MANUFACTURING EXPORTS AND TRANSPORT COSTS FROM SOUTH AFRICA'S SECONDARY CITIES

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Abstract

This study makes use of theoretical and empirical sources to examine the determinants of manufactured exports from secondary cities in South Africa. This study attempts to give policymakers a clearer understanding of the decisions made by manufacturers to locate in a specific region.

Drawing on the reasons that countries or regions export, as given in the literature, a number of factors were identified as possible determinants of exports. These determinants include: location of economic activity, distance, transport cost, and transport infrastructure. These factors have been accepted as some of the determinants of exports, but to what extent do they influence the export of manufactured goods from secondary cities in South Africa?

An analysis of the state of land freight transport and manufactured exports from South Africa gives an indication of how infrastructure development, distance, and location of economic activity influence manufactured exports. Since 1994, manufactured exports have become the largest export sector from South Africa and the majority of these exports are transported by road to the ports. Durban is the largest harbour for the export of manufactured goods from South Africa and receives the bulk of the manufactured exports from Gauteng. More than 80 per cent of manufactured exports from South Africa come from metropolitan areas. The relatively small percentage of manufactured exports from secondary cities indicates that there is a lack of support for firms to establish in those regions.

Using a cross-section analysis of the 22 secondary cities chosen, a series of regressions are modelled to determine the factors that influence manufactured exports from these regions. The empirical evidence suggests that cities with higher education levels and higher gross value added (GVA) are more successful in exporting manufactured goods. An evaluation of location (distance) and

transport cost found that distance and infrastructure affect the transport cost of manufactured exports from secondary cities.

Opsomming

Hierdie studie het van teoretiese en empiriese bronne gebruik gemaak om die faktore wat vervaardigde uitvoer van sekondêre stede in Suid Afrika bevorder te ondersoek. Deur die bogenoemde te bepaal kan beleid makers begryp waarom vervaardigers by sekere areas vestig.

In die literatuur word verskillende redes bespreek waarom lande en distrikte uitvoer. Vanuit die literatuur is die volgende faktore identifiseer wat uitvoer van lande en distrikte bepaal: ligging van ekonomiese aktiwiteit, afstand, vervoer koste en vervoer infrastruktuur. Al die bogenoemde faktore kan uitvoer bepaal, maar watter invloed het dit op vervaardigde uitvoer van sekondêre stede in Suid Afrika.

Die toestand van vrag vervoer in Suid Afrika en die ontwikkeling van vervaardigde uitvoer kan 'n aanduiding gee van hoe die land se infrastruktuur, afstand vanaf 'n hawe en die ligging van ekonomiese aktiwiteite vervaardigde uitvoer kan beïnvloed. Sedert 1994 is vervaardigde uitvoer die grootste uitvoer sektor van Suid Afrika en die meerderheid van die produkte word deur hawens uitgevoer. Durban is Suid Afrika se grootste en belangrikste vervaardigde uitvoer hawe en ontvang die meeste van die goedere van Gauteng. Meer as 80 per sent van vervaardigde uitvoer kom van metropolitaanse gebiede terwyl sekondêre stede se bydra nie noemenswaardig is nie.

Om te bepaal wat veroorsaak dat sekondêre stede vervaardigde produkte uitvoer, word 'n kruis-snit van 22 sekondêre stede gebruik en 'n aantal regressies gedoen. Die regressies dui aan watter faktore beïnvloed vervaardigde uitvoer van sekondêre stede in Suid Afrika. Die empiriese analise het aangedui dat stede met hoër onderwys en groter netto toegevoegde waarde (GVA) meer suksesvol is om uit te voer. 'n Evaluasie tussen ligging en vervoer koste het

gevind dat dit afstand en infrastruktuur beïnvloed vervoer koste van sekondêre stede in Suid Afrika.

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List of abbreviations

MSA	Moving South Africa
REF	Regional Economic Focus
GVA	Gross Value Added
H-O	Heckscher-Ohlin
GDP	Gross Domestic Product
DOT	Department of Transport
GATT	General Agreement on Tariffs and Trade
ITRISA	International Trade Institute of Southern Africa
RTQS	Road Transport Quality System
GVM	Gross Vehicle Mass
SARB	South African Reserve Bank
DPLG	Department of Provincial and Local Government
DPL	Poverty Datum Level

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Chapter 1

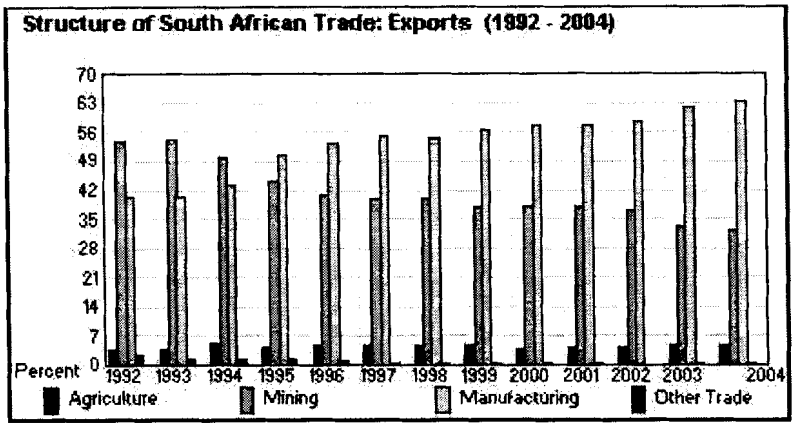
Introduction

1.1 Introduction

Since 1994, manufacturing has become the largest export sector from South Africa as shown in figure 1.1. Prior to 1994 mining exports were the highest. Since then, the share of manufactured exports to total exports increased each year and was at 63 per cent during 2004. In 10 years, from 1994 to 2004, manufactured exports grew by 23 percentage points and firmly established itself as South Africa's largest exporting sector.

For manufacturers to be able to export to international markets, they must be globally competitive. This means being able to ask lower prices for your product than other competitors, good management of the firm, high standards of logistics, and a fast and reliable supply chain. It is not only the manufacturer that competes globally, but the country as well. When firms start to export, the weaknesses in an economy become visible because it is the country that provides the platform from which firms compete in the world economy (Department of transport, 1998). This platform encompasses, in the broadest sense; human capital, policies, and infrastructure at locations from which firms export and compete in the world economy.

Figure 1.1 Structure of South African exports (1992-2004)



Source: South African Department of Trade and Industry, 2005

South Africa's remote location from the world markets adds an additional constraint to the international competitiveness of exporters. For example, Clark *et al*, (2004:3) found that, currently, the reduction of trade barriers reduces this cost to below that of the cost to transport goods. If manufacturers make an effort to minimise costs that can affect international competitiveness they will want to locate as close as possible to the market and the inputs required to manufacture a good. In terms of the spatial economy, this means that some cities will attract more manufacturers than others, due to better locations for reduced transport cost.

Models have been formulated indicating that distance between trading partners influences trade potential (Limao & Venables, 2000), and that infrastructure investment and transport cost affect trade (Bougheas *et al*, 1999). Along with these, other factors such as political, economical and environmental changes also have an effect on world trade patterns and the ability of regions to participate in world trade. Adam Smith noted how the environment can influence a country's ability to trade;

"As by means of water-carriage a more extensive market is opened to every sort of industry than what land-carriage alone can afford it, so it is upon the sea-coast, and along the banks of navigable rivers, that industry of every kind naturally begins to sub-divide and improve itself, and it is frequently not till a long time after that those improvements extend themselves to the inland part of the country" (Smith, 1937:18) '(SIC)'.

From the above, it can be noted that a location at the coast with international accessibility has growth and development advantages and that these advantages can only improve in the hinterland if infrastructure development takes place to increase the accessibility of regions located at the interior of a country.

Infrastructure in the interior of South Africa is well developed, which increases the accessibility to the global market of regions located in the hinterland. South Africa's interior is connected by road and rail to the coastal areas from where exports by sea are possible.

This chapter will specify the objective of this study, the motivation and problem statement surrounding transport cost in South Africa, and then the methodology and outline of the remaining chapters.

1.2 Problem statement

For exports to continue to make a significant contribution to economic growth and development in South Africa, researchers and policymakers need to consider the determinants of exports. A key determinant of manufactured exports is transport cost. Taking account of transport cost means taking into account the location of manufacturing exporters and the roles that geography and infrastructure play.

Specifically, this study aims to examine transport cost as a determinant of manufactured exports from secondary cities in South Africa.

1.3 Motivation

Trade is an essential part of the world economy and, as indicated by Limao and Venables (2000), the costs of trade are important determinants of a country's ability to participate in the world economy. In the case of South Africa, the country's participation in the world economy broadened significantly since the political transition in 1994. Manufactured exports from South Africa have increased by 9,2 per cent per annum between 1996 and 2000. Approximately 90 per cent of exports

are transported by sea (Naudé & Gries, 2004). This means that most manufacturing exporters first have to use road or rail transport to get the goods to the ports. The costs to transport these goods vary in respect of the type of good transported. The location of the manufacturer may thus be an important determinant of exports, as it will determine the distance to ports and the mode of transport that will be used.

The question of how distance and the associated transport costs determine the volume of trade, the patterns of trade, and industrial structure has already been asked by Venables and Limao (2002) and it is known that total transport cost increases if goods need to be transported to ports and harbours over longer distances. Gallup *et al*, (1999) and Radelet and Sachs (1998) also show that high transport costs can damage countries' export performance and economic growth. Gallup *et al*, (1999) points out that geographical advantage has changed over time as technology has changed. Technological changes in railways, motor vehicles, and air transport reduced the advantages of coastal development relative to the hinterland, but they state that a port city-based trade still has an advantage.

Along with technology, the other important aspect that can have an impact on transport cost is the policy that government implements. According to Busse (2003), government policies play a central role in improving the efficiency of international transport services. Radelet and Sachs (1998) show that not only does geography influence manufactured exports but government policies also have an impact on exports. Economic policy can influence geographic limitations of countries as stated by Gallup *et al*, (1999).

Firstly, competition between transport companies reduces the cost and improves the efficiency of the transport sector. Well-designed competition policies should help to reduce various forms of transaction costs (Busse, 2003). Secondly, Busse (2003) indicated that the level of infrastructure influences transport cost. Infrastructure

provides external benefits to users such as exporters. This enables them to ask a lower price for their products than their competitors[1].

In South Africa, the Department of Trade and Industry highlights that improved infrastructure may lead to higher trade and therefore to more exports from South Africa. Financial resources available for the improvement and sustainability of transport infrastructure are, however, limited. This is because money needs to be allocated between various departments that are all in need of funds for development. For this reason, some regions within South Africa will witness a reduction in the standard of infrastructure. To minimise the cost of exports, manufacturers locate as closely as possible to the market. This can lead to a concentration of manufacturers in an area. For example, the share of manufactured exports from smaller cities in South Africa is currently around 18 per cent of the total of manufactured exports (Global Insight, 2005). In order to increase the share of manufactured exports from these regions, improvements in various structures is needed and among these are transport infrastructure and policy set by government, specifically local government.

1.4 Objectives

The primary objective is to examine transport cost as a determinant of manufactured exports from secondary cities in South Africa. This may be achieved by researching a number of secondary objectives:

- Examining the literature on the importance of transport cost as a determinant of trade.
- Analysing South African exports and the state of land freight transport in South Africa.
- Presenting a profile of South Africa's secondary cities and the exports from those locations.
- Using regression analysis to determine whether transport cost is a significant determinant of exports from South Africa's secondary cities.

[1] Governments may also use subsidies and incentive schemes, but such export promotion falls outside the scope of this study.

1.5 Methodology and outline of this study

To achieve the above objectives requires a literature review, data, and empirical analysis. The literature review presents different theories of trade, focusing specifically on transport cost as a determinant of trade. It also extends to the South African economy and involves the characterisation of exports and land freight transport in South Africa. There is also an analysis of data to describe South Africa's secondary cities and exports from those locations. The data analysis is closely linked to the empirical analysis. This study follows Naudé and Gries' (2004) work on the determinants of sub-national exports, but focuses on the secondary cities and improved measures of transport cost.

1.6 Outline

The study can be outlined as follows:
Theories that describe trade between regions are not a new concept. Various models have been formulated to identify the reasons that trade takes place and the factors that influence the growth and development of trade. Chapter 2 begins by describing the trade theories that were developed to try to understand why places trade with each other. The neo-classical trade theory states that trade between regions depends on comparative advantage and factor endowments. In the 1980s, new trade theory developed and stated that it is not just comparative advantage and endowments that cause trade, but factors such as transport cost and greater variety of products. An overview of developments in geographical economics that are applicable to the study are also discussed, specifically the aspects of transport cost and infrastructure.

Chapter 3 provides an overview of the land freight transport system in South Africa, describing the importance of transport for the distribution of goods. South African transport history and developments during the late 1980s and early 1990s indicate why the land freight transport network needs greater investment. The government plays an important role in the land freight transport system by supplying resources to develop this system and by encouraging growth and development through the

introduction of good, reliable policies. Government must keep in mind that economic, political and environmental circumstances change over time, and this will influence land freight transport in South Africa. The developments in transport infrastructure have a long-term impact on an economy.

Exports from South Africa are described in chapter 4. The impact of the import-substitution policy and the sanctions on South African trade influenced exports from South Africa during the 1970s and 1980s. Since 1994, when the newly elected government came to power, the situation changed significantly. From 1994, manufactured exports became the most important export sector. Only 12 per cent of exports from South Africa go to other African countries (Figure 4.3). The remainder is exported beyond Africa. Durban harbour handles most of the manufactured exports and receives the bulk of the goods by road. The transport of manufactured exports from different locations to ports, and the cost associated with the transport of these goods led to the development of certain rail and road corridors for exports. The corridor with the highest usage is between Gauteng and Durban. Chapter 4 will give a concise overview of transport cost and manufactured exports from South Africa.

In chapter 5, South Africa's secondary cities and their share in manufactured exports will be discussed. The evaluation of cities as metropolitan areas and other areas will be mentioned and the profiles of the secondary cities will be discussed. The hypothesis stating that transport cost is greater from secondary cities than from metropolitan areas will then be analysed. Secondary cities and metropolitan areas are compared by; distance to Durban, rail transport cost and infrastructure development. Cities will be compared by calculating the rail cost per kilometre from the location to the destination.

An empirical analysis of the determinants of manufactured exports from secondary cities will also be carried out in chapter 5. The data that is used is for a cross-section of 22 secondary cities. Data for 2003 and 2004 are pooled together for the 22 cities to have 44 observations. A series of regressions is used to identify the best model that describes manufactured exports from secondary cities in South Africa. Data per city for manufactured exports, education, capital, population density, gross value

added (GVA) and rainfall will be used. The cost of transporting a 12m heavy container with manufactured products is used. Chapter 6 will conclude the dissertation.

Chapter 2

The theory of geographical economics

2.1 Introduction

In the literature, several reasons are given why certain countries export more than others. Brakman *et al*, (2003:245), for example, argue that international trade is undoubtedly largely determined by the spatial distribution of economic activity. The most appropriate way to describe trade between and within regions is to start with more traditional trade theory. There are two mainstream trade theories – the neo-classical trade theory and the new trade theory, which dates from the late 1970s. Neo-classical trade theories are based on comparative advantages (Ricardian model) and factor abundance influences (Heckscher-Ohlin model). Both of them describe why production is located at a specific location.

2.1.1 Neo-classical trade theory

According to the Ricardian model, technological differences between countries or regions determine trade. Each country or region specialises in a product in which they have a comparative advantage. This will lead to specific locations where production takes place. Countries will then trade with each other in the good that they produce. The level of technological advances made by a country therefore affects trade patterns, and this will influence the type and amount of goods exported (Brakman *et al*, 2003:40).

The Heckscher-Ohlin (H-O) model explains the influence of factor abundance in a region's trade pattern. The standard H-O model states that labour and capital as well as their productivity in a particular country or region will determine exports (Naudé & Gries, 2004). Distance is, for that reason, excluded and only factor endowments are important. Countries or regions only export goods and products in which they have sufficient factors of production with which they are richly endowed.

The H-O model is described by 2 goods, 2 countries and 2 factors of production, and is thus a 2 x 2 x 2 model. Say that the goods are clothing and machinery, with low-skilled labour used for clothing and high-skilled labour for machinery production. Suppose that a Northern country is endowed with high-skilled labour and a Southern country with low-skilled labour. Consumers in both countries have the same preference and consume the same goods. Without trade North will produce machinery easily and prices will be low. This is because of the highly skilled labour in that country, and South will find the production of machinery more difficult and more costly. When trade takes place between these countries the price of machinery and clothing will equalise. North will produce machinery and South will produce clothing because they each have a competitive advantage in doing so. The factor abundance model assumes; no transport cost, production with constant returns to scale, perfect competition and mobility of factors of production between regions. Trade flows are inter-industry (clothing for machinery). The location of factor endowments thus determines the location of production (Brakman *et al*, 2003:38).

Wood and Berge (1997) extended the standard H-O model to include skills and land. According to them, it would be better to examine the relationship between human capital (skills) and natural endowments (land) as a means of assessing a country's export performance. Their reason was that countries or regions differ in human resources and in availability of land and this might have an effect on the capability of a country or region to export manufactured goods. They found that if a country has a high ratio of skills to land it will export manufactured goods and if there is a low ratio of skills to land it will export primary goods. In regions where the skill/land ratio is high, more manufactured exports will take place in comparison to primary product exports.

In neo-classical trade theory, if there is no uneven distribution of resources and no comparative advantage there is no more incentive to trade (Brakman *et al*, 2003:41).

2.1.2 New trade theory

From the 1980s, new trade theory developed, which stated that trade does not depend on comparative advantage and factor endowments alone. The starting point of new trade theory is that a large part of trade takes place between countries with similar factor endowments (Brakman *et al*, 2003:42). The process of trade is much more complicated than assumed in the neo-classical trade theory and includes different aspects. According to Krugman (1980), consumers prefer to have a variety of the same good to choose from when they buy and consume. He calls this the 'love-of-variety' effect. This will lead to an increase in goods that can be substituted for one another. When there is trade between two countries or regions the greater variety of goods will lead to further trade between these countries or regions. Trade is intra-industry (machinery in exchange for machinery) and not inter-industry (clothing for machinery) as assumed by neo-classical trade theory. The love-of-variety effect and increasing returns to scale will lead to trade (Brakman *et al*, 2003:42). The increasing returns are related to the so-called home-market effect. Markets differ in size and demand, and for this reason countries will export the goods in which the home demand is relatively high. Firms are immobile and therefore produce the good for which there is a large demand at home while high production of these goods leads to high supply and thus exports of the good. Also, in the new trade theory, the goods that are traded between countries or regions incur transport cost (Brakman *et al*, 2003:45).

It is well known that economic activity is not evenly distributed across space and that industries at various locations are dependent on transport to move goods to the consumer. Trade theories emphasise trade between countries but the logic applies equally to regions, cities and towns and to make this link one has to also look at urban economics.

2.1.3 Urban economics

Within urban economics, the monocentric city model developed by Von Thünen explains how farmers locate themselves closer to cities to minimise transport cost. The closer they are to the city the higher is the land rent. This indicates a trade-off

between land rent and transport cost (Brakman *et al*, 2003:24). This model does not have economies of scale and assumes that there is no interaction between cities. In urban economics, the importance of increasing returns to scale became apparent and Henderson (1988) stated that there are positive economies of scale in the same industry. Industries locate in cities where other firms in the same industry are located (Brakman *et al*, 2003:29). Agglomeration forces are another influence on the location of production, which indicate that firms locate in areas where a particular industry is established, to share some of the spillovers generated by the agglomeration.

As stated in the previous section, the role of geography in new trade theory became more important for intra-industry trade. To move goods from one location to another implied a cost to transport goods. This meant that the new trade theory introduced the effect of transport cost to determine the impact it has on trade (Brakman *et al*, 2003:46). The cost of trade is, for that reason, an important determinant of a country or region's ability to participate in the world economy (Limão & Venables, 2000).

The aim of this chapter is to indicate ways in which transport cost affects the export performance of a country as well as that of the regions within a country. Transport cost is influenced by physical geography (mountains, rivers and natural resources) and distance. The importance of infrastructure development will also be discussed.

The rest of this chapter will be structured as follows: Section 2 will describe how geographical economics explains trade. In section 3, the core model of geographical economics will be discussed briefly to point out the effect of transport cost in economics. In section 4, the iceberg transport cost model will show how transport cost is affected by distance, and other models that used the iceberg model will be discussed. Section 5 discusses the gravity model and section 6 shows the importance of infrastructure and the impact of infrastructure development on transport cost. Section 7 concludes this chapter.

2.2 Geography and trade

Geography is an important determinant of a region's export performance. Geography can be divided into two main categories: first-nature geography and second-nature geography. The first has to do with a region's physical geography of coasts, mountains and natural resources. Second-nature geography is about the location of economic activity (distance) and economies of scale (Overman *et al*, 2001). The field of geographical economics is a combination of trade theory and regional and urban economics (Brakman *et al*, 2003:59). Geographical economics explains trade as follows. The focus is specifically on the role of second-nature geography.

The first important explanation of trade is the home-market effect – firms want to locate as close as possible to large markets for cost benefits, spillovers and large local demand. The tendency to locate at one specific location leads to an agglomeration of firms and economic activity. The real wages of labour in these regions will rise and then lead to an increase in labour supply (immigration of labour). If these locations have good access to other markets the advantages of locating there are even higher. These regions then become exporters of manufactured goods.

The home-market effect is counterbalanced by distance. Overman *et al*, (2001), indicated that economic interaction declines as distance between locations increases and that the location of production is affected by factor endowments and market proximity. Distance from an economic agglomeration has the same negative impact on technological spillovers and, although not a core part of this study, it is necessary to indicate that as distance from an economic agglomeration increases, the nominal wages decrease.

In new economic geography, the location and volume of trade between regions is affected by geographical conditions. What are the theoretical implications of

geography and transport cost as determinants of trade? A model developed by Krugman (1991) describes the core model of geographical economics.

2.3 Core model

Suppose there are two regions and two sectors in the economy, the manufacturing sector and the food sector. There are farm workers and manufacturing workers in both regions. Labour is used to produce food with constant returns to scale and there is perfect competition. There is no transport cost for food, because it is produced and consumed in the same region, and there is no incentive to trade food. Manufactured goods are produced with internal economies of scale and labour. Each product is unique.

There is transport cost involved in selling a manufactured good in another region. These transport costs do not arise when selling the goods in the region in which they are produced because the share of transport cost is small and will not affect the price. Goods transported and sold in another region incur higher transport cost and firms will then charge a higher price to compensate for the increased cost of transport. This indicates that imported goods will cost more than domestically produced goods. Thus, firms will want to locate close to large markets to save on transport costs (Baldwin *et al*, 2002).

The core model indicates in its simulation that, if manufacturers find it difficult to transport goods from one region to another, they would spread to the areas in which they wish to sell and locate and produce there. If, on the other hand, transport is not so costly, the firms tend to locate close to each other in one of the regions and agglomeration and trade with other regions takes place (Brakman *et al*, 2003:106). Transport cost is introduced as iceberg transport cost into the model. This implies that a fraction of the manufactured good does not arrive at the destination when goods are shipped between regions. The parameter τ, represents the iceberg transport cost in the model.

2.4 Iceberg transport cost model

Geography and distance is introduced into new economic geography models in the form of the iceberg transport costs function, where a part of the goods is consumed by transporting. This model of transport cost was used for the first time by Samualson (1952) to identify the impact of transport in terms of trade (Steininger, 2001:5). The model did not include the distance variable within a country and therefore Krugman changed the iceberg function into a geographical distance-related function (McCann, 2005). Krugman (1991a, 1991b) defines the iceberg transport cost as:

$$V_d = V_o e^{-\tau D} \qquad (2.1)$$

Where V_o is the value of the good at the origin location, τ is the iceberg decay parameter (the portion that 'melts' away each kilometre), D is the haulage distance, and V_d is the quantity of goods actually delivered at the delivery location d. If $W = V_d / V_o$ then equation (1) can be rewritten as:

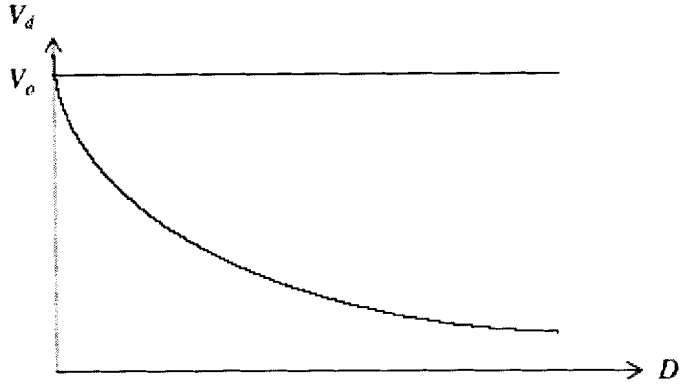
$$W = e^{-\tau D} \qquad (2.2)$$

Taking logs of both sides of equation (2) and differentiating both sides with respect to D gives:

$$\frac{1}{W}\frac{\partial W}{\partial D} = -\tau \qquad (2.3)$$

Therefore, as the haulage distance increases, the rate of growth of the value of good V_d actually delivered, divided by the original source value, V_o of good produced, remains constant. That means τ represents the constant rate of distance decay.

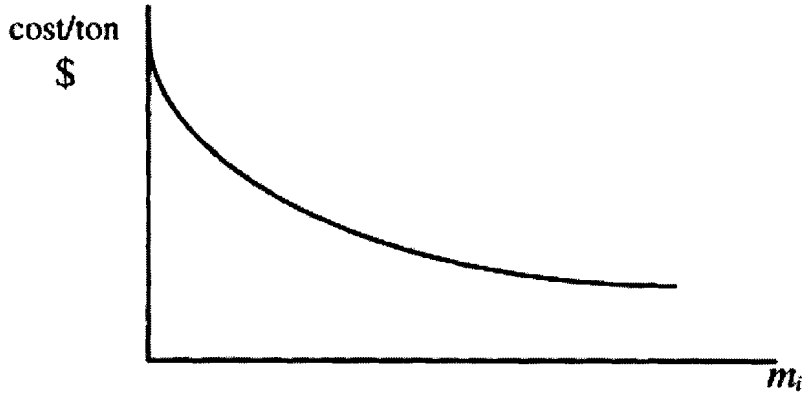
Figure 2.1 Iceberg distance decay



Source: McCann, 2005

Figure 2.1 shows that, as distance increases from the origin destination, the quantity V_o, of the goods transported, decreases. The convex curve illustrates the relative goods that "melt" away as distance increases. The function is convex and it therefore indicates that the marginal cost of transportation decreases as the distance increases. An example can be used to explain the above: if goods need to be transported to a destination 50 km away, the cost per unit will be more than when the goods needed to be transported 300 km. There is a faster rate of "melting" over short distances and, as the distance increases, this rate decreases (Figure 2.1). McCann (2001) also indicated that transport rates fall with respect to the haulage quantity for any given distance.

Figure 2.2 Transport cost of goods as the quantity increases

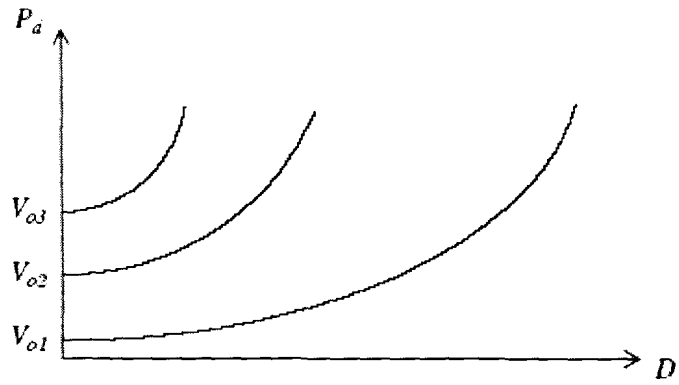


Source: McCann, 2001

Figure 2.2 indicates that, as the quantity of a good transported, m_i, increases over any distance, the cost per unit decreases. To illustrate this better, the iceberg transport cost function may be changed into a delivered price function. The following must be noted: V_o (value of the good at the origin location) is equal to P_o (origin mill price per ton of good) multiplied by M_o (tonnage of good leaving the production location) and V_d (quantity of good actually delivered) is equal to P_o multiplied by M_o (tonnage of good actually arriving at destination). This can help to determine the price of the good P_d at the consumption destination.

$$P_d = P_o e^{\tau D} \qquad (2.4)$$

Figure 2.3 Relationship between the iceberg distance costs formulation and the delivered price per tonne.



Source: McCann, 2005

Figure 2.3 shows that if the price at origin of the good produced is high, then its delivered price will increase faster as distance increases than goods with a lower price at origin.

The iceberg transport model is used in the core model of geographical economics to illustrate the impact of transport cost on prices of goods and the effect it has on manufacturers to locate in a specific area. There are other models, which also include the iceberg transport cost function, and they can be discussed briefly.

For example, a model developed by Matsuyama (1999) extended the two-region model of Helpman and Krugman (1985) into a multi-region model.

In this model, the world has identical economic agents, who are spread across regions. They have the same preferences and consume only one outside good and a variety of manufactured goods. The consumer has a demand for the outside good and for the manufactured good. The outside good incurs no transport cost and can be transported across all the regions. Not all consumer goods and manufactured products are made locally, that means that manufactured goods can be obtained by importing them from another region. If manufactured goods need to be transported from one region to another iceberg transport cost is incurred. To consume $c_j(z)$ units, one needs to ship $\tau_{ij}c_j(z)$ units, where $c_j(z)$ is consumption of z in region j and τ_{ij} is the iceberg transport cost. As a result, manufactured goods are costly to trade (Matsuyama, 1999). If the producer in region i charges p(z) per unit then the consumer in region j needs to pay $p(z)\tau_{ij}$ per unit. The producer will make no profit in this deal. Matsuyama (1999) indicated that the existence of transport cost not only influences the trade ability of the producer, but has an impact on the prices of goods consumed in another region as well.

In another example, Venables and Limão (2002) developed a model to analyse the trade and production preferences of regions located at various distances from an economic centre. There is a central location. From there, economic activity moves to the side on a linear line and the activity becomes smaller. The labour and capital endowments also decrease as the distance from the central location increases. Say that there are three goods in the economy, and all the locations can produce them. All three goods are consumed at all the locations. If goods are transported from one location to another, there is iceberg transport cost. The cost to transport these goods has an effect on the price of the goods delivered at the consumption location. At a certain point away from the centre location, the cost to transport the goods will be too high and that will result in no goods being traded to these locations. Locations at a greater distance from the centre will receive lower prices for their exports and will pay more for imports.

The above models give an indication what the importance of transport cost is in the modelling of economic geography. There are other models that also explain the effect of transport cost and they will be briefly discussed next.

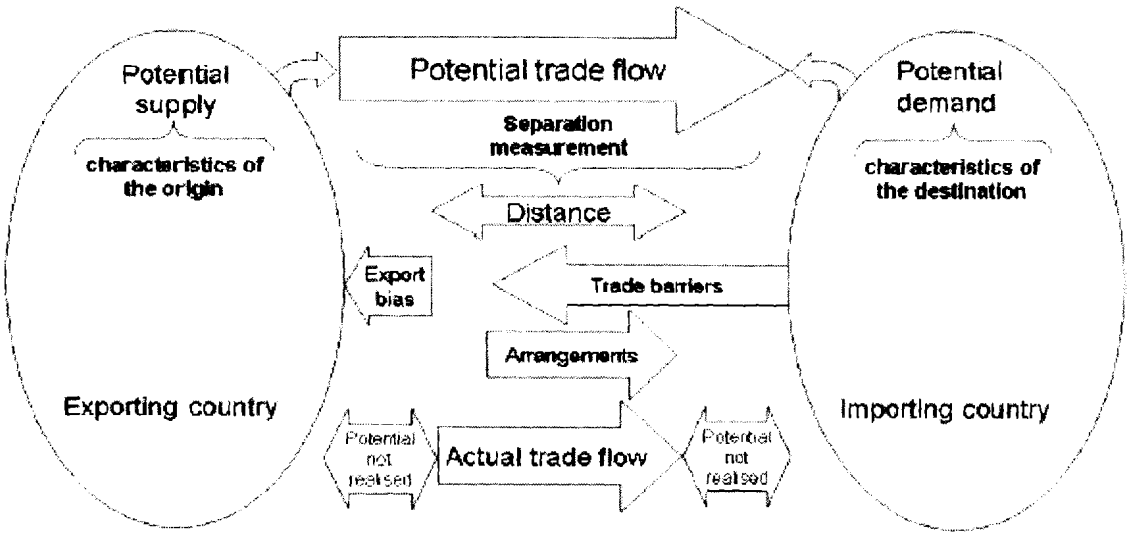
2.5 The gravity model

The motive for the development of the gravity model is that a country's economic size determines the trade from and between countries, but it may be inhibited by transport costs (Bougheas *et al*, 1999). The gravity equation is an attempt to show that location matters in international trade (Brakman *et al*, 2003:267). The basic gravity model in log form is:

$$\log(X_{ij,t}) = \alpha + \beta_1 \log(Y_{i,t}) + \beta_2 \log(Y_{j,t}) + \beta_3 \log(D_{ij}) \qquad (2.5)$$

Where $X_{ij,t}$ are the exports from country i to country j at time t, $Y_{i,t}$ and $Y_{j,t}$ are the GDPs of country i and j, respectively, at time t, and D_{ij} is the distance between the capital cities of the two countries (regions). Distance increases transport cost, which restrains trade.

Figure 2.4 The gravity model



Source: South African Department of Trade and Industry (2005)

The figure shows how potential supply, potential demand, and the size of the economy predict the potential trade flow between countries. The gravity model indicates that distance plays a role in exporting goods from one region to another. Distance is associated with the cost to transport goods from the production site to the consumer. Luo (2004) showed that the gravity model predicts that if the two trading partners have large economies and the distance between them is relatively small their bilateral trade will be greater. He indicates that it is not necessarily the distance between them, but the transport cost, which reduces the profitability of trade.

A possible way to increase trade between regions when distance is a problem is to improve the transport and communications infrastructure between the countries and regions. Luo (2004) identified that the most efficient way to facilitate the growth of remote regions is to develop the infrastructure to lower the transport cost and lessen the relative effective remoteness of the region. In general, for a given distance, the better the infrastructure is, the lower the transport costs and the better the market accessibility. Infrastructure development will "shorten" the distance, so that geographic position will play a less important role.

2.6 Infrastructure and transport cost

Economic activity is spread across the world, which indicates that certain locations are more suitable for a particular economic activity than others. Interaction between these regions takes place when infrastructure (transport and communication infrastructure) is available. A country's policymakers need to provide basic structures in these areas to promote trade and growth. Infrastructure development can serve as a mechanism to increase and support economic activity. Policymakers must create a favourable climate so that private and public investment can increase for sustained growth in the economy. This will reduce restrictions on trade imposed by geographical and economic conditions (Busse, 2003). Infrastructure connects different economic centres in a country. Therefore a country's infrastructure has a role in a region's ability to trade. The difference in volume and quality of infrastructure can be responsible for the variation in transport cost between different

regions (Busse, 2003). Infrastructure can improve transport conditions through cost-reducing technology (Bougheas *et al*, 1999).

What is the impact of infrastructure on transport cost in theory? Bougheas *et al*, (1999), showed that a country needs to decide how much it is willing to spend on infrastructure development in an attempt to reduce transport cost. This infrastructure development will increase the level of trade within a country and between countries. Within the model, the distance variable is important because it will determine the quantity of spending by a country that is needed to increase trade flows between regions. Therefore, a reduction in transport cost leads to an increase in tradeable commodities (Bougheas *et al*, 1999). In their study it is clear that there is a positive relationship between infrastructure and trade volumes. There remains a chance that higher spending on infrastructure can damage final output within a region. Naudé *et al*, (2004), indicate that there is a trade-off between transport costs and the cost of supplying the public good. The level of infrastructure development determines the cost to transport goods and plays a vital role in regional development (Luo, 2004).

A country's policy and the level of infrastructure development have important implications for transport cost within a country as indicated above. With this in mind the effect of geography and development will be explained.

To establish the interaction between geography and development a simple economic growth model will be used, the AK model, described by Gallup *et al*, (1998). The model will include a transport cost variable.
The production function in the economy is:

$$Q = AK \qquad (2.6)$$

The population growth is constant, which means Q is output and output per capita. In the model, the country's economic growth is positively dependent on the savings rate, s, and the level of productivity, A. Relative prices of capital, P_I, and the depreciation rate, δ, affect the rate of growth negatively. The national savings rate is fixed. The growth rate of the country can be written as:

$$Y = sA/P_I - \delta \qquad (2.7)$$

When goods are traded, they need to be transported and, as a result, transport cost is incurred. To illustrate the implications of transport cost, the following assumption is added: each country develops a unique final good. Investment is combined with the production of the good in various countries. Therefore, there are no gains from trade so that transport cost and trade barriers reduce growth. Total investment can be defined as follows:

$$I = (I^d)^{\alpha} (I^m)^{(1-\alpha)} \qquad (2.8)$$

It is a Cobb-Douglas production function for total investment with domestic investment I^d and imported investment I^m. If the domestic good is set as numeraire, thus $I^d = 1$ then:

$$P_I = \alpha(P^m)^{(1-\alpha)} \text{ where } \alpha = \alpha^{\alpha}(1-\alpha)^{(1-\alpha)} \qquad (2.9)$$

The world market price for the imported good is P^{m*} and the price of the good in the importing country can be written as:

$$P^m = \tau P^{m*} \text{ where } \tau>1 \text{ and is the CIF factor} \qquad (2.10)$$

The CIF price (cost, insurance and freight) is the cost of the imported item at the point of entry into the country.

The modified equation for the growth rate of the economy is now:

$$Y = (sA/\alpha) (P^{m*})^{-(1-\alpha)} \tau^{-(1-\alpha)} - \delta \qquad (2.11)$$

As indicated in the equation, transport cost raises the cost of imported capital goods; therefore it has a negative effect on the economic growth rate. The above equation shows the following points.

1. Growth rates will differ because of factor productivity, A,
2. Protectionist policies that raise the price of imported capital goods are likely to reduce long-term economic growth, and
3. Growth rates will differ according to transport cost, τ

According to Gallup *et al*, (1998) the transport cost mentioned in point 3 above depend on the following characteristics. Firstly, coastal economies will have lower transport cost than the inland economies. Secondly, regions near core economies will usually have lower transport cost than regions located far away and this may lead to lower economic growth the further a region is located from a core economy.

It is clear that transport cost, in theory, is an important determinant of trade and an important factor in the location decisions of manufacturers. Trade is negatively affected by transport cost and the further away manufacturers are from a core economic area, the higher is the cost to transport goods. The role of infrastructure is also important for trade and can promote trade if it is implemented accordingly.

2.7 Conclusion

The neo-classical trade theory and the new trade theory both indicate in their own way that countries or locations have a competitive advantage in the attempt to trade. It might be more skilled labour, an abundance of resources, or the location of the industry close to a large market. The important thing is that all of these influence a region's trade pattern. It is necessary to have highly skilled labour to produce and export manufactured goods, if a country has abundance in a particular resource it will probably lead to a main trading product and the location closer to large markets will reduce transport cost and generate a price advantage over other firms. Transport cost has an impact on the prices of goods traded. As distance increases the transport cost also increases. For this reason a location as close as possible to the market or trading partners will be useful during trade.

Transport infrastructure is needed to trade with other regions. A good and reliable transport network and efficient investment in transport services will encourage firms to trade. When the basic structures, such as good road freight infrastructure, are

present, then firms will use them to trade. The participation of government in trade is also needed to ensure that goals set by the government for regional development can be obtained. Policies by government can encourage or limit trade.

Goods can be transported by different modes of transport. The most important transport networks used for manufactured goods are rail and road transport. South Africa's location in the world economy and the development of transport networks influence the amount and type of products that can be exported from the country. The next chapter will describe the history of transport in South Africa as well as the transport policy for the development and improvement of transport of manufactured exports. The current situation of road and rail transport will also be discussed.

Chapter 3

Land freight transport in South Africa

3.1 Introduction

The movement of people, goods and services depend on a good and reliable transport network. People rely on transport to travel from one destination to another either to go on holiday or for business purposes. This is also the case for manufactured goods. Manufacturers rely on good, fast, and efficient transport services to move goods from one location to another. The time associated with transporting these goods is determined by the type of transport used for the movement of goods. Some goods can take a few days to be transported, but other goods need to be delivered in a few hours. For this reason, there are different modes of transport available to manufacturers to deliver their goods to a specific location. The different modes of transport that can be used are road, rail, sea, and air transport. In this chapter the focus will be on road and rail transport.

When goods are transported from one location to another with the aim of economic benefit, it is called trade. Trade relies on different modes of transport. Trade also helps with the development of a country as it has economic benefits for the consumers of the goods (Department of Transport, 1998). Therefore, without the development of transport, international trade would be impossible and growth in economies would not take place.

For example, if it were not for the development of ships, South Africa would not have been discovered by the western world. Exploration journeys made by outsiders to unknown parts of the world led to the discovery by them of various countries that are well developed today. Further improvements in the transport sector led to the establishment of towns and cities in the rest of the country with people moving between these regions by means of different modes of transport.

This chapter will show that transport is an important distributor of goods and that this leads to the development of the country's hinterland. Government needs to make strategic decisions about the implementation of transport policy. Political and economic changes in the economy should bring adjustments in the country's transport policy and regulations. This chapter will be structured as follows. Section 2 will discuss the history of transport in South Africa and the development of rail and road services. Section 3 will explain why reliable and high-quality transport infrastructure is needed to help increase exports from a country. Section 4 describes transport policy in South Africa and the different strategies that the government identified to overcome problems in transport infrastructure. Section 5 gives an overview of changes that took place in the South African economy over the past 10 years and the challenges that needed to be addressed. Sections 6 and 7 discuss road and rail transport in South Africa and the current situation. Section 8 concludes this chapter.

3.2 History of transport in South Africa

South Africa is a country with a unique geographic make-up. The climate conditions differ in separate regions. The western part of the country is dry and arid while the eastern regions have a sub-tropical climate. The coastal belt extends, on average, 100 km into the country and the inland area is on a plateau of more than 1000 metres above sea level (Microsoft Encarta, 2005). These contrasts influenced the development of transport during the nineteenth century when rail and road transport started to play a role in the world economy.

The first rail service in South Africa began on 26 June 1860 in Durban. This was a three-kilometre rail track to transport passengers to the Point at the coast of Durban. After that, in February 1862, the first railway in the Western Cape began its service from Cape Town to Wellington (Lingen, 1960:5). The development of this 70 km railway was to expand the important wine trade from the region. During the following 12 years, there was no development in the railways but then, in 1867, diamonds were found in Hopetown and that led to the development of the town Kimberley. This

new discovery led to the extension of the railway from Cape Town to Kimberley and to the rest of the country (Lingen, 1960:6).

The geographical implications mentioned above influenced the development of railways and other transport. After the discovery of minerals in the interior, the extension of railways took place. The abundance of minerals in the interior and the absence of navigable rivers are factors that contributed to the development of railways. Goods needed to be transported over long distances to and from where diamonds and gold were found and the coast of Cape Town and Durban. The most efficient, and only, way to transport these goods was by means of rail. Therefore, rail transport led to the development of the South African economy and the development of towns and cities in the hinterland (Lingen, 1960:1).

The development of railways to rural areas was not economical as the cost to extend railways was high, so there needed to be another way to develop these areas. The development of road services was an effective substitute where railways could not be extended. The first road service in South Africa was developed between Hermanus and Botrivier in the Western Cape in December 1912. The 30 km road was meant to help the development of Hermanus into a coastal holiday destination (Lingen, 1960:72). The importance of road transport was to be an assistance to rail transport and supplemented the railway system.

It was the task of the railway administration to establish an agricultural and manufacturing population in the inland provinces by implementing cheap transport such as road transport (Anon., 1992:384). From these first developments of rail and road transport, the importance of transport for local development and exporting became more apparent. After the initial investment of roads and rail in South Africa various extensions took place until what we have as our road and rail network today.

3.3 Transport and infrastructure investment in South Africa

Investment in transport infrastructure has a long-term influence on the economy. It requires advanced planning and significant financial resources. According to macroeconomic theory, infrastructure investment such as bridges, roads, ports, or

even telephone lines can create economic growth (Mankiw, 2003:215). Governments make the assumption that new roads lead to economic growth by encouraging industries to relocate to the regions with better infrastructure (Banister & Berechman, 2000:13). Transport infrastructure has the following characteristics: it is a network that forms part of the production costs of goods; it has elements of natural monopoly with high capital costs; it has low running costs, but the sunk cost to establish it is substantial (Kay 1993).

South Africa's transport network is the most developed in Africa, but challenges still abound. During the 1980s, the transport sector suffered due to the economic decline in the country. Expenditure on transport and communications infrastructure in South Africa from 1983 until 1996 decreased by a considerable margin as indicated in tables 3.1 and 3.2. The South African government shifted its public expenditure towards education, health, social security, and welfare (Black *et al*, 1999).

Table 3.1. Government expenditure in South Africa, fiscal years 1983-1996 (percentages of total expenditure).

Item	1983	1983-89	1990-96	1996
Transport and communication	10.1	7.3	5.3	5.2

Source: Black *et al*, 1999:82

Table 3.2. Government expenditure in South Africa, fiscal years 1983-1996 (percentages of GDP).

Item	1983	1983-89	1990-96	1996
Transport and communication	3.0	2.4	2.0	1.9

Source: Black *et al*, 1999:83

Table 3.2 indicates how the government's priority towards the long-term transport infrastructure has decreased over a decade. In the political environment, the short-term public expenditure, which is visible more quickly, takes priority over long-term

investment in infrastructure (Banister and Berechman, 2000:22). Capital expenditure in infrastructure is the first to be reduced as the impacts are not immediately visible. The minister of transport during 1998, Mr. Mac Maharaj, said that the country's infrastructure is a problem: *"The quality of our roads is declining and there is insufficient capital available to maintain and upgrade them"* (Department of transport, 1998:4). The problems with transport infrastructure and the lack of funding thereof were consequences of the transport policy in the apartheid years.

During the apartheid years, the freight transport system was a system designed to support an import substitution economy. High tariff barriers were used to discourage imports in general. The system encouraged the exports of bulk commodities such as coal and iron ore (Department of transport, 1998). The South African economy received most of its foreign monetary reserves through exporting commodities. The use of rail was predominantly used for exports from the mining and agricultural sectors.

Problems in the South African economy with respect to the composition of exports became apparent after isolation from the world economy. The Moving South Africa report (1998) points out that when firms started to compete in the global market, weaknesses in the economy become visible. A nation provides the platform from which firms compete in the world economy. It is firms – not nations or regions – that compete (Department of Transport, 1998). The government needs to set the basic structures in place for companies to participate internationally. Without reliable and effective transport and communications infrastructure, companies cannot compete effectively. For this reason, a region or country is best viewed as a platform for a firm's global strategy, providing a home base that both supports and provides incentives for innovation and upgrading. Countries can therefore create the conditions under which their firms provide world-class competitive services, but this requires a concerted effort to put into place a number of components in the national platform (Department of transport, 1998).

An example of such a platform is the Spoornet CoalLink line to Richards Bay.

CoalLink as a Tailored System

During the 1960s and early 1970s, the little coal that was exported from South Africa, went through Maputo. Although feasibility studies showed that a dedicated coal export harbour at Richards Bay would not be a viable option, the Government nevertheless decided to proceed with the project. The planning of this export system was totally integrated, with producers investing in rapid-loading facilities able to fill a unit train within a few hours. Dedicated wagons contributed to the short turn-around time of slightly over two days. The line itself was designed to accommodate unit trains of fifty and later one hundred wagons. The terminal facilities at the port - owned by the coal exporters, and not the government - were also specifically designed to integrate with the rest of the system.

The initial planned volume of slightly more than two million tons was not nearly enough to make this project viable. However, the huge increase in volumes since the inception of the project has ensured that South Africa can deliver coal onto world markets at world class cost levels.

Source: Department of transport, (1998:36)

This indicates that the government has to provide the basic structures needed for firms to be competitive in the world market. Manufacturing firms need the support from government and government policies. Both liberalisation and well-designed regulations should help to reduce various forms of transaction costs. Lower costs then translate into lower prices and increase the international competitiveness of products from developing countries (Busse, 2003:28).

Transport infrastructure also provides the required platform for firms to trade in the local and international market. If there is a shortage of infrastructure development in an area with export capability, the cost to export is higher. It is therefore important

for government to identify the possibilities of competitive export and invest in those areas. According to Banister and Berechman (2000: 38), it might be better to develop transport infrastructure in regions where economic growth is low but the potential of high economic growth exists.

The South African government needed to change policy in order to increase the volume of manufactured exports. Transport infrastructures need to be prioritised and infrastructure investment should take place to have an economy that has export-led economic growth.

3.4 Transport policy

All countries face the basic problem of allocating scarce resources in an economy. The one scare resource in developing countries is the lack of monetary support for the development of transport infrastructure. The government needs to finance such projects through taxes that are levied on personal income and value added tax on goods produced in the economy. The main source of income for the South African government is taxes. The allocation of taxes between different departments and functions in the government make it possible for particular departments to spend the money in the economy where it is most needed. The availability of monetary support from the fiscal government to the transport sector influences the amount and type of development of transport infrastructure.

In the private sector, market forces ensure an efficient and productive rate of capital formation. In contrast, in the public sector, market forces are weak and investment options are often multifaceted, especially in the case of transport infrastructure investment (OECD, 2002:17). The value and type of transport investment in a country rely on a sound transport policy that is based on an action plan of what will be done and the ways that investments will be made with the scarce resources available.

Transport projects can contribute to different goals of the government. It can contribute to growth by expanding capital stock for goods and services production. Public capital has an impact on private capital, labour productivity, and economic

growth (OECD, 2002:18). A road map is needed to indicate the target for transport investment. The following section will describe the South African government's policies for the development of transport infrastructure.

3.4.1 The White Paper on National transport

The White paper on National transport is a medium-term transport policy for South Africa. The South African government has recognised that transport plays a significant role in the social and economic development of the country and, for that reason, sound economic transport policy is needed. The success of transport is, to a large extent, determined by the soundness of transport policy and the strategies used in applying the policy (SA, 1996).

In August 1996, the South African government and the Department of Transport (DoT) introduced the White Paper on National Transport. The policy was developed to "review and revisit transport policy and formulate new policy where it has become necessary to adjust to a changed environment" (SA, 1996:1).

Land freight transport, as a focus area of transport policy, includes both domestic and international transportation of goods by road and rail. Specific mention was given to land freight transport and ways of improving its service.

The vision for South African land freight transport is of a system that will:

"Provide safe, reliable, effective, efficient and fully integrated land freight transport operations and infrastructure which best meets the needs of customers at improving levels of service at an equitable cost in a fashion which supports government strategies for economic and social development while being environmentally and economically sustainable" (SA, 1996:16).

The White Paper indicates the goals that the Department of Transport want to achieve in transport development and service. The goals intend to increase South Africa's competitiveness in international trade by decreasing the cost of transporting goods. Some of the main strategic objectives are to:

- Optimise capacity and maintain and develop the land freight transport sector.
- Develop a good land freight transport network.
- Have sustainable transport infrastructure
- Expand the development of the freight industry by creating entrepreneurial opportunities (SA, 1996:12).

The improvement and sustainability of the land freight transport system in South Africa will lead to the successful integration of goods transported into regional and global transport patterns. Specific attention will be given to the transportation of goods that will be exported with the support of policy and regulation. To have sound policy and regulations for the transport sector is necessary for the development of the land freight system. To support policy there needs to be a strategic framework and action plan. The South African government developed such an action plan for the implementation and improvement of transport in South Africa. The Moving South Africa project provides the strategic plan.

3.4.2 Moving South Africa

The Moving South Africa project (MSA) was designed to produce a data-driven programme for strategic action that extends the short- to medium-term policy formulation documented in the Transport White Paper into a long-term strategic formulation to realise the vision as set out in the White Paper (Department of transport, 1998).

The project is a strategic framework for the long-term development of South Africa's transport and logistics infrastructure. It defines challenges and targets that must be achieved by government and the appropriate stakeholders. It is set out as a vision for 2020 for the transport sector in South Africa, of which the land freight transport sector is one of the featured target sectors.

The Moving South Africa report (1998:12) indicates that by the year 2020, transport in South Africa will have to meet the needs of freight customers for accessible, affordable, safe, frequent, high quality, reliable, and efficient operations and infrastructure. Transport will also have to support and enable government strategies for growth, development and redistribution in South Africa. The Department of Transport indicates through the report that the problem of scarce resources will be overcome by focused investment in the exports of value-added manufactured goods (Department of transport, 1998:12). Reference will be made throughout this study to the Moving South Africa project and research undertaken for the project.

A changing economic environment impacts on the actions that governments in the world need to take. Since 1990, globalisation and liberalisation of trade policies contributed to a need to change the policy strategies for the South African economy. The next section will identify certain economic changes and the impact they have on the economy.

3.5 Transport in a changing South Africa

The Transport White Paper of 1996 and the fourteen-month Moving South Africa research project that followed were designed to express strategies for the medium- and long-term development of South Africa's transport and logistics infrastructure. The aim of policy and regulation is to understand the authority's viewpoint on transport and infrastructure development in a country. In order to provide convincing transport policy, mechanisms should be in place to implement the policy. In the private sector, the market and market mechanisms would be the appropriate way in which policy implementation can take place, but in the public sector the government needs to decide where to invest by having a clear strategy. Government policies play a central role in improving the efficiency of international transport services.

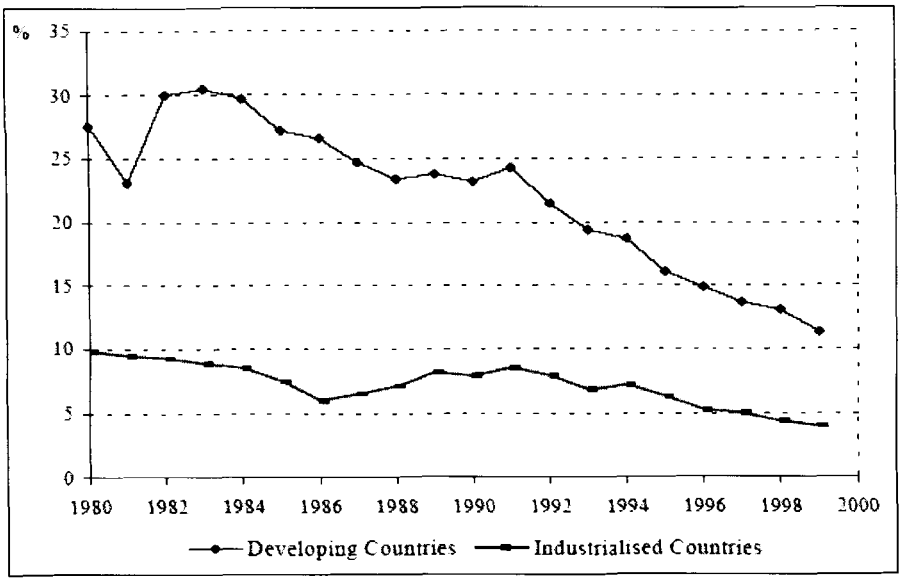
The changes that globalisation brought to the South African economy over the last decade have played a role in the decision-making process of transport infrastructure policy. After the apartheid years, the South African economy was, again, open to globalisation. The forces that drove globalisation had an immediate impact on the

economy and the well-being of citizens. Government therefore had to develop strategies and policy to improve the socio-economic outlook of South Africa. The forces of Globalisation influence the economy in various ways, and South Africa's transport sector and international trade were affected. Some of the forces that influence the economy are (Department of transport, 1998).

3.5.1 Falling tariff barriers to international trade.

During the past 50 years, there has been a reduction in trade barriers in the industrialised world and, after the signing of GATT (General Agreement on Tariffs and Trade), in the less developed countries as well. The importance of transport cost has now only began to develop because trade barriers decreased so much that the cost to transport goods is now greater than that of the trade barriers (Clark *et al*, 2004:3). Figure 3.1 indicates the decrease in trade barriers in developing and developed countries. The trade barriers in developing countries are still high and these influence the economic development of those countries.

Figure 3.1 Trends in average tariff rates for developing and industrial countries, 1980–99 (unweighted in %)

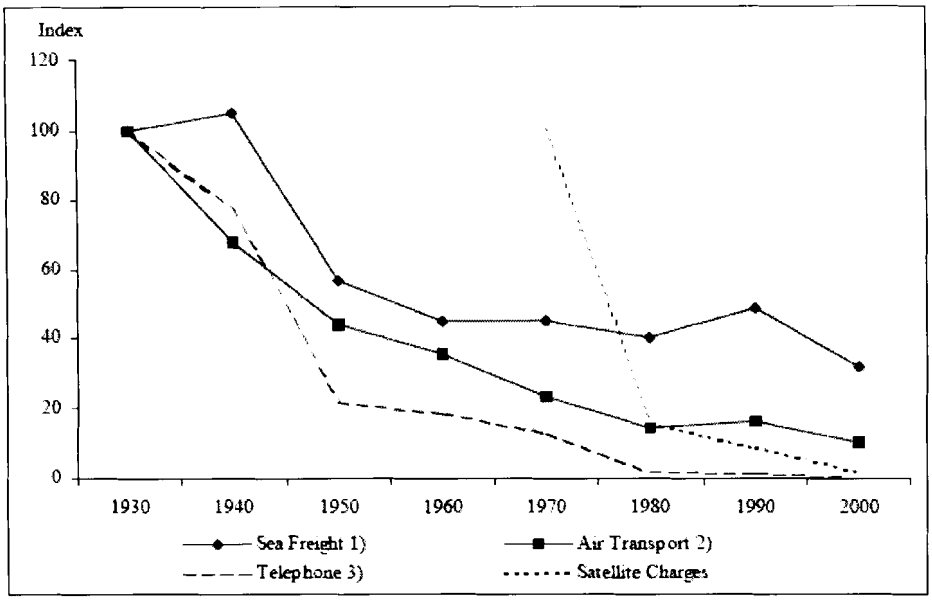


Source: World Bank (2002) in Busse, (2003:20)

3.5.2 Diminishing non-tariff barriers to trade.

Busse (2003:16) indicates that the growing interdependence between countries has been the result of lower trade barriers and the fall in communications and transport costs. Transport and telecommunications are contributors to the cost of trade and it is clear from figure 3.2 how these costs have been declining over the last 70 years.

Figure 3.2 Transport and communications costs, 1930–2000 (in 1990 $US)



Source: Hufbauer (1991), US Department of Commerce (2001) and World Bank (2002) in Busse, 2003:24

Note: [1)] Average ocean freight and port charges per short ton of import and export cargo.

Note: [2)] Average air transport revenue per passenger mile.

Note: [3)] Cost of a three-minute telephone call from New York to London.

3.5.3 Reintegration into the global economy.

Since 1994, South Africa has increased trade with all regions of the world. In the last ten years, the volume of exported manufactured products has increased from 5 per cent to 20 per cent of exports, while gold and other primary products have fallen from 65 per cent to 45 per cent of exports in the same time period. This has implications for transport systems in South Africa. Transport infrastructure needs to be changed to accommodate the change in exports to the international market (Department of transport, 1998).

3.5.4 Changes in the South African economy

The economic policy emphasis has shifted to creating jobs through an active service economy, with a strong foundation and job growth provided by manufacturing-led exports (Department of transport, 1998).

There are not just changes in the world economy, but also in the transport industry of the world. Competition in the global economy impacts on the South African transport industry and forces the government and private companies to conform to international standards. Some of the relevant factors are mentioned below as described by the Moving South Africa report (Department of transport, 1998:29).

- Competition

  Ship owners increase the capacity of their ships to be more competitive in the market. This leads to an increased demand for larger and deeper harbours and more sophisticated technology to operate these ships. Intense competition in the industry is likely to lead to cost improvements by shipping lines and lower prices for customers.

- Information technology

  Better IT leads to an environment where manufacturers use just-in-time processes to increase their value added and reduce inventory cost. The importance of good and sound logistical management is more important today for effective transport.

- Environment

  Transport strategies need to be changed to coincide with international restrictions on emissions. These new restrictions can change the cost of transporting goods.

A changing environment affects the decisions government need to make to comply with international standards. With a changing environment, there needs to be changes in policy to maintain a country's competitiveness in the global market. One of the most important platforms that a country needs to compete in the world market is reliable and high-quality transport infrastructure. The following two sections will describe road and rail transport in South Africa, the current situation, and challenges.

3.6 Road transport

Roads are the backbone of land transport. They are a basic and essential need, and every road in the network is important. The vast spread of towns in South Africa makes the importance of a good transport network for trade and economic growth important. According to Busse (2003:26), distance and the condition of the transport infrastructure influence the cost to transport goods.

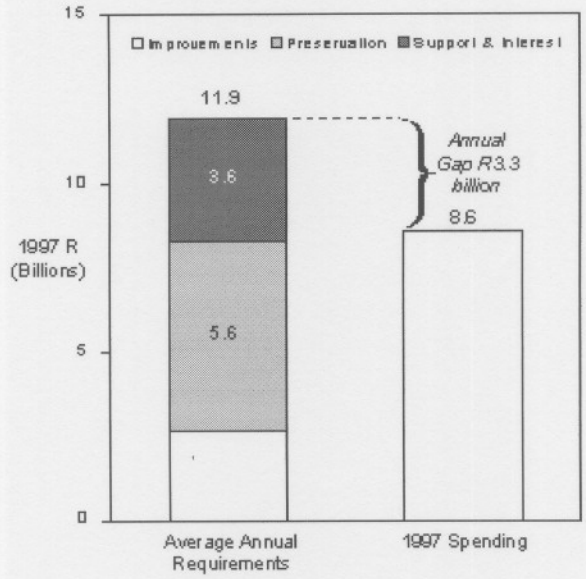
South Africa has a road network of national roads, provincial roads and local roads – a total of 362,099 km of which 20 per cent is paved. According to the Moving South Africa project (1998) the length of paved roads is declining and the roads suffer from poor maintenance. The following facts describe the situation:

- Only 18 per cent of national roads are rated in 'very good condition',
- Roads in urban areas are increasingly congested. Urban areas account for 68 per cent of total kilometres, yet they account for 93 per cent of the congestion and attendant environmental impact,
- Only 35 per cent of the needs for long-distance roads are funded,
- Road quality (surfacing, sealing, grading, etc.) is measured on an A-F scale, with A being highest quality and F being completely deteriorated. Projecting to 2020 along current trend lines, assuming no changes, the number of roads rated 'E' and 'F' quality will increase by 12,000 kilometres, or over 20 per cent of the network.

The biggest cause of this is the lack of sufficient funding to maintain the roads. The MSA (Department of transport, 1998) project found that there was a R3.3 billion

annual road under-funding in South Africa, national fleets which are, on average, operating at above 80 per cent of their economic life, insufficient financing, and high externality costs. Figure 3.3 shows the under-funding of road infrastructure in South Africa during 1997.

Figure 3.3 Annual gap between current and required road infrastructure spending



Source: Moving South Africa, 1998

Road transport in SA is subject to the Road Transport Quality System (RTQS), with various regulations (ITRISA, 2004:16). Earlier road regulation restricted the weight of goods transported by road but deregulation has increased the competition between rail and road haulage of bulky products. The deregulation of gross vehicle mass (GVM) in 1988 from around 38 tons to 56 tons made transport by road 15 per cent cheaper than rail freight. Herman Evert, the General Manager of Spoornet, showed that truck transport freight in South Africa can operate at a lower cost than those of the US where total GVM is at 38 tons (ITRISA, 2004:37). This means that road freight companies in South Africa can afford to charge low rates for their services. Before this, road freight transport was not always a competitive industry.

Before 1999, the port authority had a monopoly on short haulage from 100 km from the port and to SA container terminals. The port authority was the only haulier that

could transport products to container terminals from where exports took place. Entry into SA ports was restricted to only Portnet's own cargo fleets (ITRISA, 2004:23). Today long distance hauliers are permitted to drop off goods at a transfer area and exporters have a choice between various private hauliers.

Road transport has some advantages:

- It offers a door-to-door service and a higher degree of security.
- Road haulage facilitates movement of cargo to and form otherwise inaccessible areas.
- Road haulage, unlike rail transport, is not subject to scheduled departure times; the haulier is in control of the journey (ITRISA, 2004:16).

3.7 Rail transport

Rail transport is often the only means of conveying large quantities of low-value, bulk cargoes over long distances. A large proportion of SA exports fall in this category (ITRISA, 2004:31).

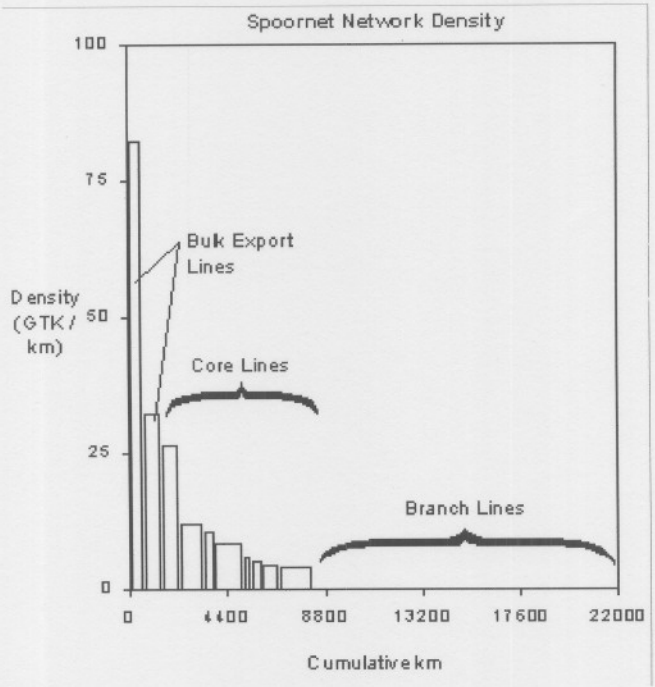
The railway system, which links all main centres, is almost entirely owned by the state and is controlled by a government agency, the South African Transport Services (Transnet). Its subsidiary, Spoornet (the renamed South African Railways) operates approximately 22,657 km of track. Since 1988 when the permit system for road freighters was stopped and the gross vehicle mass (GVM) was increased to 56 tons, the use of railways for freight in South Africa began to decline. From 1988 to 1990 the freight cargo of rail decreased by 11 per cent and between 1993 and 2000, Spoornet's freight cargo fell from 97,8 million tons to 93,8 million tons (ITRISA, 2004:37).

The problems faced by Spoornet indicate that the playing field between road freight and rail freight is not level. In Spoornet's case, the development and maintenance of infrastructure is done by themselves, while the truck companies do not incur the direct expenses of highway maintenance. Truck companies also do not pay for the

damage caused by their vehicles to the road while Spoornet has to repair the rail tracks. The main problem, according to Herman Evert, General Manager of Spoornet, is the 56 tons of GVM allowed for road freight (ITRISA, 2004:37).

The rail network in South Africa is a combination of two high-density bulk lines, and a low-density general freight network comprised of core and branch lines (Department of transport, 1998). The bulk export line operates at world-class levels, but the general freight network operates at lower densities, and they do not carry sufficient traffic to generate enough revenue to make a profit for maintenance.

Figure 3.4 Rail freight network densities



Source: Moving South Africa, 1998

Figure 3.4 shows the bulk-, core- and branch lines of the rail system and only the first two lines (corridors) are operating at high densities. The cost to keep the branch lines in working condition places the rail authority under financial pressures. This is because the branch lines do not generate a profit.

The long-term overland transport strategy should encourage freight to be transported by the most suitable mode, i.e. long-distance haulage by rail and short

and medium haulage by road, thereby rectifying transport usage distortions (CSIR, Freight Logistics Sector Project, 2004).

3.8 Conclusion

The abundant mineral resources in the interior of South Africa led to the development of most towns and cities located in the hinterland. Long-haulage of minerals was limited to rail transport while road transport only began to operate 60 years later. The developments in transport infrastructure have a long-term impact on an economy and financial resources are needed to implement these developments.

Changes in the political environment influenced the development of infrastructure with the share of government expenditure towards transport infrastructure decreasing. This led to a weakening of the road and rail infrastructures and a reduction in the use of rail freight transport. The deterioration of the land freight transport network makes their use costly for manufacturers. A decline in the level of transport infrastructure increases transport cost, which will lead to either a reduction in the transport of manufactured goods or to an increase in the price of manufactured goods. When transport infrastructure is better in large cities than in smaller cities, manufacturers may be tempted to relocate to reduce transport cost.

The location of scare resources in the economy was stipulated by the new transport policy developed by government during the 1990s. The policies were created and changed to improve South Africa's land freight transport to compete internationally. The Moving South Africa report and the White Paper on Transport were developed for this reason.

With the reduction of trade barriers in the world economy and trade liberalisation taking place, exports from South Africa could be improved. Government indicated that they want to have growth in the economy that is export-led. Chapter 4 will describe exports from South Africa.

Chapter 4

South African exports

4.1 Introduction

The discovery of gold and diamonds in the 1880s, and the rich coal and iron ore reserves that South Africa holds, increased the quantity of goods exported to the international market in the 19th century. Mineral exports to the rest of the world led to the growth of the economy. Exports of wool from the Cape, and gold and diamonds from the inland were the main export goods to the world at the end of the 19th century (Houghton, 1967:14).

Table 4.1 Exports of South African products (R millions).

Annual average	Food and drink	Raw materials	Diamonds	Gold	Total
1861-1865	0.2	3.8	0	0	4.2
1871-1875	0.2	7.8	2.6	0	11.3
1881-1884	0.2	8.2	6.5	0	16
1891-1895	0.2	7.9	7.9	11.3	28.6
1901-1905	0.1	8.7	11.6	24.4	48.3

Source: Houghton (1967:14).

Table 4.1 indicates that the value of gold and diamond exports increased total exports over 40 years by more than 10 times. These increases led to the improvement and expansion of transport infrastructure to export commodities, and also to the development of industries related to the mining industry. Commodity export created spin-off effects in other sectors that serve the mining industry. The manufacturing of explosives and other tools for the mining industry as well as small scale manufacturing of consumer goods took place (Houghton, 1967:14). This increased the market for industrial products.

The exports of commodities in bulk formation were what drove the South African economy during the early parts of the 20th century. Manufacturing took place on a

small scale to cater for local demand. Mining led to the development of infrastructure, better technology to mine and the improvement of exports, which led to the development of South Africa's international trade (Gouws, 2005:17).

During the 1930s, the value of manufactured exports accounted for around 2.5 per cent of total exports at the time. At the same time, several government reports stressed the importance of a diversified manufacturing export industry to replace revenue from gold mines as they become exhausted (Houghton, 1967:126). During World War II, local manufacturing firms were forced to expand and make products that were normally imported. After the war, the manufacturing industry was larger and more diversified with technical skills and confidence (Houghton, 1967:16). Although the manufacturing sector expanded and diversified, most of the exports after World War II were still from the raw material and mining sectors.

In 1947, when GATT (General Agreement on Tariffs and Trade) was formed, with South Africa as one of the founding members, the emphasis was on the reduction of trade barriers and the liberalisation of trade policy in international trade. Between 1945 and 1955, the total number of manufacturing firms established increased by 47 per cent (Houghton, 1967:120). The increase in the number of manufacturing firms did not have the same impact on the value of manufactured exports. Manufacturing output was mainly used for local consumption and exports were mainly from the commodity sector. During 1964, agricultural and mining products accounted for 76 per cent of total exports, while the manufacturing sector's share was 20 per cent. (Houghton, 1967:168).

The Apartheid government introduced import-substitution policies to promote local manufacturing of imported goods to increase the share of manufacturing output in the economy. This did not last long, as the South African market was not big enough to sustain such developments. This led to imports of these goods at higher cost. Since the mid-1980s, sanctions were introduced against the South African government, which influenced the output of the economy.

Between 1981 and the first half of 1996, the manufacturing output declined steadily at an annualised rate of approximately ½ per cent (SARB, 1996:6). The reasons for the stagnation in manufacturing production were (SARB, 1996:6):

- The international isolation of South Africa and the tightening of trade sanctions against the country during the 1980s;
- The disinvestment campaign of the 1980s and the outflow of capital from 1985, which effectively blocked any new foreign direct investment in South Africa and raised the cost of introducing new production technologies;
- The decline in the domestic savings ratio, which contributed to the low investment ratio and the expansion of manufacturing production capacity;
- The inward-looking attitude of manufacturing industries, which concentrated on meeting domestic demand rather than facing competition in export markets;
- High levels of protection accorded to South African producers by an elaborate system of import tariffs.

The importance of diversifying the economy to include more manufacturing production and exports was identified by reports of the ruling party from the 1950s. Manufactured exports increased, but not by the amount that was needed for an economy that was mainly commodity driven (Houghton, 1967). Sanctions also influenced the potential of the manufacturing industry and output in the economy. Changes were needed and, since 1990, these changes had a positive impact on the South African economy and the manufacturing industry.

This chapter looks at manufactured exports form South Africa. It shows that Durban is the most important harbour for manufactured exports and that rail and road transport corridors are created by industry exports. The chapter will be structured as follows. Section 2, describes manufactured exports form South Africa since 1990. Section 3, identifies the transport modes used for manufactured exports and other exports from South Africa. Section 4 is about transport cost in South Africa and shows the various volumes of trade for each mode of transport. Section 5 looks at transport corridors in South Africa and section 6 discusses the concentration of

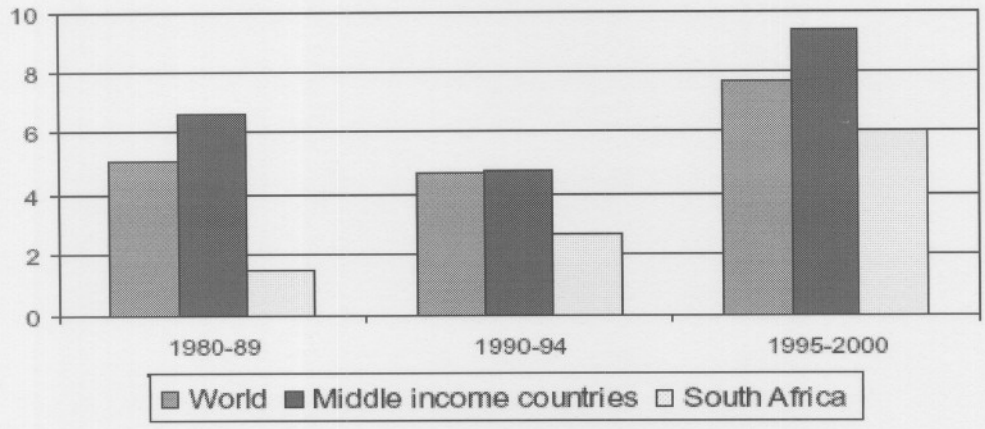
manufactured products in the hinterland of South Africa. Section 7 concludes this chapter.

4.2 Manufactured exports

From 1990, South Africa introduced policies to change the inward-looking import substitution policies to an outward orientation in order to promote the competitiveness of manufactured goods (Gouws, 2005:34). The new government committed itself to liberalisation and privatisation, reprioritising public expenditure toward public goods and income distribution while maintaining cautious macroeconomic policies (Edwards & Golub, 2004:1323). The liberalisation of international trade and domestic markets was intended to increase the share of manufactured exports and therefore have economic growth that is export-led.

The period between 1980 and 1989 saw little growth in exports in South Africa compared to the annual average of world trade. This period was characterised by high import tariffs and trade sanctions towards South Africa. The elimination of trade barriers and sanctions changed the situation during the 1990s. Between 1996 and 2000, total exports recorded an average annual growth rate of 6.7 per cent, which was closer to the annual world trade average (Naudé & Gries, 2004:8). Figure 4.1 show how the policies and liberalisation changed exports from South Africa.

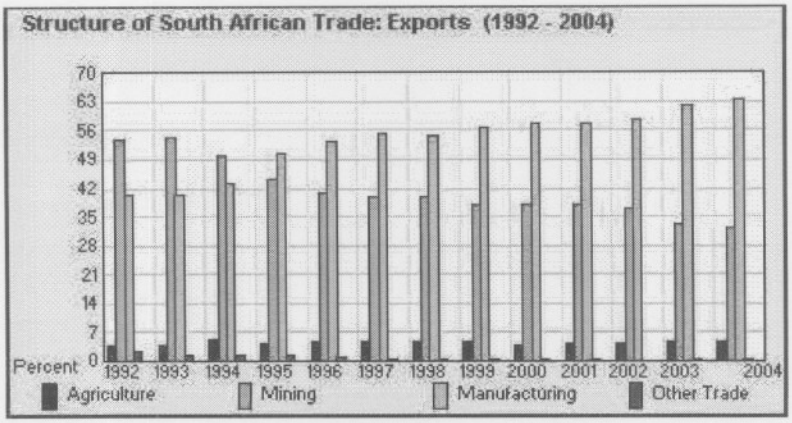
Figure 4.1 Growth rates of exports of goods and services annual average, as percentages.



Source: Edwards and Golub, 2004

The proportion of manufactured exports to total exports also changed during these periods. Tsikata (1999) showed that manufactured exports increased, on average, by 4.4 per cent from 1990 until 1994. From 1996 to 2000 manufactured exports increased by 9.2 per cent per annum and the proportion of manufactured exports to total exports increased from 53 per cent to 57 per cent in this period. The improvement in the proportion of manufactured exports was caused by improved price competitiveness of goods in South Africa, due to the Rand:Dollar exchange rate that depreciated significantly between 1996 and 2000 (Naudé & Gries, 2004). Between 2000 and 2004, manufactured exports increased from 57 per cent to 63 per cent of total exports (Figure 4.2).

Figure 4.2 Structure of South African trade (1996-2004)



Percent Share	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Agriculture	3.63	3.74	5.20	4.23	4.98	4.54	4.83	4.90	3.74	4.05	4.44	4.82	4.53
Mining	54.01	54.37	50.16	44.07	40.99	39.61	39.92	37.90	37.98	37.90	36.87	33.14	31.95
Manufacturing	40.24	40.42	43.20	50.23	53.28	55.29	54.69	56.60	57.84	57.78	58.53	61.75	63.16
Other Trade	2.12	1.47	1.44	1.47	0.76	0.56	0.56	0.60	0.44	0.27	0.16	0.29	0.35

Source: Department of Trade and Industry, 2005

Table 4.2 shows how much tariffs on manufactured exports were reduced from 1990 to 1998. The reduction in tariffs contributed to the increase of manufactured exports from South Africa as is shown in Figure 4.2.

Table 4.2 Tariffs on manufacturing for 1990 and 1998.

Tariffs	1990	1998
Manufacturing		
Maximum tariff	1,389	72
Average import-weighted tariff	28	10
Average unweighted tariff	30	14
Number of tariff bands	> 200	72
Standard deviation	43	15
Number of tariff lines	>13,000	7,814
Percent of tariff lines with non-ad valorem duties	28	26
Range of effective protection	189 to -411	204 to -2
Average import-weighted surcharge	6	0
Import surcharge bands	10, 15, and 40	Eliminated

Source: IMF, 2000:55

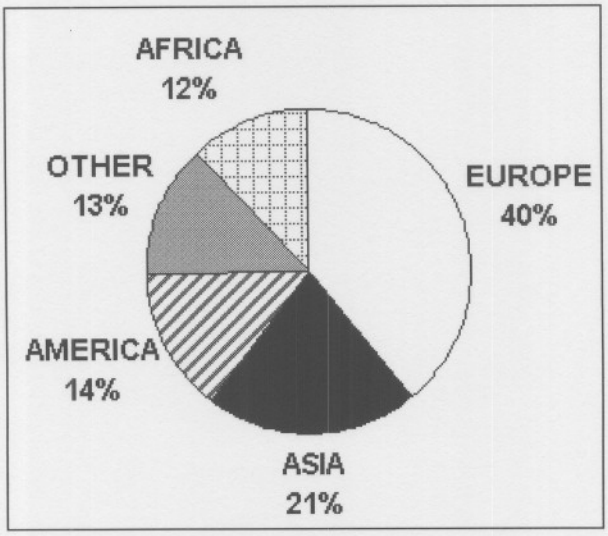
The improved policies and openness to world markets meant that the volume of goods exported increased. The volume of South African trade during 2000 was approximately 130 million tonnes. South African export volumes are still largely raw materials and the top exporting industries, in volume terms, are minerals (i.e. mineral fuel products; ores, slag and ash); and the iron and steel industries (National Collaboration Blueprint, 2001).

Each type of product that is exported has an efficient way of transporting it to the harbour. The best way to transport minerals is by bulk[2] formation and by rail. For some kinds of manufactured products, containerisation might be the best way to transport. More than 90 per cent of South Africa's manufactured exports are transported by sea. Durban is the most important harbour for manufactured exports from South Africa with Cape Town and Port Elizabeth being the other two important manufactured export harbours (National Collaboration Blueprint, 2001).

Figure 4.3 shows that South African exports need to be transported over long distances and to other countries not necessarily bordering to South Africa. Most of the goods are transported by sea to world markets. South Africa's biggest export markets are in Europe and Asia, and to deliver the goods at competitive prices to these destinations a good transport system is required. For this reason ports in South Africa are key factors for distributing exports to other countries.

[2] Bulk cargo will be used for goods conveyed in an unpacked or loose form in quantities of 100 tonnes of primary products or commodities as coal, iron ore and oil. Break-bulk is cargo that has been packaged – drums, crates, sacks. Containerised cargo can be a 20 foot (6m) or 40 foot (12m) container. FEU (forty foot equivalent unit), containers are multimodal and can be used for transport by sea, road and rail (ITRISA, 2002).

Figure 4.3 Indicating South Africa's exporting destinations during 2000.



Source: National Collaboration Blueprint, 2001.

According to Houghton (1967:132), manufacturing industries concentrated in 4 main areas in the 1950s. The location of industries was to minimise transport and transaction cost. The manufacturing firms that served the needs of the mining industry located in the Southern Transvaal (Gauteng), and the manufacturers that imported goods for the consumer were established at the coast to minimise the transport cost. Some harbours were more important than others, and some imported only a specific product. During the past 50 years, each harbour developed its own identity of importing and exporting certain products. What is happening at South African harbours today?

4.2.1 South African harbours

South Africa is a major sea trading nation with a relatively open economy that accounts for more or less 6 per cent of real world sea trade. This performance places South Africa within the top 12 international maritime trading nations (Chasomeris, 2002:1). South African harbours handle over 130 million tones of exports, and the majority of these move through Richards Bay, Saldanha Bay and Durban (National Collaboration Blueprint, 2001).

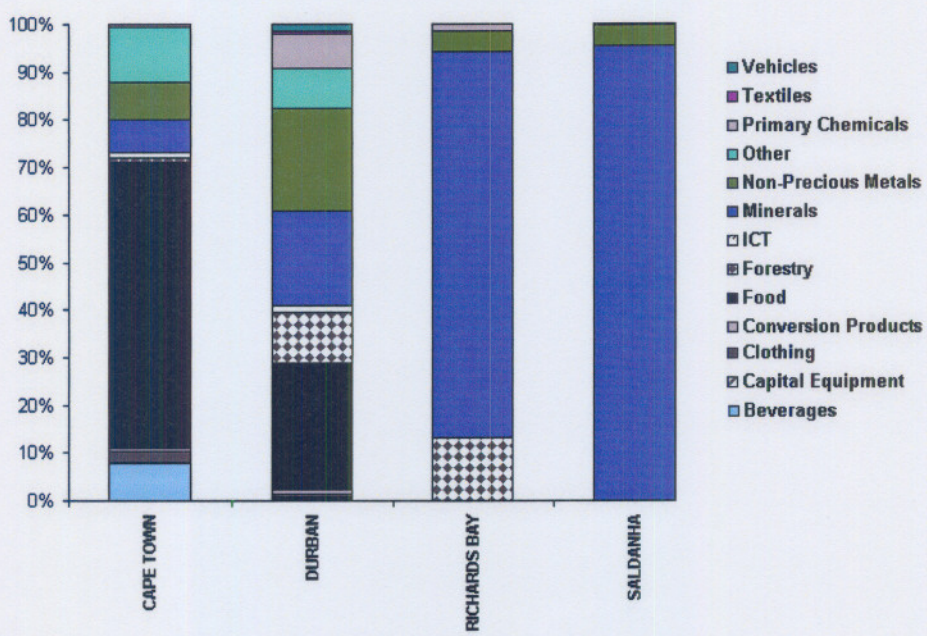
Table 4.3 Export volumes through South African ports, 2000

Ports	Export volumes
Richards bay	65%
Saldanha bay	17%
Durban	12%
Cape Town	3%
Port Elizabeth	3%
East London	0.10%

Source: National Collaboration Blueprint, 2001

Richards Bay and Saldanha Bay are the harbours that handle the specialised bulk exports from the country. Richards Bay handles the coal exports from South Africa and Saldanha Bay the iron ore from Sishen in the Northern Cape.

Figure 4.4 Exports from South African harbours

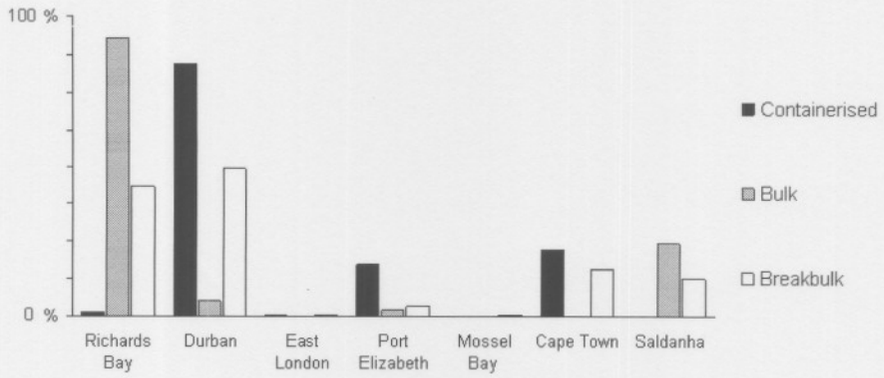


Source: National Collaboration Blueprint, 2001

From figure 4.4, it is clear that there are very little manufactured exports going through Richards Bay and Saldanha Bay. They are specialised ports for bulk exports

but not for manufactured exports. Cape Town and Durban harbours handle the most manufactured goods in South Africa. Figure 4.5 shows that Durban and Cape Town are the ports that handle the most containerised cargo, whereas Richards Bay and Saldanha Bay are the ports that handle the most bulk cargo. Durban is South Africa's most important manufactured export harbour.

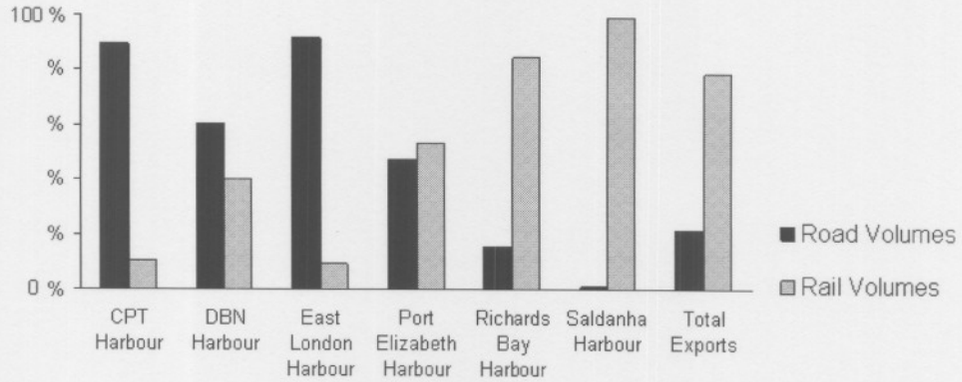
Figure 4.5 Types of cargo for export from South African harbours, 2000



Source: National Collaboration Blueprint, 2001

The products that are exported are transported by road and rail to the different harbours as indicated by figure 4.6.

Figure 4.6 Road and rail freight for exports to South African harbours (2000).



Source: National Collaboration Blueprint, 2001

Cape Town, Durban and East London Harbours receive most of their goods by road and the others by rail. Richards Bay, Saldanha and Durban handle 90 per cent of the

export volumes through South African harbours and most of these arrive by means of rail freight.

Table 4.4 Road and rail volumes of exports to harbours in South Africa (2000).

	Road Volumes	Rail Volumes	Sea Exports
			Tonnes
CPT Harbour	89%	11%	3,619,908
DBN Harbour	60%	40%	16,561,170
East London Harbour	91%	9%	234,445
Port Elizabeth Harbour	47%	53%	3,364,698
Richards Bay Harbour	16%	84%	86,144,369
Saldanha Harbour	1%	99%	24,160,008
Total Exports	21.60%	78.40%	

Source: National Collaboration Blueprint, 2001.

It is clear that most of the exports from South Africa are transported by rail freight (table 4.4), with most of the export volumes coming from the mineral sector. Minerals such as ores, slag, and ash use rail freight together with the iron and steel industries. Manufactured export volumes are less than those of the mineral sector, but the value of manufactured exports is more than that of minerals. The value–volume ratio of manufactured goods are greater than those of the minerals sector and, for that reason, less volume is required to have the same revenue as minerals.

Transport from the production site to these ports is needed for exporting the products. To have an environment of good transport networks at low cost is an effective way to promote exports from destinations further away from ports. The transport cost of manufactured goods will be discussed next.

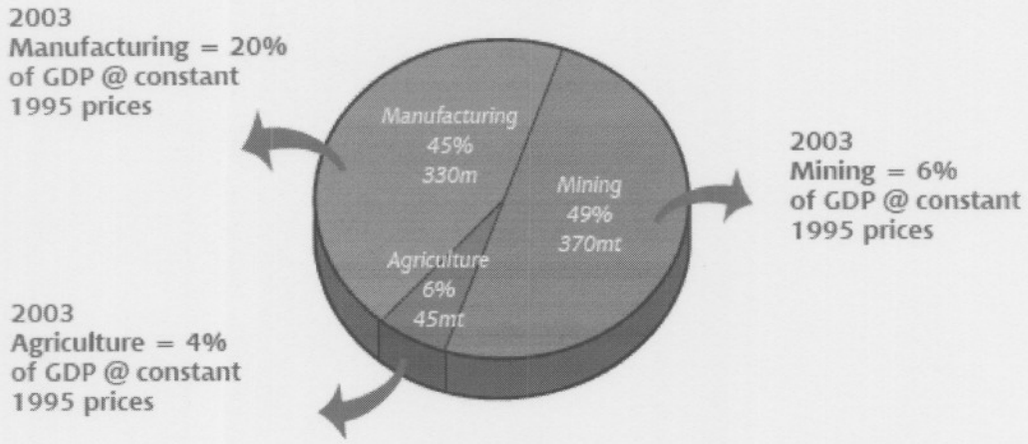
4.3 Transport of manufactured exports

After 1991, when South Africa's isolation from the world economy ended, globalisation of the manufacturing sector started to have a major impact on production. Competition between companies in the manufacturing sector encouraged manufacturers to cut production costs where possible. Supply chain management became a vital part in manufacturer's strategic management. Two types of supply chains are defined (National collaboration blueprint, 2001). The first

is physically efficient supply chains that are designed to minimise physical costs arising from the conversion of raw materials into parts, components and eventually finished goods and the transport of goods from one point in the supply chain to the next. The second is market-responsive supply chains, designed to minimise costs arising from mismatches in supply and demand that leads to lost sales opportunities and dissatisfied customers when supply falls short of demand, or lost revenues due to mark-downs when supply exceeds demand. According to a study that looked at logistical costs in South Africa, the automotive, manufacturing and agricultural sectors are the sectors that are encouraging good supply chain management (Supply chain foresight, 2003). This is mostly due to the globalisation forces that affect price competitiveness within these sectors.

As liberalisation continues to reduce artificial barriers, the effective rate of protection provided by transport costs is now, in many cases, higher than that provided by tariffs (Clark *et al*, 2004:3). In 1998, the primary and secondary sectors spent over R25 billion on transport services. This includes the cost of supporting activities to transport these goods. In the First State of Logistics Survey of South Africa (CSIR, 2004), it is indicated that logistical costs represent 14, 7 per cent of the country's GDP. This indicates that, in South Africa, significant amounts are spent on transport cost. The distribution of products and services from the point of origin to point of consumption is a very important part of any country's gross national product, and indicates how much value the country has produced or made. Logistics activities thus mean money to a country (Voortman, 2004:13). Goods produced in the mining, agricultural and manufacturing sectors need to be transported to various destinations. Figure 4.7 indicates which sector uses the most transport as a percentage of total transport.

Figure 4.7 Transporting imports and production of goods during 2003.



Source: The First State of Logistics Survey, 2004.

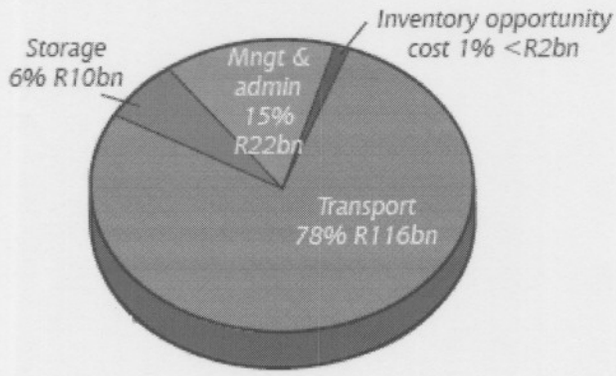
The mining sector uses the most transport, although the contribution of mining to GDP is only 6 per cent. The manufacturing sector's contribution was 20 per cent of GDP during 2003. Goods manufactured in the interior of South Africa need to be transported to the ports to be exported. The distance that these goods need to be transported influences the cost to transport them. Naudé and Gries (2004:13) noted that the location of a magisterial district may be an important determinant of exports, as it will determine the distance to harbours from where a country's exports move. As distance increases, the cost to transport goods also increases. Limão and Venables (2001:455) show how distance increases the cost of transport. They compared the transport cost of a good transported from Baltimore in the United States of America to other cities in the world. They found that having a journey of sea and land transport, an extra 1000 km by sea raises costs by only $190, while the same distance by land raises costs by $1380.

It costs the South African economy R134 billion in total to transport all freight tonnage. The biggest portion of this cost – R111 billion (83%) – is attributable to basic road transport (The First State of Logistics Survey, 2004). The transport cost of goods is only a part of the total logistical cost to transport goods from one location

to another. Logistical costs include; the transport of goods, warehousing, inventory handling, and administration and management of the goods.

In South Africa, transport cost is 75 per cent of total logistical cost. The secondary sector in the economy consumes 83 per cent of total logistical cost whereas the primary sector only consumes 17 per cent of total cost. As figure 4.8 shows, within the secondary sector the transport cost is the greatest, representing 78 per cent of logistical cost (The First State of Logistics Survey, 2004).

Figure 4.8 Logistical composition of the secondary sector in South Africa.



Source: First state of Logistics Survey, 2004.

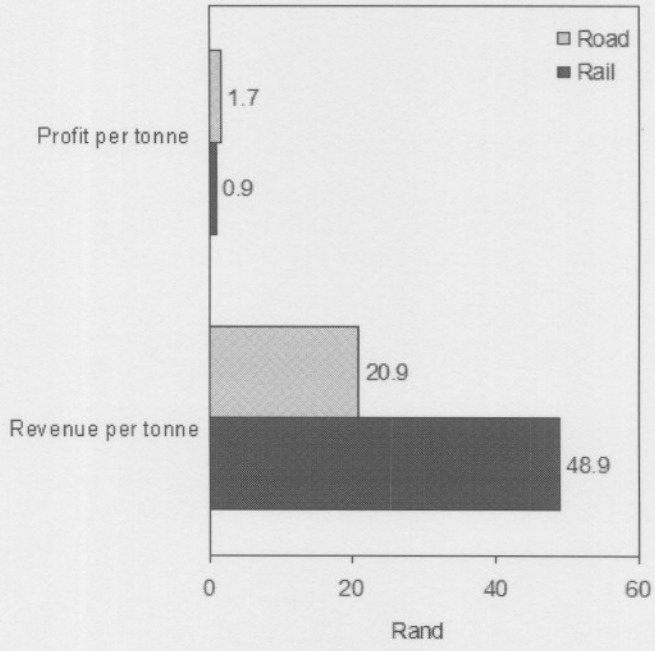
Certain industries are more sensitive to logistical costs and changes in these costs. Industries with a low value-volume ratio have high sensitivity towards logistical changes i.e. primary chemicals, bulk formulated products and minerals (National Collaboration Blueprint, 2001). A product that needs high export volumes to generate a profit requires transport cost to be as low as possible. Capital equipment and precious metals have low sensitivity towards logistical cost changes as these have more value per volume and, for that reason, the transport cost will not influence the profit to such an extent. The sensitivity of the manufacturing sector is not as high as that of the primary sector but, as previously stated, the secondary sector has greater transport cost than the primary sector. Globalisation has caused the manufacturing sector to manage their supply chains better in an attempt to reduce unnecessary cost and to gain a competitive advantage in prices.

4.4 Land freight transport

In South Africa there is an 80:20 split between road haulage and rail freight, with an increasing trend towards road haulage over the last ten years because of increased rail costs and the unreliability of Spoornet (CSIR, Freight Logistics Sector Project, 2004).

The trend towards using road freight transport rather than rail freight began in 1988 when the permit system for road freighters was stopped and the gross vehicle mass (GVM) was increased to 56 tonnes. This helped the road freight sector to charge lower rates for their services and attain more profit per tonne than the rail services. Figure 4.9 indicates the profit and revenue per tonne transported by road and rail transport.

Figure 4.9 Revenue and profit per tonne by transport mode 1999.

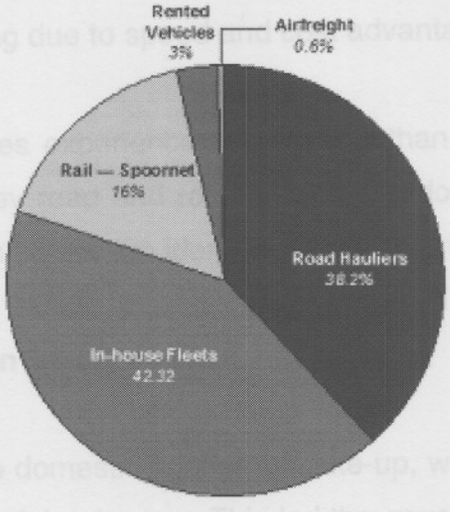


Source: CSIR, Freight Logistics Sector Project, 2004

It is normal to transport long-distance goods by means of rail, and other products by road transport. In South Africa, almost 75 per cent of long-haulage freight is transported by road. (The First State of Logistics Survey, 2004). This is clearly a problem that has to be looked at.

Of the 75 per cent of goods carried by road, 48 per cent of haulage is for own account, meaning that companies run their own fleets to distribute their goods. Thirty per cent of road haulage is outsourced to professional haulage companies and the remaining 2 per cent is made up of rentals. Figure 4.10 illustrates South Africa's transport mode statistics for 1998. (CSIR, Freight Logistics Sector Project, 2004).

Figure 4.10 South Africa's transport modes.



Source: CSIR, Freight Logistics Sector Project, 2004

If the specialist rail export lines are excluded, the tonnage transported by rail has declined by nearly 20 per cent over the past decade. In contrast, road transport increased by more than 50 per cent over the same period (CSIR, Land Freight Market Analysis, 2003).

There are some disadvantages to using road transport in South Africa (CSIR, Freight Logistics Sector Project, 2004):

- High maintenance costs, high insurance costs and fleet vehicle financing costs,
- Empty back-hauling problem and
- Inadequate service standards that lack technologies, dial-in customer information, and web sites with customer interfaces for real-time tracking.

At the same time, the rail network in South Africa is in need of maintenance and upgrading. Compared to international standards, the rail freight network performs poorly on service reliability and cost. Rail freight is used for long distance; this is better suited for bulk transport. Rail freight in South Africa is decreasing because of costs and inefficiencies and this leads to an increase in road freight of rail-suited goods (CSIR, Freight Logistics Sector Project, 2004). Containerised export by means of road is increasing due to speed and cost advantages.

Certain roads and rail lines experience more traffic than others. This leads to the development of certain key road and rail lines as corridors to transport the bulk of exports to the ports. The next section identifies export corridors in South Africa.

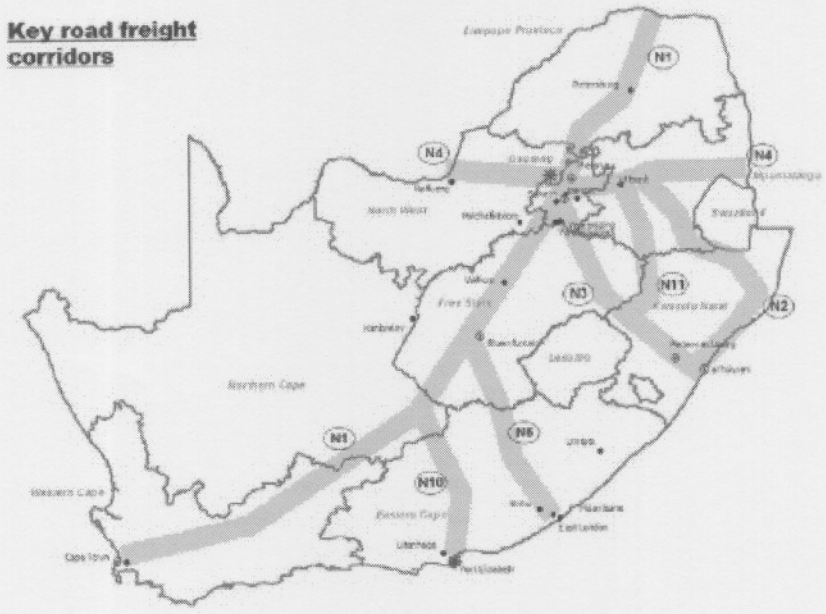
4.5 Export corridors in South Africa

South Africa has a unique domestic economy make-up, where most of the economic activity is still based in the inland areas. This led the government to change its focus to an efficient corridor-based railway system that links into harbours, both coastal and inland. This should ensure that exports are efficiently and cost-effectively handled and that the products will be delivered without inflationary pressures from freight transport (Creamer, 2005).

The majority of freight customers are geographically concentrated, requiring transport from dense industrial locations to ports (Department of transport, 1998:42). Between these nodes there are transport corridors of which Gauteng-Durban and Gauteng-Cape Town are the most important ones. The distance between the harbours and production sites makes the cost efficient transport of goods for the

export market important. Figure 4.11 and figure 4.12 show the most important road and rail corridors respectively.

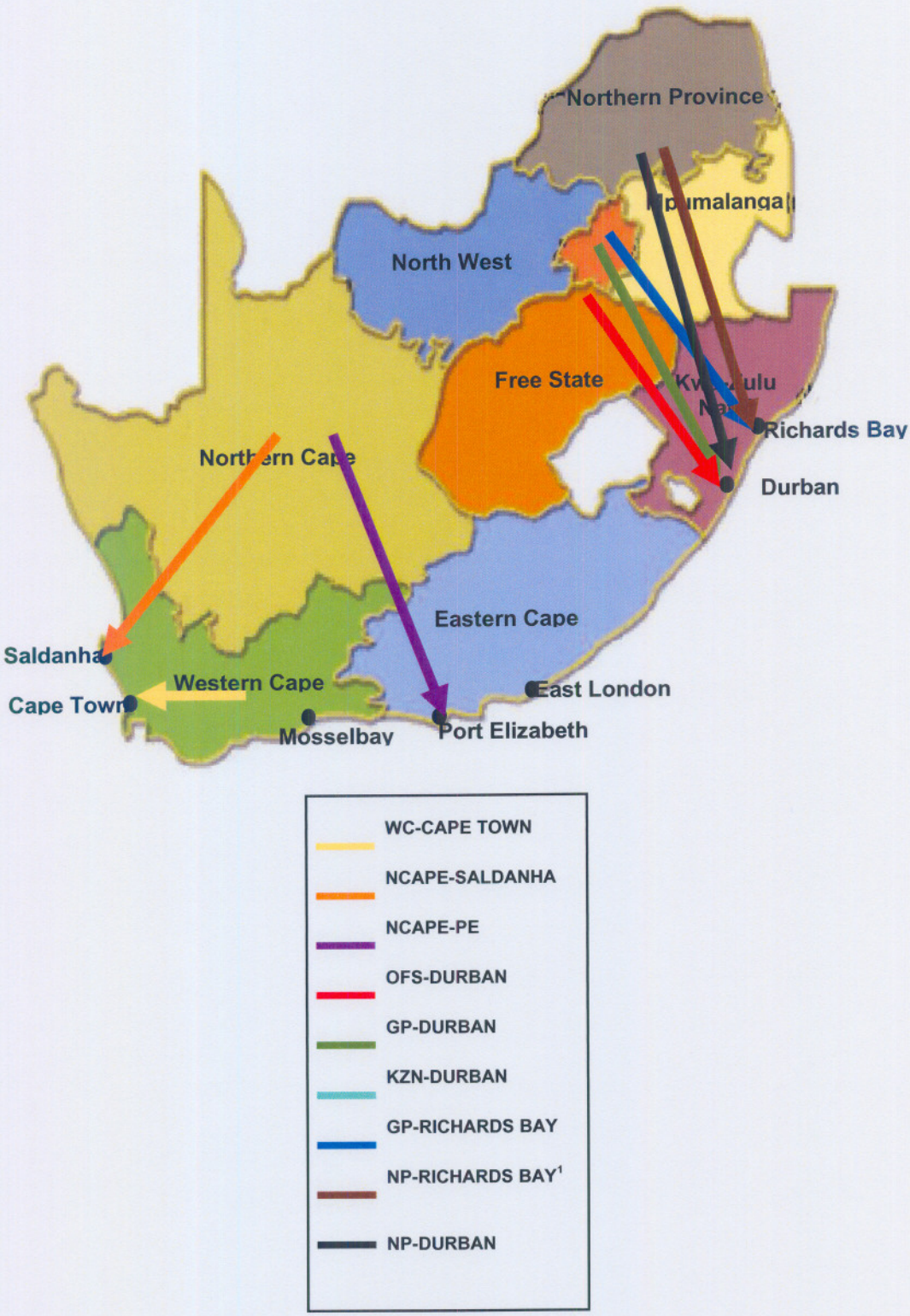
Figure 4.11 Key road freight corridors in South Africa



Source: CSIR, Land freight market analysis, 2004:74

From figure 4.11 it is interesting to see that all the roads lead to/from Gauteng. The road corridors go to 5 ports and 3 countries bordering South Africa. Most of the rail corridors in figure 4.12 come from the interior of the country to Durban.

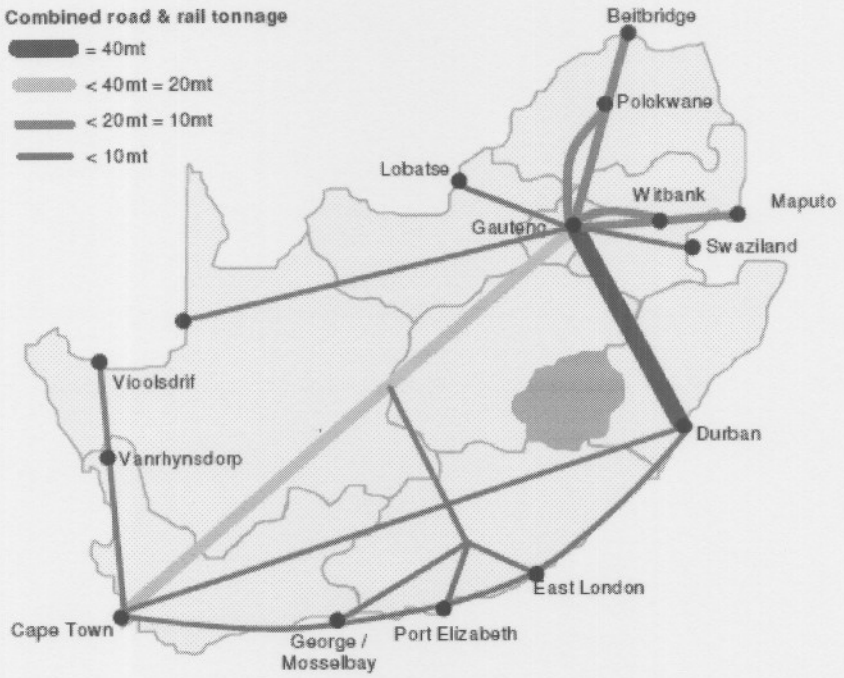
Figure 4.12 Main rail corridors in South Africa



Source: National Collaboration Blueprint, 2001

Freight transport of cargo export is concentrated between Gauteng and Durban and other smaller cargo flows. Freight transport is mostly from dense industrial locations that use transport corridors to move the goods to the export hub. The high usage of these corridors gives rise to high volumes of goods transported on these corridors.

Figure 4.13 Combined road and rail fright corridors in South Africa.



Source: First state of Logistics Survey, 2004:28

Figure 4.13 indicates that the Gauteng-Durban and Gauteng-Cape Town corridors are the corridors with the highest use. The Gauteng-Durban corridor transports more than 40 million tonnes and the Gauteng-Cape Town corridor between 20 and 40 million tonnes.

Table 4.5 Products transported by export corridors

Industry	Type of Cargo	Key Ports	Preferred Transort Mode	Key Rail Corridor	Key Road Corridors
Minerals Products	Bulk Cargo	Richards Bay, Saldanha	Rail	Gauteng-Richards Bay, Northern Cape-Saldanha	
Primary Chemicals	Bulk Cargo	Richards Bay, Durban	Rail	Northern Province-Richards Bay, Gauteng-Richards Bay	
Bulk Formulated	Bulk Cargo	Durban, Richards Bay	Road	-	Free State-Durban, Gauteng-Durban
Forestry	Break Bulk and Bulk	Durban, Richards Bay	Road	-	KZN-DBN
Food	Bulk and Containerized	Durban, Cape Town	Road	-	Free State,- KZN,- Northern Province,- Gauteng-Durban
Clothing	Containerized	Cape Town, Durban	Road	-	Northern Province-Richards Bay
Textiles	Containerized	Durban, Port Elizabeth	Road	-	Northern Province-Richards Bay
Non-precious metals	Bulk Cargo	Durban, Richards Bay, Saldanha	Rail	Gauteng-Richards Bay, KZN-Richards Bay	

Source: National blueprint collaboration, 2001

It is obvious from table 4.5 that there is a concentration of industries at certain locations. These goods are then transported by the most appropriate transport mode to the ports. The preferred transport mode for manufacturing products is by means of road transport with only bulk cargo transported by rail.

The next section will conclude this chapter and also describe the concentration of manufacturers in South Africa.

4.6 Conclusion

The majority of exports, by value, from South Africa are from the manufactured sector. Land freight transport is important for the transportation of goods in South Africa. While road freight is the most important way in which goods are transported in South Africa, it is not the most effective, nor the most cost efficient. With rail transport decreasing over the last decade and road freight transport increasing, the national authorities need to improve the efficiency, cost and reliability of Spoornet.

More than 90 per cent of manufactured exports are transported by sea. Durban is the most important harbour for manufactured exports from South Africa. Most of the

manufactured exports originate in Gauteng, while Durban and Cape Town also contribute a big part.

Cities with different sizes specialise in different types of economic activity. A study done by Holmes and Stevens (2004:229) to establish the relationship between geographic concentration and establishment size indicated that the manufacturing sector in the United States is established in the smaller cities. This is because the cost of shipping goods is lower than that of moving people. Manufacturers in small cities [3] can obtain scale economies by shipping to a national market. Holmes and Stevens (2004:229) show that manufacturing plants are small in large cities because those industries only engage in custom work; while plants in small cities are large and they produce standardised products that can be exported.

South Africa is not the same as America, and the situation of cities and manufacturers in South Africa differs from those in America. Cities are not as large as in America and historical and political differences influenced the economies of the two countries in different ways. If some changes were made in South Africa, the situation might change and manufacturing might be located at smaller cities. If road infrastructure, labour-skills, and basic services were to improve in smaller cities this might encourage manufacturers to locate at those locations. In South Africa, the rate of urbanisation to the major cities is increasing with the effect that the local market in smaller cities is reducing. This is one of the reasons that manufactured exports are predominantly an urban activity in South Africa. According to Banister and Berechman (2000:46), the classic location theory shows that land, labour and capital are the primary inputs to the production process.

Transport infrastructure determines the accessibility of places and therefore has a major impact on the location of industries. Some industries need to locate close to markets and others can locate to the hinterland, depending on the needs of the manufacturer. Improved transport infrastructure will improve firms' output and

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[3] Holmes and Stevens (2004:228) classified cities with less than 500 000 people as small cities.

accessibility through agglomeration. Better accessibility will increase the propensity of households to supply labour as an input in the production process.

Location is much more important now than in the past. Access to suppliers and markets has become less important than the availability of a skilled labour force, suitable land for development, a high quality environment, and car-based accessibility. These factors have led to development at the periphery of major urban areas (Banister and Berechman, 2000:46). In South Africa, there has been a slight decrease of the total value of manufactured exports from the 22 urban areas. In 1996 they produced 85.17 per cent of manufactured exports and in 2000 it was 83.85 per cent (Naudé and Gries, 2004:10).

Exports can take place from places with abundant natural resources. Cities that are further away from ports have higher transport costs for manufactured exports than cities located closer to ports. There is also an expectation that secondary cities have higher transport cost than metropolitan areas, although their distance from the port might be the same. This statement will be examined in the next chapter. It will describe South African cities and the export activities that take place in those places.

Chapter 5

Manufactured exports and secondary cities

5.1 Introduction

The theoretical discussion in chapter two provided a number of explanations of why certain places export. The factors that were mentioned as determinants of export performance included resource endowments, distance to ports, infrastructure, and government policies. In a recent study of South Africa, Naudé and Gries (2004) examined whether manufactured exports from the magisterial districts are influenced by economic geography or resource endowments (labour and capital). Their results showed that geography, especially distance, influenced exports from South Africa.

Distance creates transport costs, which can determine the location of manufacturing for export in South Africa. Natural resource availability in the presence of high transport costs creates incentives to establish near crucial inputs, therefore the greater proportion of manufactured exports will be located closer to ports to reduce the transport cost of exports (Naudé *et al*, 2004:13). They also found that transport cost, due to distance from ports, has a significant negative effect on exports. With poor infrastructure, the cost to transport will increase even further. To keep transport cost resulting from long distances to the ports as low as possible, it is necessary to have good transport infrastructure. They also found that population plays a role in exports. As a district's population declined, the volume of exports reduces (Naudé *et al*, 2004).

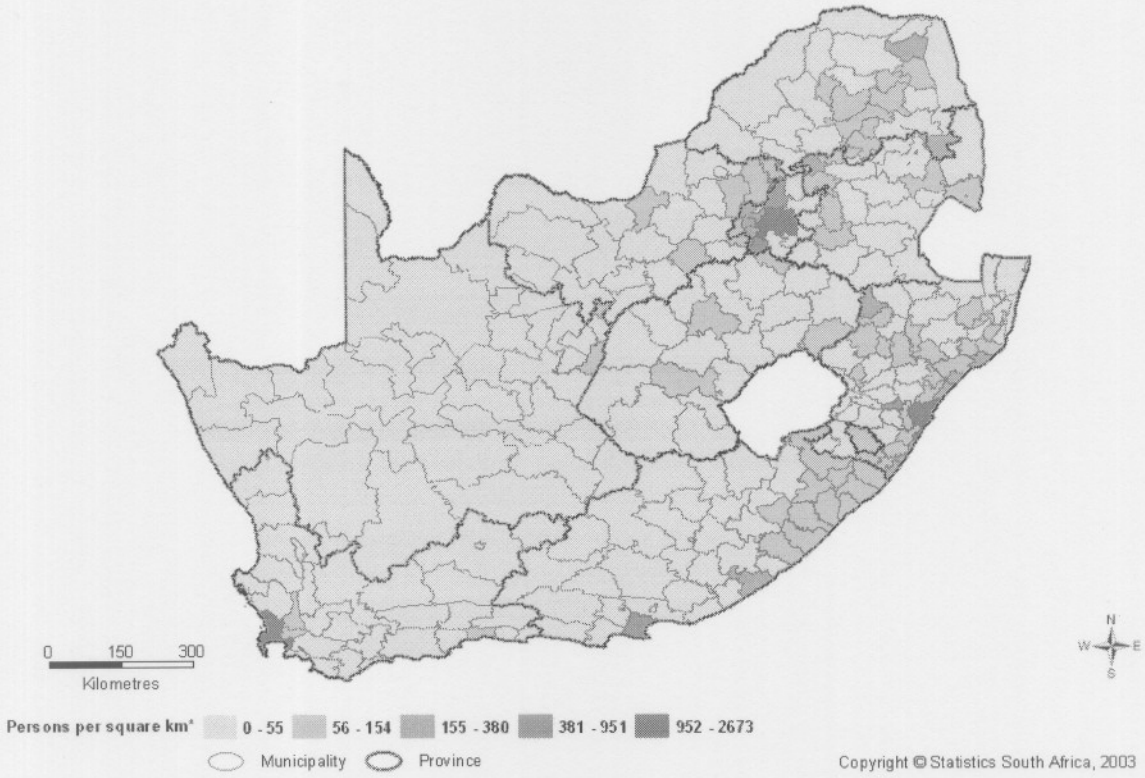
The previous chapter mentioned that most of South Africa's manufactured exports are from urban areas and the findings of Naudé *et al*, (2004) confirmed that larger populations tend to be associated with greater exports. Does this mean that secondary cities export less than metropolitan areas? The next section will describe and classify South African cities. After this, secondary cities can be identified and manufactured exports from these areas can be discussed.

This chapter will describe manufactured exports from cities, looking at the difference between metropolitan areas and secondary cities and present empirical research to demonstrate the factors that determine manufactured exports from secondary cities. The chapter will be structured as follows; Section 2 will describe the increase of urban population and the criteria for a city to be classified as a metropolitan area. Section 3 shows from what cities the most manufactured exports come from. Section 4 describes secondary cities and gives profiles of the secondary cities selected for the empirical analysis. Section 5 will compare localities and transport cost to determine whether it is more expensive to transport a manufactured good from secondary cities than from metropolitan areas in South Africa, while section 6 will show the regression results for the determinants of manufactured exports from secondary cities. Section 7 will conclude this chapter.

5.2 South African cities and population growth

South Africa has a population of around 42 million people and 58 per cent live in urban areas. As in every country in the world, South Africa is following the trend of urbanisation. In 1996, 53,7 per cent of the population was urbanised. This figure now stands at 58 per cent, compared to 34 per cent in sub-Saharan Africa. The urbanised percentage of the South African population is projected to rise to 64 per cent in 2030 (State of cities report, 2004). The largest concentrations of people live around the southern and eastern coast and in the interior of the country. The eastern part of the country has a higher population density than the western part and this is mostly due to the fact that the western part is dry and arid with little rainfall.

Figure 5.1 South Africa's population density, 2004



Source: Statistics South Africa, 2003

South Africa has a population density of 35 people per sq km and the highest density of people is in Gauteng (528.60 per sq km) (Regional Economic Focus, 2005). It is clear from figure 5.1 that there are 4 regions in South Africa where dense populations are present, Gauteng, Durban, Port Elizabeth and Cape Town. There are sporadic regions of medium density population spread over the country. Most of these areas are located in the interior and at the east coast of South Africa.

To classify an area as rural or urban depends on the definition of what is urban. Many countries agree that settlements with more than 20 000 people, and having a density greater than 1 000 persons per square kilometre, are urban (State of cities report, 2004). Cities in South Africa are classified according to the Municipal Structures Act of 1998. This Act classifies cities as metropolitan and other urban areas. The Municipal Structures Act states that the minister must declare which areas are metropolitan areas, but the Demarcation Board decides on the boundaries of those areas (DPLG, 2005). The Municipal Structures Act of South Africa classifies

municipalities as Category A (Metropolitan), Category B (Local) and Category C (District).

According to the Act, metropolitan areas must fulfil the following criteria;

- Areas of high population density.
- Intense movement of people, goods and services.
- Extensive development.
- Multiple business districts and industrial areas.
- A centre of economic activity with a complex and diverse economy.

If all these criteria are met, then the area can be declared a metropolitan area.

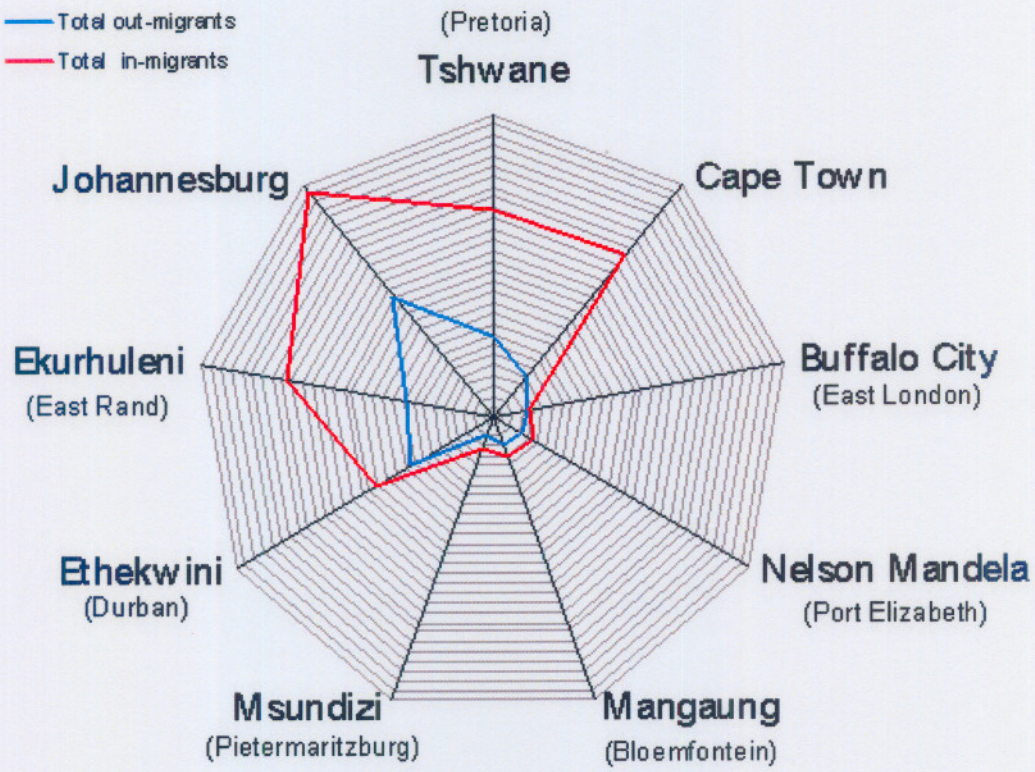
According to the Department of Constitutional Development (1999), the following places were considered candidates for Metropolitan areas;

- Johannesburg
- Durban
- Pretoria
- Cape Town
- East Rand
- Port Elizabeth
- Vaal
- East London
- Pietermaritzburg
- Bloemfontein

Not all of the above cities have been given metropolitan status because not all complied with all the relevant criteria, e.g. Port Elizabeth does not have sufficient overall population size and numbers of councillors to justify metropolitan status and the Vaal's structure of its economy is far simpler than that of the much larger and more distinctly metropolitan parts of the country (DPLG, 2005). Currently there are 5 cities that have metropolitan status; Greater Johannesburg, Greater Cape Town, *Greater Durban, Greater* East Rand and Greater Pretoria. These areas all have high *population densities and a diversity of economic activities (DPLG, 2005).*

All the above cities have experienced an increase in population growth due to urbanisation. Changes in their population growth are visible in figure 5.2.

Figure 5.2 City population trends (1996-2001)



Source: State of cities report, 2004

Population trends in South Africa since 1990 changed to the degree that there is a concern that continued fast urbanisation would overwhelm the capacity of cities to accommodate all residents (State of cities report, 2004). As figure 5.2 indicates Johannesburg, Tshwane (Pretoria), Cape Town and Ekurhuleni (East Rand) are the cities where population growth is the highest.

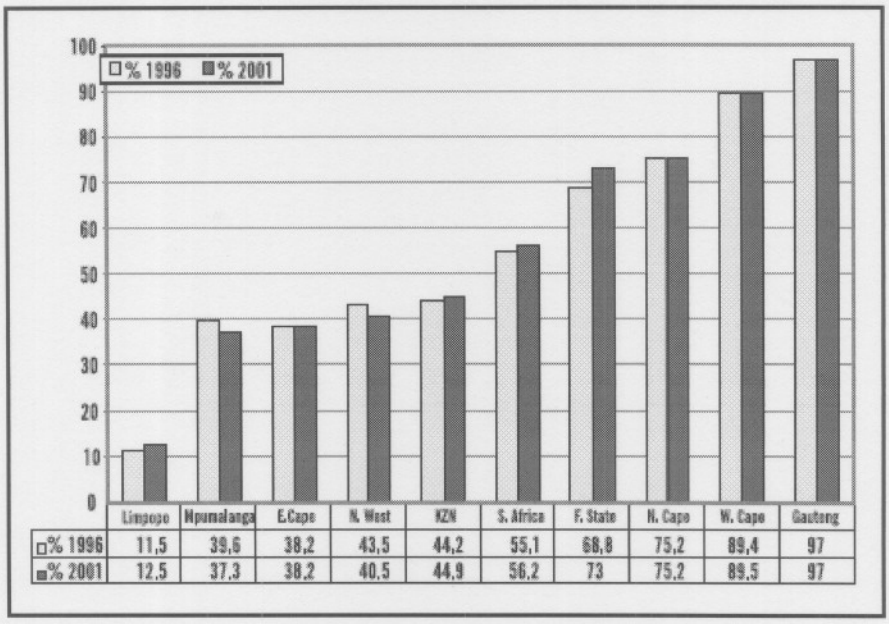
Table 5.1 Population growth rate (%) in Metropolitan cities for 1996-2001

Ekurhuleni (East Rand)	4.12
Johannesburg	4.10
Tshwane (Pretoria)	3.37
Cape Town	2.45

Source: State of cities report, 2004

The phenomenon of people moving to the cities from rural areas is a feature of the developing world. These changes have implications for the development of rural and urban areas in South Africa. Figure 5.3 show the increase in population living in urban areas in 2001 compared to 1996.

Figure 5.3 Population living in urban areas in 1996 and 2001



	Limpopo	Mpumalanga	E.Cape	N. West	KZN	S. Africa	F. State	N. Cape	W. Cape	Gauteng
% 1996	11,5	39,6	38,2	43,5	44,2	55,1	68,8	75,2	89,4	97
% 2001	12,5	37,3	38,2	40,5	44,9	56,2	73	75,2	89,5	97

Source: State of cities report, 2004

A reduction in the rural population and the migration of skilled labour to the larger cities implies that specialised industries close down in smaller towns. The manufacturing and service sectors locate in cities where market share is large, where knowledge spillovers occur, and where labour skills are high. This means

there is agglomeration and concentration of economic activity and firms in the region.

Agglomeration of economic activities in cities and towns brings many benefits including economies of scale and scope, localisation economies (firms locating close to firms in the same industries) and urbanisation economies, together with less vulnerability to economic fluctuations because of a diversified economic base (World Bank, 2001). Bigger cities can overcome problems such as economic fluctuations because of greater diversity, but smaller cities rely mostly on one or two sectors of specialisation.

The sector in the South African economy that has the largest proportion of exports is the manufacturing sector. This is also a sector that employs a large proportion of the South African workforce and, to indicate the importance of this sector, government wants to have an economy that is export-led with manufacturing providing the greatest contribution to growth and development. Then the question is which South African cities contribute the most toward manufactured exports?

Each city has its share in manufactured exports, and this feature will be discussed in the next section. This will give a better understanding of the location of manufactured export production in South Africa.

5.3 Manufactured exports from cities

Table 5.2 shows the 20 places in South Africa with the greatest contribution to manufactured exports. The metropolitan areas are the regions that show the highest proportion of manufactured exports. Gauteng, consisting of Johannesburg, Randburg, Boksburg, Germiston, Kempton Park, and Pretoria contribute 39,94 per cent of the total manufactured exports in value from South Africa. Cape Town, Belville and Wynberg in the Western Province account for 7,06 per cent and Durban-Pietermaritzburg, 11,32 per cent.

Naudé *et al*, (2004:12) found that there are locations where different manufacturing sectors cluster. At the coast (Port Elizabeth, Cape Town and Durban) the chemicals,

textiles, and wood exports locate while the metals, electrical components, and furniture are located in the interior (Johannesburg, Pretoria and Kimberley). The manufacturing sectors located at the interior supply most of their output to the mining sector.

Table 5.2 Manufactured exports from South Africa during 2001

Place	Proportion of total manufactured exports in 2001
Johannesburg	18.77%
Durban	9.70%
Lower Umfolozi	7.29%
Randburg	7.25%
Pretoria	7.21%
Cape Town	4.76%
Port Elizabeth	4.19%
Kimberley	3.62%
Uitenhage	3.42%
Kempton Park	2.52%
Germiston	2.29%
Rustenburg	2.03%
Pietermaritzburg	1.62%
East London	1.60%
Umzinto	1.33%
Belville	1.22%
Vredenburg	1.11%
Wynberg	1.08%
Witbank	0.98%
Boksburg	0.92%

Source: Own calculations using data from Global insight (2005)

Most of the places in table 5.2 are part of metropolitan areas. Places such as Kimberley, Rustenburg and Witbank are the only secondary cities that contribute a large part to manufactured exports from South Africa. The share of manufactured exports from other cities excluding metropolitan areas is 18,37 per cent (Global Insight, 2005). This is almost the same proportion as that of Johannesburg.

Metropolitan areas mostly have manufactured exports with secondary cities not contributing that much to the total amount. A factor that can contribute to this is the difference in population size between metropolitan areas and secondary cities. Dense populations increase a firm's market and also increase the proportion of

skilled workers available. Population is not the only determinant of manufactured exports. According to Naudé *et al*, (2004) policies should support lower domestic transport cost and increase local investment in order to promote exports. This will improve a region's market access and help increase economic growth and exports.

Is the share of manufactured exports from secondary cities so low because of lower population, distance to ports, infrastructure (such as national roads and rail tracks), or transport cost of manufactured goods? To answer this, an empirical analysis will be presented in section 5.6.

The next section will describe secondary cities in South Africa and thereafter profiles of various secondary cities will be discussed.

5.4 Secondary cities in South Africa

Secondary cities are fairly significant urban settlements that are usually surrounded by smaller and even very small urban and rural settlements (Community law centre, 2001). There are certain differences between secondary cities (smaller cities) and metropolitan areas. First, it can be noted that densities of smaller cities decline more rapidly with distance from the centre than is the case with large cities. Smaller cities are more likely to have a single, well-defined centre with simpler density patterns surrounding it. In the larger cities, the concentration of jobs in financial and services sectors tends to be much higher than in the smaller cities (DPLG, 2005).

Secondary cities are characterised by smaller populations, a less diversified economic base, and less-well developed infrastructure. Like many secondary cities, most in South Africa have been dominated historically by primary sector activities, usually agriculture or mining. In general, secondary cities in South Africa lack the ability to diversify their economic base while the primary sector declines steadily (Pillay, 2005). The more diversified a city and economy, the better it will perform during recessions.

International evidence suggests that manufacturing should be a major component of economic activity in secondary cities (Pillay, 2005). In all towns there is a relatively

large proportion of the population in 'elementary occupations', such as unskilled workers. Skills development and upgrading would appear to be an urgent need, and a necessary condition for economic growth and development in these areas (Pillay, 2005).

Across the developing world secondary cities are witnessing a growth in their populations due to rural-urban migration (Pillay, 2005). The populations of some secondary cities in South Africa are growing faster than those of some of the large cities. Polokwane and Rustenburg are secondary cities that grew at over 3.5 per cent per annum since 1996 (State of cities report, 2004).

The increase in population brings benefits, but also puts pressure on local government. Support to these people in the form of basic services such as infrastructure provision (schools, houses, sanitation etc.), employment, and skills acquisition must be provided by the local municipality. On the positive side, the migration from the rural areas to secondary cities leads to a bigger market for goods and products to be sold. It can also lead to bigger and more efficient manufacturing industries to provide for the local market (Pillay, 2005). With increasing population growth in secondary cities, the manufacturing sector would be a good employer for the unemployed.

Increasing densities in towns and cities, and the greater connectivity between cities, as well as between urban and rural areas, increases the catchment area of markets, and the returns to economic enterprise (Pillay, 2005:3).

Economic development of a country starts in the cities. When cities have economic growth and development, a country's economic situation improves. There cannot be an increase in manufactured exports from South Africa if cities do not increase their share in manufacturing production. Infrastructure development and policies at local government level can help stimulate manufacturing production in South African cities.

Infrastructure provision to secondary cities is a problem that hinders the development of manufactured exports. If local government could develop and

implement good transport infrastructure, manufacturing firms might relocate and develop in those areas (Banister and Berechman, 2000). As mentioned by Banister and Berechman (2000:4), there is a link between growth in transport investment and economic growth. If a road network is improved, firms can use the transport system to their advantage to minimise cost. Accessibility to world markets is very important for manufactured exports.

The quality of the land freight transport determines both the volume and value of goods that can be exported, assuming that there is a demand for the goods. Accessibility to markets reduces the time goods need to travel before arriving at the destination. The less time goods need to travel, the lower the cost of transport will be. That is why transport infrastructure is so important. New transport investment raises the profile of an area and local development is promoted by the quality of the new transport infrastructure. A lack of infrastructure may work against the attractiveness of an area (Banister and Berechman, 2000:29).

Policies to establish a culture of manufactured exports are also needed at local level. This will enable manufacturers to locate at certain locations (secondary cities).

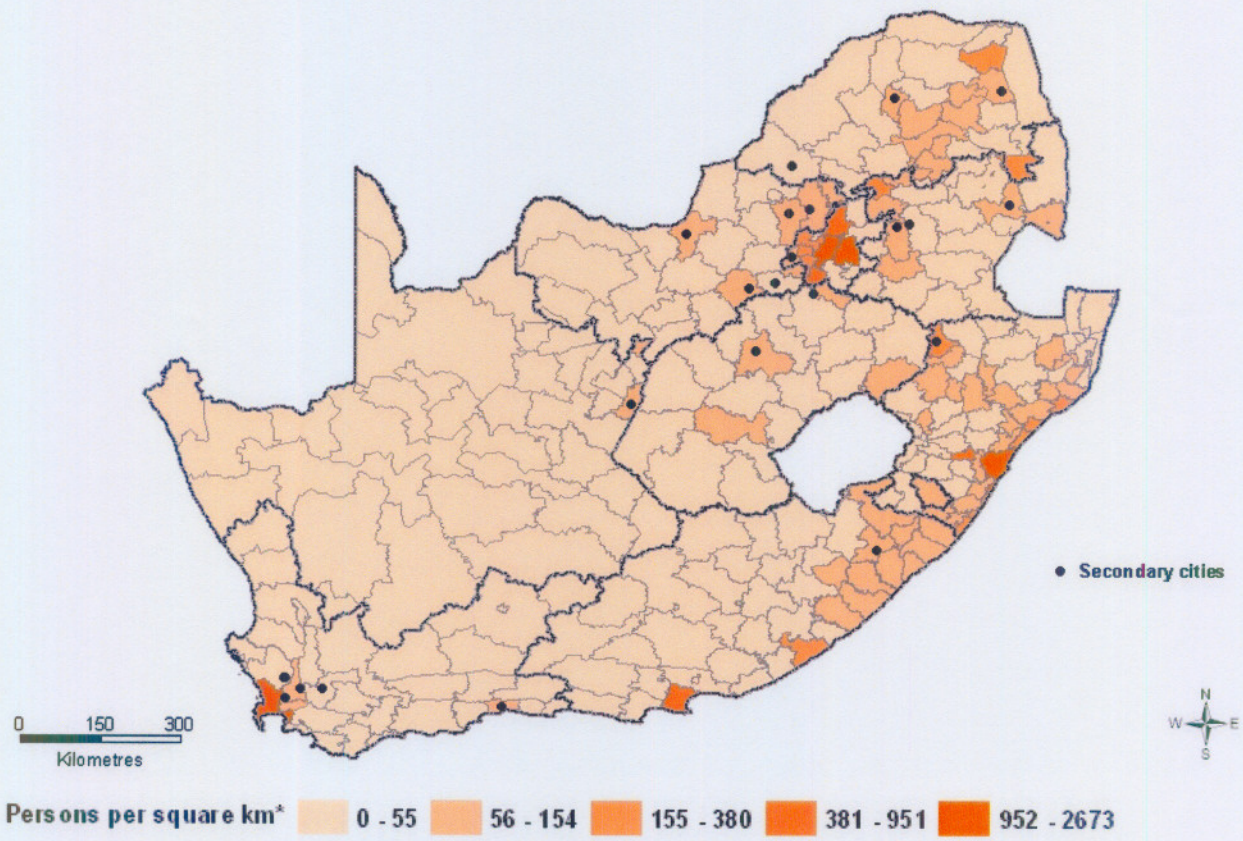
5.4.1 Profile of secondary cities

A sample of 22 secondary cities was chosen as part of the empirical analysis of this study. These cities will be described in this section.

There is no formal definition of what classifies a city as a secondary city in South Africa, apart from the characteristics outlined by the DPLG (2005), which were mentioned in the previous section. For the purpose of this study, 22 places were identified as secondary cities. All the cities that were selected had, in total, a GDP greater than R3,8 billion during 2004. They are also not part of, or near, a metropolitan area. The list of the cities is attached as Appendix A. The data that were used come from Global Insight's, Regional Economic Focus (REF). Figure 5.4 indicates the location of the 22 cities selected. From figure 5.4 it is clear that most of these cities are located around and close to Gauteng and a smaller concentration in the Western Cape close to Cape Town.

It is expected that, as the distance from markets increases, the transport cost of a manufactured good will be greater. For that reason, manufacturers will locate as closely as possible to places where market accessibility is high. That is why there is a dense concentration of cities around Gauteng.

Figure 5.4 shows the 22 secondary cities in South Africa that were selected for the research.



Source: Statistics South Africa, 2003

Each city has unique economic and environmental conditions and these will be briefly discussed (also see Appendix A).

5.4.1.1 Specific Socio-Economic characteristics

Rustenburg

Of the 22 places in the sample, Rustenburg is the city with the highest gross domestic product and this GDP is the 7th highest in South Africa. The city is located 100 km to the west of Pretoria in the North West province. It is the largest city in the North West province with 446 234 people, and has had an average GDP growth rate of 6,7 per cent (1997-2004).

Population (2004)	446 234
Population density (2004)	54.67
GDP growth rate (1997-2004)	6,7 %
Manufactured exports (2001)	2.03 %
Rainfall	676.53 mm

Source: Global Insight, 2005

Only 47.2 per cent of the population is economically active. This figure comprises 54 per cent of men and 38.6 per cent of women. The proportion living below the Poverty Datum Level (PDL) is 26.7 per cent. Of the total number of people living in the North West province and having a bachelor's degree, 11.5 per cent work in Rustenburg. Mining is the primary activity, with platinum mining the most important mining activity. Only 5,9 per cent of the workforce work in the manufacturing sector.

Middelburg

Middelburg is located in Mpumalanga along the N4, which is one of South Africa's national highways en route to Maputo in Mozambique. Middelburg has a population of 177,373 and an average population growth rate of 1,7 per cent (1996-2004).

Population (2004)	177 373
Population density (2004)	31.10
GDP growth rate (1997-2004)	3,2 %
Manufactured exports (2001)	0.01 %
Rainfall	834.08mm

Source: Global Insight, 2005

Just over 37 per cent of the people are living below the PDL. Education is relatively high. Of the total number of people living in Mpumalanga and having a bachelor's degree, 12.1 per cent work in Middelburg.

Agriculture and service delivery are the main sectors in the city economy. The agriculture sector employs 10.7 per cent of the population and the manufacturing sector employs 11.7 per cent.

Witbank

Witbank is just 30 km west of Middelburg and has a population of 262 570 people. Between 1996 and 2004 the population growth was 1,7 per cent. The city is surrounded by grassy plains and is situated on the Highveld, where it is the largest coal producing area in Africa.

Population (2004)	262 570
Population density (2004)	92.23
GDP growth rate (1997-2004)	2,0 %
Manufactured exports (2001)	0,98 %
Rainfall	546.91mm

Source: Global Insight, 2005

The manufacturing sector employs 16 per cent of the workforce, but the mining and electricity sectors contribute the most to the local economy.

Sasolburg

The city is situated in the North of the Free Sate province close to Vanderbijlpark and Vereeniging. It has a population of 116 186 with a population growth rate of 0,8 per cent (1996-2004). Of the total number of people living in the Free State province and having a bachelor's degree, 6.8 per cent work in Sasolburg.

Population (2004)	116 186
Population density (2004)	118.90
GDP growth rate (1997-2004)	4,2 %
Manufactured exports (2001)	0,45 %
Rainfall	640 mm

Source: Global Insight, 2005

Only 44.8 per cent of the population is economically active. This figure comprises 47.9 per cent of men and 41.3 per cent of women. Manufacturing (employing 26.7

per cent of the workforce) and electricity generation are the most important sectors and the town has a massive coal-to-oil conversion plant.

Klerksdorp

Klerksdorp is the city with the second highest population in the sample and is located in the south of the North West province. Gold is mined outside of the city and plays an important role in the local economy.

Population (2004)	382 898
Population density (2004) km^2	121.09
GDP growth rate (1997-2004)	-2,3 %
Manufactured exports (2001)	0,02 %
Rainfall (annual)	618.20mm

Source: Global Insight, 2005

The negative GDP growth rate in the city is mainly due to the decrease in mining activity and the diminished role that mining is beginning to play in the South African economy. Other cities such as Welkom and Oberholzer, which also depend on mining activity, show a similarly negative economic growth rate. Diversification of their economic structure needs to take place to improve the economic outlook of the regions. Only 3,2 per cent of the workforce work in the manufacturing sector.

Nelspruit

This is the capital city of Mpumalanga and is situated about 65 km west of the Mozambique border. Nelspruit is a commercial hub for the region's rich agricultural sector, and its industries still include canneries for citrus fruits and vegetables as well as timber mills, wood pulp and paper mills, furniture manufacturers, and light engineering factories (Encarta, 2005).

Population (2004)	71 740
Population density (2004)	32.79
GDP growth rate (1997-2004)	3,7 %
Manufactured exports (2001)	0,50 %
Rainfall	730.70mm

Source: Global Insight, 2005

Poverty is a problem, as in most of the cities in South Africa, with 27,6 per cent of the population living below the PDL. Agriculture and manufacturing are the sectors

that contribute the most to the local economy. Agriculture (16 per cent) and manufacturing (11,4 per cent) are the important employers.

Thabazimbi

The city is situated in the south of the Limpopo province. This is one of three cities in the Limpopo province in this study and all of them are smaller and have less population density than the other sample cities. The primary sector is mining and there are no manufactured exports from here.

Population (2004)	68 515
Population density (2004)	6.60
GDP growth rate (1997-2004)	3,4 %
Manufactured exports (2001)	0 %
Rainfall	624.94mm

Source: Global Insight, 2005

Only 3,4 per cent of the population is employed in the manufacturing sector, which caters for local demand. There is not much skilled labour, and only 1,2 per cent of the total number of people living in the Limpopo province and having a bachelor's degree work here.

Kimberley

Kimberley is the capital city of the Northern Cape. The principal industries include diamond-cutting, the processing of lime and tungsten, and the manufacture of cement and bricks (Encarta, 2005). It is a dry region without much rain. Most of the province's educated people live in Kimberley with 35,5 per cent of the total number of people in the province having a bachelors degree living in the city.

Population (2004)	241 628
Population density (2004)	56.56
GDP growth rate (1997-2004)	3,7 %
Manufactured exports (2001)	3,62 %
Rainfall	293.15mm

Source: Global Insight, 2005

Mining is the most important sector in the city while only 5,3 per cent of the people work in the mining industry.

Oberholzer

This city is situated to the west of Johannesburg and is mainly a gold mining city. This city has the highest population density of all the cities in the sample because urbanisation is 98,2 per cent. Only 3 per cent of workers work in the manufacturing sector.

Population (2004)	202 120
Population density (2004)	471.09
GDP growth rate (1997-2004)	-2,7 %
Manufactured exports (2001)	0,01 %
Rainfall	560.68mm

Source: Global Insight, 2005

Phalaborwa

This is an important mining town in the north-east of the Limpopo province. It has major deposits of phosphates, copper, uranium, and iron ore and is also the site of ancient African mining activities (Encarta, 2005). The population density is very low and this is also the city with the least number of people in the sample for this study.

Population (2004)	37 118
Population density (2004)	3.46
GDP growth rate (1997-2004)	9,1 %
Manufactured exports (2001)	0,62 %
Rainfall	568.24mm

Source: Global Insight, 2005

Mining is the most important sector and only 1 per cent of the population work in the manufacturing sector.

Paarl

Paarl is located in the Western Cape and is a busy commercial, market, and processing centre for the surrounding agricultural area in which fruit, olives, and tobacco are grown. Paarl is also an important centre of viticulture, with local wines having an international reputation for their quality. Paarl is a tourist destination on the Paarl Wine Route (Encarta, 2005).

Population (2004)	177 273
Population density (2004)	162.40

GDP growth rate (1997-2004)	1,7 %
Manufactured exports (2001)	0,61 %
Rainfall	938.63mm

Source: Global Insight, 2005

Agriculture is the main sector (25,9 per cent of employment) in the city with the wine industry contributing the most to the local economy. Manufacturing employment in the city is 17,9 per cent.

Welkom

Located in the centre of the Free State province, it is 160 km north-east of Bloemfontein. The city draws its wealth from gold and uranium mining. In addition to mining, there are numerous other industries, including sawmilling, steel working, and meat processing (Encarta, 2005).

Population (2004)	294 562
Population density (2004)	458.47
GDP growth rate (1997-2004)	-3,6 %
Manufactured exports (2001)	0,03 %
Rainfall	253.65mm

Source: Global Insight, 2005

Only 2,8 per cent of the workforce is employed in the manufacturing sector. The economically active portion of the population is 59.6 per cent, and most of these people work on the mines.

Pietersburg

This is the capital of Limpopo Province with 76 394 people. As well as being the seat of the provincial government, it provides services for the surrounding agricultural area, where cattle ranching predominates. It is on the Cape to Cairo (or "Big North") road, as well as being an important railway centre for trade with Zimbabwe. Its airport has scheduled connections with Johannesburg (Encarta, 2005).

Population (2004)	76 394
Population density (2004)	11.91
GDP growth rate (1997-2004)	0,5 %
Manufactured exports (2001)	0,26 %
Rainfall	684.50mm

Source: Global Insight, 2005

The agricultural sector employs 20 per cent of the workforce and only 4,5 per cent work in the manufacturing sector.

Newcastle

The city is located in KwaZulu-Natal and it is an industrial town, its economy centred on the nearby coal mines and the town's steelworks.

Population (2004)	363 466
Population density (2004)	164.93
GDP growth rate (1997-2004)	2,5 %
Manufactured exports (2001)	0,18 %
Rainfall	684.73mm

Source: Global Insight, 2005

Most of the employed work in the manufacturing sector (27,4 per cent).

Mmabatho

This is the capital city, along with nearby Mafikeng, of the North West province and is just 20 km south of the Botswana border. Poverty is very high, with 58.2 per cent living below the PDL, and only 38,7 per cent of the population is economically active.

Population (2004)	292 103
Population density (2004)	37.81
GDP growth rate (1997-2004)	2,6 %
Manufactured exports (2001)	0 %
Rainfall	450.85mm

Source: Global Insight, 2005

Services and agriculture are the most important sectors, while only 4,4 per cent of the workforce work in the manufacturing sector. Mmabatho is the city in the North West province with the highest proportion of people having a bachelor's degree, yet Mmabatho has no manufactured exports and very high poverty statistics. This is because most of the educated people work for the provincial government.

Worcester

Viniculture is an important local industry (the fertility of the surrounding rich farmland allows huge quantities of grapes to be grown) and the wines of the region are enjoying increasing prominence and popularity. Other industries in the region include

brandy distillation, fruit growing, sheep farming, food processing, and textile production (Encarta, 2005).

Population (2004)	149 498
Population density (2004)	36.65
GDP growth rate (1997-2004)	2,1 %
Manufactured exports (2001)	0,25 %
Rainfall	250.53mm

Source: Global Insight, 2005

Only 44.6 per cent of the population is economically active. The proportion living below the Poverty Datum Level (PDL) is 23.5 per cent. The agricultural sector employs 40.9 per cent of the workforce and 9,3 per cent are employed in the manufacturing sector.

Stellenbosch

Stellenbosch is the second oldest settlement in South Africa after Cape Town, and is situated in the Western Cape. This is also a wine producing area with a large proportion of employment in agriculture (17,3 per cent). Population growth rate is 1,2 per cent (2004).

Population (2004)	89 160
Population density (2004)	205.73
GDP growth rate (1997-2004)	2,7 %
Manufactured exports (2001)	0.65 %
Rainfall	940.32mm

Source: Global Insight, 2005

This is the city with the lowest level of poverty in the sample of 22 secondary cities (14,5 per cent living below the PDL). Stellenbosch is relatively developed and it has a high proportion of its population with access to services.

Malmesbury

Malmesbury is situated in the Western Cape about 60 km North of Cape Town. The city has a population growth rate of 0,9 per cent (1996-2004). Most of the employment is in the agricultural sector (26,8 per cent) and the manufacturing sector (27,1 per cent).

Population (2004)	131 095
Population density (2004)	40.61
GDP growth rate (1997-2004)	1,5 %
Manufactured exports (2001)	0,11 %
Rainfall	388.56mm

Source: Global Insight, 2005

George

The city is situated in the Western Cape about 440 km to the east of Cape Town. The main industries of George are wood-related, including furniture manufacturing, sawmilling, boat building, and the construction of prefabricated houses for forestry workers (Encarta, 2005). Poverty is also lower than in some of the other cities, only 17,6 per cent of the population live below the PDL. Only 44,4 per cent of the population is economically active.

Population (2004)	130 990
Population density (2004)	52.97
GDP growth rate (1997-2004)	5,5 %
Manufactured exports (2001)	0,03 %
Rainfall	714.86mm

Source: Global Insight, 2005

Manufacturing makes a meaningful contribution to the local economy and 15 per cent of the total employment is engaged in the manufactured sector.

Potchefstroom

The city is located in the eastern parts of the North West province, about 100 km south-west of Johannesburg. With its university, the town is a leading centre of religious, educational, and cultural activities, and the economy of the town is based on these and attendant white-collar professions, such as publishing (Encarta, 2005). Education is relatively high as 14,3 per cent of the total number of people living in North West and having a bachelor's degree work in Potchefstroom.

Population (2004)	193 157
Population density (2004)	49.87
GDP growth rate (1997-2004)	1,0 %
Manufactured exports (2001)	0,14 %
Rainfall	626.91mm

Source: Global Insight, 2005

Potchefstroom serves as the area's principal centre of agricultural research and this is also the main economic activity (15,6 per cent of the workforce). Manufacturing employs 6.8 per cent of the workforce and 40.3 per cent live below the PDL.

Umtata

The primary economic activities in the area are subsistence agricultural and raising livestock. Industries include the manufacturing of textiles, wood products, foodstuffs, and the processing of tobacco (Microsoft Encarta, 2005).

Population (2004)	292 112
Population density (2004)	163.6
GDP growth rate (1997-2004)	2,4 %
Manufactured exports (2001)	0 %
Rainfall	620.41mm

Source: Global Insight, 2005

The manufacturing sector employs 4.1 per cent of the workforce and the agricultural and service sector contribute the most to the local economy. Poverty is very high, with 63,3 per cent living below the PDL, and only 30,7 per cent of the population is economically active.

Brits

Brits is 40 km to the west of Pretoria in the North West province. Most of the people work in the agriculture sector (35,7 per cent of the workforce), and 47.1 per cent of the population is economically active.

Population (2004)	192 176
Population density (2004)	63.66
GDP growth rate (1997-2004)	-0,3 %
Manufactured exports (2001)	0,70 %
Rainfall	529.99mm

Source: Global Insight, 2005

This is one of the secondary cities with the greatest value of manufactured exports, and 10,9 per cent of the workforce are employed in this sector.

In conclusion, it can be said that each city has its unique economic structures and in each city there is one sector that is more important than the others. It is necessary to have a diversity of economic activity and to increase the share of other sectors' roles

in the local economy, especially manufacturing. This will lessen the impact of recessions on employment and other economic factors. According to Luus (2005:97) South African cities that have a diverse economy grew more quickly than places that specialise in one sector. The next section will describe whether the secondary cities have the potential to increase their share in manufactured exports by having an advantage in distance and rail cost.

5.5 Comparing localities and transport costs

In this section, the transport cost of manufactured goods from secondary cities will be compared to the transport cost of manufactured goods from metropolitan areas. This is to determine whether it is more cost efficient to transport a manufactured product from a metropolitan area or from a secondary city.

Previously, it was shown that Durban is the harbour that handles the greatest value of manufactured exports from South Africa. For this reason, the cost to transport a manufactured good by rail from various cities to Durban will be used to determine whether manufacturers in secondary cities have higher transport cost than those in metropolitan areas. Throughout the study it was mentioned that road transport is important for manufactured exports from South Africa. Unfortunately data for road transport cost are not readily available, and therefore this comparison, the empirical model, and the regression results presented in the following section only include the cost of transporting manufactured exports by rail.

As was argued in chapter 1, transport costs of manufactured exports from secondary cities in South Africa are greater than from metropolitan areas: therefore geography (distance) and infrastructure play a role in the location of manufacturing industries.

To evaluate this statement, secondary cities and metropolitan areas are compared in terms of distance to Durban, rail transport cost, and infrastructure development. Cities will be compared by calculating the rail cost per kilometre from their location to the destination. Spoornet supplied transport cost data for a 12-metre container of manufactured goods transported by rail between the secondary cities and Durban,

as well as the distances between these cities and Durban. The goods that are shipped are homogenous.

Table 5.3 shows the cost per kilometre for a container transported by rail from various secondary cities and metropolitan areas to Durban. The cities in bold type are the metropolitan areas. From the table it is interesting to see that rail cost per kilometre is the lowest for five secondary cities and thereafter for the metropolitan areas. It seems as though distances between 790 km and 880 km from Durban have the lowest cost per kilometre. As distance increase above 880 km or drop below 790 km, the cost per kilometre increases. Rustenburg has the lowest cost per kilometre, but the distance from the port makes the total rail cost higher.

Table 5.3 Rail cost per kilometre excluding the forward cartage price.

Place	Rail cost per km	Distance to Durban by rail (km)	Rail cost	Rank
Rustenburg	7.59	874	6632	1
Potchefstroom	7.63	791	6036	2
Oberholzer	7.64	790	6036	3
Middelburg	8.09	820	6632	4
Brits	8.09	820	6632	5
Witbank	8.28	801	6632	6
Johannesburg	8.38	720	6036	7
Pretoria	8.67	765	6632	8
Bloemfontein	8.74	784	6856	9
Welkom	9.98	687	6857	10
Umtata	9.99	1603	16019	11
Malmesbury	11.23	1998	22432	12
East London	11.44	1400	16019	13
Stellenbosch	11.49	1953	22432	14
Port Elizabeth	11.61	1485	17242	15
Paarl	11.66	1924	22432	16
Cape Town	11.70	1918	22432	17
George	11.77	1697	19968	18
Worcester	12.41	1807	22432	19
Phalaborwa	12.48	1083	13517	20
Pietersburg	12.87	1050	13517	21
Kimberley	13.05	953	12436	22
Mmabatho	13.21	1023	13517	23
Thabazimbi	13.36	1012	13517	24
Nelspruit	13.70	830	11367	25
Klerksdorp	13.83	744	10289	26
Sasolburg	15.15	711	10772	27
Newcastle	17.37	406	7053	28

Source: Own Calculations and Spoornet data, 2005

Cities with the lowest rail cost are Potchefstroom, Oberholzer, and Johannesburg. Figure 5.5 shows the locations from where the cost per kilometre is the lowest. If the rail cost of Newcastle, the closest city to Durban, is compared to that of Rustenburg, it can be seen that it is cheaper to export from Rustenburg than from Newcastle, even though the distance from Rustenburg is greater. With the rail cost data in the above table, it is clear that the secondary cities at the top of the table can compete with metropolitan areas in terms of cost, assuming no other costs are included. In this sample the three places from where manufactured exports by rail are the most cost efficient are, Potchefstroom, Oberholzer and Johannesburg.

The situation changes when the other costs are included, such as forwarding cartage cost. The forwarding cartage cost applies when an empty container is transported by road from an inland port to the secondary city. Some of the cities have the necessary rail infrastructure and do not need forwarding cartage. The export goods are then loaded into the container and will be transported by rail to Durban from the city. The right side of table 5.4 shows the forwarding cartage prices.

Figure 5.5 Cities from where the rail transport cost per kilometre is the least.

From the above evidence, it can be concluded that the potential exists for manufacturing firms to export from some secondary cities. Distance plays a role in the cost of rail transport although, for example, the cost to transport from Newcastle is more than from cities located further in the interior. The implication of this is that possible infrastructure development in Potchefstroom, Rustenburg and Oberholzer could lead to increased manufactured exports from these regions, transported by rail. It must be remembered that only a small percentage of manufactured exports are transported by rail from South African cities. It was mentioned in chapter 4 that most of South Africa's manufactured exports are transported by road. If it were possible to calculate the cost of road transport for manufactured exports, other conclusions may have been drawn.

Earlier, it was mentioned that Naudé *et al*, (2004) studied the importance of geography and factor abundance as determinants of manufactured exports from various locations in South Africa. The next section will try to describe factors that influence manufactured exports from secondary cities in South Africa.

5.6 Empirical analysis

The data that is used is a cross-section of the 22 places described in the previous section. Data for 2003 and 2004 are pooled together for the 22 cities to have 44 observations. A series of regressions is used to get the regression that best describes manufactured exports from secondary cities in South Africa. Data per city for manufactured exports, education, capital, population density, gross value added (GVA), and rainfall were all obtained from the Regional Economic Focus provided by Global Insight South Africa. The cost to transport a container of manufactured goods from various secondary cities was supplied by Spoornet. The times taken to travel by road from a secondary city to Durban were gathered from www.shellgeostar.co.za and data on the distance between cities and Durban were gathered from Spoornet. The transport of a 12-metre heavy container with manufactured products is used.

5.6.1 The determinants of manufactured exports from secondary cities.

The first estimating equation is:

Manufactured exports = f(Education, Capital, Population density, GVA, Rainfall)

Logs are used to simplify the estimating equation.

lnmanexp = f (Education, Capital, lnPop_dens, lnGVA, lnRainfall)

Where lnmanexp = manufactured exports from a city.
Education = a proxy for the level of education in a city.
Capital = the capital stock of a city to indicate the institutional quality
lnPop_dens = the population density in a city.
lnGVA = gross value added in a city as a measure of the size of the market.
lnRainfall = the amount of rainfall in a city.

In table 5.5 below the results of the regression are shown.

Table 5.5 Regression results of the determinants of manufactured exports

lnmanexp	**Coef.**	**Std. Err**	**t**	**P>|t|**	**[95% Conf. Interval]**
Education	2.308544	.6668466	3.46	0.002	.9485014 3.668586
Capital	-.4966498	.9112129	-0.55	0.590	-2.355081 1.361781
lnPop_dens	.0915327	.3776	0.24	0.810	-.6785876 .861653
lnGVA	1.571754	.9299415	1.69	0.101	-.3248746 3.468382
lnRainfall	-.281271	.9127164	-0.31	0.760	-2.142768 1.580226
_cons	-12.15717	10.98707	-1.11	0.277	-34.56545 10.2511
Number of observations: 37		R-squared = 0.3950			Adj R-squared = 0.2975

The results in table 5.5 show that only education is a significant determinant of manufactured exports from the secondary cities at a 5 per cent level of confidence. Most of the variables enter with the correct sign, with the exceptions of capital and rainfall. Rainfall indicates the geographic favourability of an area, which can lead to faster economic growth. Rainfall has a negative coefficient but is insignificant. Capital also enters with a negative sign. This can be explained by describing existing capital as a long-term investment. As capital is used each year, depreciation occurs which leads to the capital becoming more out of date with the marginal product of labour, wage rate, and income falling. Thus a negative coefficient is possible (Naudé *et al*, 2004). The model shows low explanatory power as indicated by the R-squared value.

The model tested by Naudé *et al*, (2004) included distance to the port. To see whether the estimation equation will describe manufactured exports from secondary cities better than the previous regression, the next estimating equation will also include distance.

lnmanexp = f(Education, Capital, lnPop_dens, lnGVA, lnRainfall, lnDistance)

Where, lnDistance = the distance from a secondary city to Durban harbour.
The other variables are as described above.

Table 5.6 Regression results with distance included.

lnmanexp	**Coef.**	**Std. Err**	**t**	**P>|t|**	**[95% Conf. Interval]**
Education	2.223249	.6766671	3.29	0.003	.8413106 3.605188
Capital	-.4319973	.9178667	-0.47	0.641	-2.306531 1.442537
lnPop_dens	.1321655	.38198	0.35	0.732	-.6479418 .9122727
lnGVA	1.703058	.9458063	1.80	0.082	-.2285357 3.634653
lnRainfall	-.3743342	.9225958	-0.41	0.688	-2.258526 1.509858
lnDistance	.7075929	.8146563	0.87	0.392	-.9561573 2.371343
_cons	-18.82219	13.43733	-1.40	0.172	-46.26488 8.620501
Number of observations: 37	R-squared = 0.4099				Adj R-squared = 0.2918

According to the results in table 5.6 with distance introduced in the regression, the model does not show high explanatory power as was expected. The sign of distance is not what is expected and it is insignificant at the 5 per cent level of confidence. Most of the secondary cities used in the study are located in the interior and close to Gauteng. This may be the reason for the positive relationship between manufactured exports and distance – there are not many manufactured exports from secondary cities close to Durban. On the contrary, Naudé *et al*, (2004) found that as distance increases away from the port, the cost of transporting a good increases and therefore reduces the amount of goods exported from all locations in South Africa.

The next estimating equation includes a travel time variable. It is expected that as travel time increases away from the ports, manufactured exports will decrease. It is expected that the time variable will have a negative coefficient.

lnmanexp = f(Education, Capital, lnPop_dens, lnGVA, lnRainfall, lnTime)

Where, lnTime = the time it takes by road from a secondary city to Durban.
The other variables are as mentioned above, excluding distance.

Table 5.7 Regression results with time included.

lnmanexp	Coef.	Std. Err	t	P>|t|	[95% Conf. Interval]
Education	2.180101	.675306	3.23	0.003	.800942 3.55926
Capital	-.4318534	.9104975	-0.47	0.639	-2.291337 1.427631
lnPop_dens	.1444091	.3796221	0.38	0.706	-.6308828 .9197009
lnGVA	1.729522	.9385031	1.84	0.075	-.1871569 3.646201
lnRainfall	-.3602662	.9129397	-0.39	0.696	-2.224738 1.504205
lnTime	.9264553	.8520392	1.09	0.286	-.8136408 2.666551
_cons	-19.99562	13.11401	-1.52	0.138	-46.778 6.786762
Number of observations: 37	R-squared = 0.4180				Adj R-squared = 0.3016

The results in table 5.7 are the same as for the previous regressions with only education being significant. Time is not as was expected. It enters with a positive

sign and is not significant. The same explanation can be given for time as was given for distance in the previous regression.

The cost of transporting a container with manufactured exports from secondary cities may be included to see whether this will improve the explanatory power of the regression.

lnmanexp = f(Education, Capital, lnPop_dens, lnGVA, lnRainfall, lnRailcost)

Where, lnRailcost = the cost by rail to transport a container with manufactured goods from a secondary city to Durban.

The other variables are as mentioned above, excluding distance.

Table 5.8 Regression results with rail cost included.

lnmanexp	Coef.	Std. Err	t	P>|t|	[95% Conf. Interval]	
Education	2.229264	.6576345	3.39	0.002	.8861954	3.572333
Capital	-.3625076	.9002841	-0.40	0.690	-2.201133	1.476118
lnPop_dens	.1584609	.3739582	0.42	0.675	-.6052636	.9221853
lnGVA	1.842745	.932874	1.98	0.057	-.0624382	3.747928
lnRainfall	-.4214297	.9021902	-0.47	0.644	-2.263948	1.421088
lnRailcost	1.257037	.8680566	1.45	0.158	-.5157707	3.029846
_cons	-28.61085	15.67449	-1.83	0.078	-60.62243	3.400735
Number of observations: 37	R-squared = 0.4346				Adj R-squared = 0.3215	

The results from table 5.8 are similar to all the previous regressions. The GVA and education are significant, with rail cost being insignificant and positive. This regression describes manufactured exports the best of all the preceding regressions. It explains 32 per cent of manufactured exports from secondary cities.

The estimating equation that best describes manufactured exports is shown in table 5.9. This regression explains 35 per cent of manufactured exports from secondary cities. Note that distance enters with the correct sign, but rail cost still does not have

the right sign. The correlation between rail cost and distance is 94 per cent, which indicates that as one increases, the other should also increase and vice versa. This makes the difference in signs more confusing.

Table 5.9 Regression model explaining manufactured exports.

lnmanexp	Coef.	Std. Err	t	P>|t|	[95% Conf. Interval]
Education	2.472807	.6281474	3.94	0.000	1.189959 3.755655
Capital	-.0809359	.6768909	-0.12	0.906	-1.463332 1.30146
lnDistance	-3.096012	2.221628	-1.39	0.174	-7.633181 1.441157
lnGVA	1.759136	.7836975	2.24	0.032	.158612 3.35966
lnRainfall	-.2797529	.851767	-0.33	0.745	-2.019293 1.459787
lnRailcost	4.372826	2.418035	1.81	0.081	-.5654595 9.311112
_cons	-39.566	17.33697	-2.28	0.030	-74.97281 -4.159181
Number of observations: 37	R-squared = 0.4658				Adj R-squared = 0.3589

Throughout the model, it is clear that education and gross value added (GVA) are the two variables that are the most significant determinants of manufactured exports. Distance, time and rail cost did not enter into the model as expected. Reasons for this might be because most of South Africa's manufactured exports are transported by road as mentioned in chapter 4. If road transport data could have been received the regression results might have been different. Distance is the variable that changed signs most frequently. This might be because the sample towns were all located in the interior and in the Western Cape, which affects the distance variable.

5.6.2 Shortcomings

The data needed to calculate the infrastructure per city (amount of paved roads, railways, and communication infrastructure) are not available. This is also the problem with quantifying policies. The data of subsidies from local government to manufacturing firms located in a city is not available. The cost of a container transported by road was not available. Road hauliers would not give this information because of the competitive nature of the industry.

5.7 Conclusion

South Africa's remote location from world markets makes international competitiveness a more daunting task. One way to achieve competitiveness is to optimise inland freight transport cost (CSIR, Land Freight Market Analysis, 2003). The efficiency, reliability, and cost of transport are determining factors to local firms' total input costs and their ability to export at competitive prices to the rest of the world.

Most of South Africa's manufactured exports are from metropolitan areas, of which the Johannesburg-Pretoria agglomeration is the highest. Secondary cities contribution towards manufactured exports is small, with only three meaningful contributions from Rustenburg, Witbank and Kimberley.

The obvious and most studied determinant of transport cost is geography, particularly distance. The greater the distance between two markets, the higher the expected transport cost. This was indicated in the hypothesis testing, that as distance increases, transport cost also increases. Not only did distance determine the cost of transport, but infrastructure had an impact as well. Transport infrastructure will affect the cost to transport the goods to the ports for export. According to Mckinnon and Woodburn (1994), an improvement in road infrastructure minimises cost for firms by making longer and more frequent journeys possible (Banister and Berechman, 2000:6). Infrastructure investment in some of the secondary cities can increase the probability of manufacturers locating in that area due to cost advantages.

Analysis of the determinants of manufactured exports showed that a city's gross value added (GVA) and level of education are important factors in having manufactured exports. The regression shows that distance, rail cost, and time do not affect a region's export performance, although other research has indicated that this does play a role in manufactured exports.

The hypothesis stated that manufactured exports cost more from secondary cities than from metropolitan areas. This statement is true when all costs are included. The improvement of rail infrastructure and the increase in volumes in Potchefstroom, Oberholzer and Rustenburg may lead to the same cost level as Johannesburg and other metropolitan areas. Distance and infrastructure affect the transport cost of manufactured exports from secondary cities.

Chapter 6

Conclusion

6.1 Introduction

The aim of this dissertation was to examine transport cost as a determinant of manufactured exports from secondary cities in South Africa. Throughout the dissertation, from the theoretical discussion in chapter 1, to the empirical analysis in chapter 5, the factors that can influence trade potential were indicated.

In chapter 1, the theory of comparative advantage suggested that cities in South Africa will trade the resource which is abundant in that area. This means that each city has an advantage in some or other product that can be traded with the rest of South Africa and the world. The findings in chapter 5, describing the profiles of the secondary cities, showed that each city has a resource that is used for local demand and trade. The Wood and Berge (1997) H-O model indicated that a greater skill to land ratio will lead to higher manufactured exports than primary sector exports. Naudé and Gries (2004) researched this for South Africa, but the results did not show that this is necessarily the case. This study's regression results showed that education is a significant determinant of exports from an area.

With the introduction of new trade theory and the theory of geographical economics, the role of transport cost as a determinant of trade became more significant. Krugman (1991) showed an increase in distance can increase transport cost, which in turn leads to higher prices for goods that need to move over long distances. Bougheas *et al*, (1999) showed that it is not only distance that can increase transport cost. Transport infrastructure also influences transport cost. Good transport infrastructure leads to lower transport cost and vice versa.

To determine whether transport cost from secondary cities in South Africa is higher than from metropolitan areas due to bad infrastructure or long distances, an

evaluation of the land freight network was presented. This was followed by an overview of manufactured exports from South African cities.

6.2 Land freight transport and manufactured exports

Investment in transport infrastructure has a long-term influence on the economy, as it requires advanced planning and considerable financial resources to implement. Governments have an assumption that new roads lead to economic growth by encouraging industries to relocate to the regions with better infrastructure.

During the apartheid years, the freight transport system encouraged the export of bulk commodities such as coal and iron ore (Department of transport, 1998), while the South African economy received most of its foreign monetary reserves from exporting commodities.

From 1994, a new era started for South Africa as the newly elected government decided to address the problems facing land freight transport. At that time, globalisation played a role in the decision-making process for transport infrastructure policy. The South African government pointed out that they want to achieve a sustainable and growing economy that is driven by a service sector and manufactured exports (Department of transport, 1998). To achieve this, the land freight transport network had to be improved.

The minister of transport during 1998, Mr. Mac Maharaj, indicated that the country's infrastructure is a problem *"The quality of our roads is declining and there is insufficient capital available to maintain and upgrade them"* (Department of transport, 1998:4). The department of transport introduced the Transport White Paper of 1996 and the 14-month Moving South Africa research project to express strategies for the medium- and long-term development of South Africa's transport and logistics infrastructure. Transport was envisioned to support and enable government strategies for growth, development and redistribution in South Africa.

The deregulation of gross vehicle mass (GVM) for road transport from around 38 tonnes to 56 tonnes made transport by road 15 per cent lower than the previous

cost, which increased the share of exports carried by road. In South Africa, there is currently an 80:20 split between road haulage and rail freight, with an increasing trend towards road haulage over the last ten years due to increased rail costs and the unreliability of Spoornet (CSIR, Freight Logistics Sector Project, 2004). A recent study undertaken by CSIR Transportek showed that many customers would prefer to pay higher costs and continue to use the road mode because of the unreliable delivery times of rail. Only bulk products are transported by rail and most manufactured goods are transported by road. Durban is the most important harbour for manufactured exports, and has the largest road and rail corridors between Gauteng and Durban.

6.3 Determinants of manufactured exports from secondary cities

South African cities are classified according to the Municipal Structures Act of 1998. This Act classifies cities as metropolitan and other urban areas. Metropolitan areas have high population density, together with intense movement of people, goods and services. Metropolitan areas also have extensive development and a diversity of economic activity.

Chapter 5 showed that urbanisation to metropolitan areas is increasing at a steady rate – these population changes affect the rural areas by reducing the number of skilled labourers in the small cities. This, in turn, leads to the closing down of specialised industries in smaller towns. The manufacturing and service sectors locate in cities where market share is large, knowledge spillovers occur, and labour skills are high. This is visible with the Gauteng agglomeration of manufactured exports and production. Most of South Africa's exports are from urban areas, with metropolitan areas contributing 72 per cent of total manufactured exports in value (Global Insight, 2005).

Chapter 5 also evaluated the hypothesis that transport costs of manufactured exports from secondary cities in South Africa are greater than from metropolitan areas: therefore geography (distance) and infrastructure play a role in the location of manufacturing industries.

The analysis showed that this statement is true when all costs are included. An improvement in rail infrastructure and an increase in volumes in Potchefstroom, Oberholzer and Rustenburg may lead to the same level of transport cost as Johannesburg and other metropolitan areas. Distance and infrastructure affected the transport cost of manufactured exports from secondary cities.

The iceberg transport cost model showed that the marginal cost of transport decreases as the distance increases. This was not the case in South Africa. For example, Newcastle (closest to Durban) had the highest price per km; the prices of places not located between 790 km and 880 km from Durban were very costly.

Finally, the determinants of manufactured exports from secondary cities were analysed in the regression models. Factors such as education, capital, population density, gross value added (GVA), and rainfall were used to see whether they determine exports. The results showed that only education and GVA are significant. It was expected that rail cost, distance, and time would also be significant but that was not the case. Reasons for this might be because most of South Africa's manufactured exports are transported by road as mentioned in chapter 4, and only rail data was available for the analysis.

6.4 Conclusion

Location, distance to ports and markets and transport cost are all determined by transport infrastructure. If transport infrastructure would have the same level of development across South Africa and in all cities, manufacturers could locate at the locations that optimise their competitiveness. It is not the distance per se that hinders bilateral commerce; it is the transport cost that impedes trade by reducing the profit margin between cost of exporter and price of importer (Luo, 2004:6).

This research, however, is only a start to questions of the location of economic activity, exports, transport costs, and infrastructure in South Africa. Further research should examine the possibility of compiling a more comprehensive indicator of transport cost in South Africa.

Appendix A

List of secondary cities used for the project.

Secondary cities	GDP (2004) R1000	GDP growth rate (2004)	Urbanisation (2004)	Exports as % of GDP of city (2004)	Regional share of exports (2004)
Rustenburg	32,180,587	10.4%	46.0%	30.64%	3.79%
Middelburg	13,508,018	3.9%	72.3%	0.42%	0.00%
Witbank	11,231,187	5.8%	86.5%	18.32%	0.84%
Sasolburg	10,877,867	5.8%	89.1%	2.55%	0.12%
Klerksdorp	7,259,151	-0.7%	88.2%	0.55%	0.02%
Nelspruit	6,818,935	5.8%	39.8%	9.85%	0.28%
Thabazimbi	6,131,090	10.7%	58.7%	0.05%	0.00%
Kimberley	5,856,757	5.8%	98.1%	71.60%	1.75%
Oberholzer	5,530,557	-7.4%	98.2%	0.12%	0.00%
Phalaborwa	5,255,137	-0.4%	53.4%	13.95%	0.29%
Paarl	5,197,998	5.3%	72.9%	34.24%	0.77%
Welkom	4,893,614	-3.4%	89.4%	1.54%	0.03%
Pietersburg	4,837,853	0.7%	85.6%	9.83%	0.20%
Newcastle	4,553,699	3.9%	80.5%	4.35%	0.09%
Mmabatho	4,394,726	3.3%	17.7%	0.00%	0.00%
Worcester	4,377,615	4.4%	68.0%	3.13%	0.06%
Stellenbosch	4,371,507	5.5%	65.5%	32.83%	0.62%
Malmesbury	4,347,390	8.0%	75.4%	6.58%	0.13%
George	4,257,002	7.3%	89.8%	1.36%	0.02%
Potchefstroom	3,948,984	3.2%	90.8%	3.06%	0.05%
Umtata	3,938,230	4.9%	37.8%	0.00%	0.00%
Brits	3,823,776	3.3%	41.8%	54.51%	0.89%

Source: Data from Global insight (Regional Economic Focus).

These cities where chosen as secondary cities by using the GDP for 2004.

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