a magisterial district. The next section presents a growth regression and the regression results determine whether specialisation of the manufacturing industry is a significant determinant of economic growth at sub-national level.

4.3.2) Regression Analysis

In this section the main objective was to test for the determinants of sub-national economic growth, including the location quotient. This gives an indication of the importance for growth of the specialisation of magisterial districts in manufacturing. In the regression analysis, two models were run, the random effects model and a dynamic one-step model.

4.3.2.1) Estimating equation

The analysis follows Naudé and Krugell's (2005) work on the determination of the sub-national growth rates in South Africa. The vector of determinants of local economic growth rates includes (following growth theory and the empirical literature) measures of physical capital, human capital, resource endowment, the openness of the local economy, agglomeration and geography. The equation presented in the Random Effects model can be illustrated as follows:

$$gva\_growthY = \alpha_1 + \alpha_2 initial\_gva + \alpha_3 education + \alpha_4 capital\_stock + \alpha_5 resources$$
$$+ \alpha_6 export\_share + \alpha_7 dis\_market + \alpha_8 dis\_port + \alpha_9 ra\inf all + \alpha_{10} location + \varepsilon \tag{53}$$

GVA growth was taken as the dependent variable and measures economic growth within a locality. Some of the independent variables were initial GVA, education, capital stock, resources, export share, and rainfall. These were included as measures of the determinants of growth within a magisterial district. Independent variables relating to distance were also included. The distance to the main market is illustrated in the regression as "Distance to Johannesburg" and the distance to the closest port was

included in the regression as "Distance to Durban". The data is sourced from Global Insight's Regional Economic Focus for the years 1998-2002.

The "new" or "endogenous" growth theory emphasises the importance of economies of scale, agglomeration effects, and knowledge spillovers as determinants of economic growth and convergence (Button, 1998). This theory suggests that economic growth tends to be faster in countries (but also localities) that have a relatively large stock of capital, a highly educated population, and an economic environment favourable to the accumulation of knowledge.

A locality's resource endowment may also be a determinant of its steady-state level of income and in this case, mineral endowments are used. This endowment is proxied by the number of workers in the mining sector relative to the total workforce. A negative coefficient is expected.

As for the openness of the local economy, the export share is measured by the value of exports as a proportion of GVA. A large literature exists on the benefits of openness for growth and a positive coefficient is expected.

The inclusion of measures of agglomeration and geography, such as the location quotient and rainfall respectively, draws on explanations of growth that emphasise market size, spillovers, and imperfect competition. Henderson (2000:2) points out that a high degree of urban concentration is essential for a country to kick-start industrial development. In the analysis, measures of distance are used to capture the effects of the forces of agglomeration and geography in growth. A location quotient was calculated in section (4.3.1), which measures the level of concentration of manufacturing in the magisterial district compared to the average of the rest of the country for that specific industry. The distance measures include the distance from the nearest port and the distance from Johannesburg. Greater distance from markets and harbours are considered detrimental to growth through agglomeration, and a negative coefficient is expected. Finally, rainfall serves as a further measure of geography. A positive coefficient is expected. Two regression models were run, the Random Effects model and the Dynamic model, to illustrate the time path of the dependent variable, GVA growth, in relation to its past values.

4.3.2.2) Estimation results

Table 4.6: GLS Random Effects Regression Results

Gva growth	Coefficient.	Standard. Error	z	P>|z|	[95% Conf. Interval]	
Initial gva	.0097282	.0058337	1.67	0.095	-.0017055	.021162
Education	.0008404	.0032116	0.26	0.794	-.0054541	.007135
Capital stock	-.0015471	.0009719	-1.59	0.111	-.0034521	.0003578
Resources	-.0004123	.0020293	-0.20	0.839	-.0043896	.003565
Export share	.0017954	.0014447	1.24	0.214	-.0010361	.0046269
Distance jhb	-.001215	.0032461	-0.37	0.708	-.0075772	.0051472
Distance dbn	-.000436	.0051228	-0.09	0.932	-.0104765	.0096045
Rainfall	-.0018455	.007237	-0.26	0.799	-.0160299	.0123388
Ln location	.0025651	.0058743	0.44	0.662	-.0089484	.0140786
_cons	-.0400922	.0731573	-0.55	0.584	-.1834779	.1032935
R^2 within: 0.0002			R^2 between: 0.1003		R^2 overall: 0.0422	
Number of observations: 461			Number of groups: 104			

The results from table 4.6 (the random effects regression) show no significant variables at a 5% level of confidence. The capital stock is insignificant, and enters with a negative sign. This could be explained with reference to Glaeser *et al.* (1992), who argued that localities follow the fortunes of the industries to which they were initially exposed. This view is linked to a vintage capital model where areas that invest in older types of capital do not replace the capital as it becomes outdated. This may be because existing capital presents a sunken investment, and cannot be reinvested. As the capital becomes more out of date, the marginal product of labour, wage rate, and income fall, and thus a negative coefficient is possible. There is no evidence of these variables affecting economic growth and the overall R^2 shows that the regression equation explains only 4% of the variation of GVA growth rates.

The table above indicates that location, education, resources, export share, distance from the nearest port, and distance from Johannesburg all have the expected sign. Although education, resources and distance to port all seem to have the expected sign and are insignificant, their respective coefficients have relatively small values.

Rainfall and capital stock, did not correspond with the expected signs. Rainfall is used as a measure to control for a suitable climate (geography), suggesting that if a magisterial district had a favourable climate, it would grow faster. Rainfall has resulted in a negative coefficient. The coefficient is not significant and can therefore be disregarded. The location quotient, which measures concentration, has the expected sign, but is insignificant. This might imply that a magisterial district with above average concentration in the manufacturing sector grows no faster than that of a magisterial district which is not concentrated in the manufacturing industry.

The dynamic model was run consider the change over time of the dependent variable (GVA growth). In the dynamic model, export share and density were included as exogenous variables. The regression differentiated the variables rainfall, location, and initial GVA. The rate of change of the location quotient was then considered. The model used a one-period time lag on the dependent variable, GVA growth. Export share, density, and initial GVA were dropped in the dynamic model due to collinearity. With the GVA growth being lagged, it can be presented as follows

$$gva\_growth_t - gva\_growth_{t-1} = gva\_growthLD \qquad (54)$$

Thus the equation for the dynamic model is as follows:

$$gva\_growth_t = \alpha_1 + \alpha_2 gva\_growthLD + \alpha_3 ra\inf all + \alpha_4 location$$
$$+ \alpha_5 dis\_market + \alpha_6 dis\_port + \alpha_7 initial\_gva + \alpha_8 education + \alpha_9 capital\_stock$$
$$+ \alpha_{10} resources + \varepsilon$$

$$(55)$$

The results of the regression are presented in table 4.7

Table 4.7: One-step GMM Regression Results - Arellano-Bond dynamic panel-data estimation

D. gva growth	Coefficient.	Standard. Error	z	P>|z|	[95% Conf. Interval]
Gva growth LD.	.1053105	.0740456	1.42	0.155	-.0398162 .2504373
Rainfall D1.	.0280708	.00968	2.90	0.004	.0090983 .0470433
Ln location D1.	.0238272	.0195874	1.22	0.224	-.0145635 .0622179
Initial gva D1.	(dropped)				
Distance jhb	-.0097638	.0024303	-4.02	0.000	-.014527 -.0050006
Distance dbn	-.0030851	.0034563	-0.89	0.372	-.0098593 .0036892
Initial gva	-.007341	.0041285	-1.78	0.075	-.0154326 .0007507
Education	-.0006807	.0021145	-0.32	0.748	-.0048251 .0034637
Capital stock	.0017213	.000632	2.72	0.006	.0004826 .00296
resources	-.0012763	.0013405	-0.95	0.341	-.0039037 .001351
_cons	.1404681	.031995	4.39	0.000	.077759 .2031771
Arellano-Bond Test for second order autocorrelation	p-value = 0.9731				
Sargan test of over-identifying restrictions:	chi2(5) = 42.83 Prob > chi2 = 0.0000				
Wald χ^2 (10)	54.17				
Number of observations: 306	Number of groups: 114				

The dynamic model provides better results than the static Random Effects model. Coefficients of all the variables except that of education correspond with their expected signs. Education differs from the Random Effects model, where the coefficient corresponded with the expected positive sign and has now changed to a negative sign, suggesting an effect opposite to that expected. Rainfall, distance to Johannesburg (to the main market), and capital stock (at 10%), are shown to be significant and thus to be determinants of GVA growth. Although the distance to the port, as well as resources, seem to correspond with their expected signs, they are insignificant at a confidence level of 5%, and the coefficients are small.

The location quotient calculated in section (4.3.1) was added into the dynamic regression equation and once again proved insignificant in contributing towards GVA growth (or, in simple terms, economic growth). This may suggest, like the Random Effects model, that the concentration or specialisation of an industry does not cause faster growth within a magisterial district. It may be beneficial to the economy that a magisterial district is not specialised in a certain industry.

4.4) Conclusion

South Africa has a large number of challenges relating to low economic growth, unemployment, and inequality. The importance of cities has been emphasised in recent times and ways in which these cities could contribute towards a more sustainable economy. South Africa has a large number of obstacles to economic growth. South Africa needs higher growth rates, which should be more evenly spread across the country in order to address these issues. There should be a greater focus, not just on the larger cities, but on smaller towns and metropolitan areas.

In this chapter, the empirical analysis was broken down into two sections; the calculation of the location quotient and the regression analysis. The calculation of the location quotient was based on Mukkala (2004), where the location quotient determines whether a certain magisterial district was more specialised in a particular industry. There were 66 out of 354 magisterial districts in South Africa that seemed to have a location quotient greater than unity, thus indicating that these magisterial districts were more specialised or concentrated in manufacturing. From the evidence presented in section (4.3.1.1), the fastest growing magisterial districts in the country were the magisterial districts which are not concentrated in a certain industry; or rather the more diverse magisterial districts. As this study states in section (4.3.1.2), there could be many more variables affecting the growth of a magisterial district.

In the regression analysis, this study ran a Random Effects as well as a dynamic model. A large number of variables were entered into the model, including the location quotient mentioned above. In the Random Effects model; where GVA growth was the

dependent variable; no variables were significant, including the location quotient. Although there were variables that corresponded with their expected signs; the variables included in the regression only explained 4% of the growth in GVA.

The dynamic model seemed to produce a better range of results. Variables such as distance to the market, rainfall, and capital stock were all significant. The rainfall variable indicates a favourable climate, indicating that a favourable climate in a particular magisterial district contributes to GVA growth. All the variables except that of education corresponded with their expected signs. The location quotient once again proved to be insignificant, indicating that the specialisation of an industry in a specific magisterial district does not cause the district to grow faster or, for that matter, contribute towards economic growth as significantly as expected.

When considering the results of the location quotients and the regression models, in both cases the location quotient seems unable to explain economic growth. The fastest growing magisterial districts seemed to be those that were not concentrated. Diverse magisterial districts grew more quickly than the specialised magisterial districts. Based on the results, it seems that specialisation does not contribute towards sub-national economic growth in South Africa and does not cause the magisterial district to grow faster than those that are not concentrated or specialised in a certain industry.

Chapter 5

Conclusion and Recommendations

The main objective of the study was to determine whether South African Cities should be more specialised in an industry, or whether they should be more diversified in order to promote economic growth. Cities seem to be the driving force in most economies across the world. Why should South Africa be any different? In recently published articles not just on the importance of cities, but also of smaller towns and urban areas have been argued. The growth and importance of these South African magisterial districts would have to be widespread in order to reach all parts of the country and to act as points of service and delivery. A large burden is being carried by these magisterial districts in attempting to promote economic growth. In South Africa, economic activity tends to lump together and this has implications for the country. The challenges that face the country are factors such as low growth, poverty and inequality.

Chapter 2 presented the theoretical analysis and there were a number of important discussions concerning the formation of agglomerations. The most important being the roles played by transport costs, labour mobility, geography, and economies of scale. If transport costs were high, most industries would locate themselves as close as possible to the market. Firms would like to be as close as possible to the location with the highest demand, which would be the city centre. Being close to the market or city centre would increase the land rent. The importance of this can be seen in the regression model where the distance to Johannesburg was used as an independent variable and proved to be significant in contributing towards economic growth.

Labourers move more easily between regions than between countries for obvious reasons. When considering the spatial wage structure, migration from poor to rich countries encourages agglomeration. Labourers move between regions and cities in order to obtain higher real wages. Higher wages are usually offered in metropolitan areas, thus causing more labourers to flock towards the cities and therefore encourage agglomeration.

Economies of scale; specifically external economies of scale; is the most important factor which gives rise to agglomeration. Being located within the same region and with the existence of external economies; spillovers lead to information and techniques relating to production being passed on from firm to firm without them having to pay for receiving the benefit. Firms would like to be located where spillovers are present, thus moving towards the agglomerations. Being located in a region where spillovers are present has a positive impact on growth.

The benefits of being located in a city are due to localisation economies and urbanisation economies. Localisation economies refer to the benefits a firm receives from being with other firms in the same industry. Urbanisation economies refer to the benefits of overall scale and diversity in cities. Apart from these "static" benefits, there are also dynamic benefits that grow over time due to knowledge sharing, learning, and innovation in a particular area. Cities are therefore important for economic growth because they provide the dynamic information spillovers that are important for innovation.

Jacobs, Marshall-Arrow-Romer, and Porter externalities are highlighted in Glaeser et al. (1992), where each of the types of externalities has its own implications regarding the growth of cities. Marshall-Arrow-Romer and Porter externalities imply that industry specialisation in a region would benefit from knowledge spillovers and such regions would therefore grow more quickly than those of diversified industries.

Jacobs externalities mean that industries that are located in areas that are diversified should grow more quickly. Glaeser et al. (1992) was unable to prove that specialisation or within-industry knowledge spillovers promote growth. Based on Glaeser et al.'s (1992) findings, there is no concrete evidence that all growth in cities will be spurred by spillovers and that cities must be more diverse to promote growth. There are many other externalities that influence city specialisation and the formation of cities other than those of knowledge spillovers and externalities. The transfer of information easier from person to person than over long distances. With current and improving technology, the flow of information can be passed easily between sender and receiver, thus ensuring accuracy. Duranton and Puga (1999) suggest the simplest way to measure a city's specialisation in a given sector is to quantify the share of this sector in local employment.

Duranton and Puga (1999) stated that there will always be a need for large diversified cities and for more specialised cities, but this does not imply that one type of city is economically more desirable than the other.

Henderson (1974) stated that equilibrium sizes are determined by location or investment decisions of labourers and capital owners, each attempting to maximise their own welfare. Every city will have a different optimum size due to the size of the population and the size and types of industries that occur within the city. Black and Henderson (1999a) stated that the optimum city size is found by maximising the welfare of participants in the economy. Cities can only reach certain sizes before they become ineffective and no longer beneficial for growth. These statements can be tied up with the Central Place theory discussed in section (2.2.2), where labourers move to a city to receive higher remuneration. With more people flocking to cities, more suburbs and villages are established. These new suburbs form new agglomerations of their own, and they, too, could present economies of scale between the suburbs. This could lead to increased congestion and the benefit of living in the city diminishes once the city has exceeded its optimum size.

Chapter 3 examined the concentration indices that are used to measure the extent of agglomeration within a certain area, in other words the extent of agglomeration within a city. Using concentration indices, Ellison and Glaeser (1997) found that many industries are only slightly concentrated, and some of the most extreme cases of concentration are likely due to natural advantages. Black and Henderson (1999a) suggest that the most important finding concerns localisation and MAR external economies for high-tech industries. High-tech industries are subject to localisation and MAR dynamic externalities, while standard machinery industries experience no externalities.

Mukkala (2004) presented an empirical analysis, which was used to determine whether cities should be more specialised or diversified. The results from Mukkala (2004) clearly show support for regional specialisation rather than diversification. According to Mukkala (2004), a highly specialised region is heavily dependent on the success of the given sector and such regions can be very sensitive to national or global economic fluctuations. Strong reliance on a given sector can prevent the creation of new

economic activity in the region. It could be concluded that what is beneficial to firms is not always of benefit to the region as a whole.

South Africa requires higher growth rates to combat the challenges facing the country. Cities, as well as smaller metropolitan places and towns need to be the driving force in the economy. The growth of magisterial districts needs to be widespread and sustainable so that everybody can access the benefits of economic growth.

In chapter 4, the study of the specialisation and diversity of South African cities took the location quotient formula and applied it to South Africa's magisterial districts is to determine whether these magisterial districts were more specialised than others in a given sector - the sector being the manufacturing sector. The empirical analysis was separated into two sections, the calculation of the location quotient and the regression analysis. The calculation of the location quotient was obtained from Mukkala (2004). Out of 354 magisterial districts, only 66 appeared to specialised in the manufacturing industry. The average economic growth over the period 1996-2004 was also taken into consideration. When comparing the concentrated (specialised) magisterial districts to the non-concentrated magisterial districts (diversified), the non-concentrated magisterial districts proved to be the fastest growing. Magisterial districts that have diverse economies seem to grow faster than magisterial districts that have activities concentrated in the manufacturing sector.

The regression analysis comprised a Random Effects model as well as a dynamic regression model. The location quotient was calculated for each magisterial district and entered into the regressions as a independent variable to test whether the quotients were significant determinants of local growth. GVA growth was the dependent variable. No variables proved significant in the Random Effects model regression, indicating that none of the variables contributed towards GVA growth, including that of the location quotient. In the Dynamic model regression, variables such as distance to the market, rainfall and capital stock seemed to be contributing to GVA growth. The rainfall variable indicates a favourable climate and infers that a favourable climate in a particular magisterial district contributes to GVA growth. Rainfall, distance to Johannesburg (to the main market), and capital stock (at the 10% level) are shown to be significant and thus to be determinants of

GVA growth. The location quotient proved to be insignificant, indicating that specialisation in the manufacturing industry in a magisterial district doesn't cause the district to grow faster or, for that matter, contribute towards economic growth as significantly as expected.

Large amounts of work remain to be done on the importance of economic specialisation and diversity of cites. If there should be further research done on the topic, there are some things to consider concerning the data. As mentioned in section (4.3.1.2), there could be many other variables affecting the growth of magisterial districts that were unaccounted for. When considering further research on this topic, firm-level survey data would facilitate analysis similar to that of Glaeser *et al.* (1992). The possibility of spatial autocorrelation should also be examined using spatial econometric techniques

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