AUTOMOTIVE POLICY AND THE RESTRUCTURING OF THE SOUTH AFRICAN INDUSTRY, 1990 - 2005

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ABSTRACT

Since 1990 the South African automotive industry has been through the most dramatic phase of its long history as reduced protection has led to much greater international integration. This thesis analyses the restructuring of the sector in response to these developments.

The first major section provides a detailed assessment of the international environment and its impact on the prospects for growth of the automotive industry in developing countries and South Africa in particular. In many developing countries, the sector has been subject to extensive state support and intervention. While traditional production locations in advanced countries remain dominant, there has been a significant shift of production to developing countries. This expansion has, however, been focused on a relatively small number of locations. For countries which do not have very large existing or potential domestic markets, policy needs to define an 'automotive space' and provide some protection to anchor the domestic industry if local capacity is to be retained and developed.

In South Africa, a gradual but sustained period of tariff liberalisation has been coupled with import-export complementation measures aimed at increasing exports and achieving a higher degree of specialisation. With its unfavourable geographical location and history of heavy protection, the prognosis for the South African industry in the early 1990s was not good. To date the costs of liberalisation have been quite low. The export response to the realignment of the incentive structure has been strong and the industry has become much more efficient and competitive. However, other objectives have not been achieved. Recently, the share of vehicle imports has grown sharply. Local content levels remain low partly because of lower protection. There have also been serious distortions. The system of export credits used to offset import duties has led to rapid expansion of 'peripheral' component exports, driven more by the objective of rebating import duties than any real economic justification. Investment levels have been modest compared to the investments flowing into some of the world's more dynamic emerging automotive industries.

Historically, the development of small-scale, multi-model plants has been the central structural problem in the South African automotive industry. It exacerbated the lack of competitiveness associated with high levels of protection and limited the prospects for expanding local content. One of the key objectives of policy has been to encourage industry rationalisation. But while a theoretical case for industrial policies can easily be made,

implementation is much more complex. There has been progress in achieving higher model volumes, but it has not been sufficient to justify investments in high levels of local content.

A number of case studies of firm level restructuring were conducted. These illustrate that the major reason for the lack of competitiveness in the initial stages was not necessarily inefficiency or a lack of dynamism on the part of firms but rather an inefficient industry structure consisting of too many low volume producers. Component firms have in fact proved quite dynamic in adapting to this environment. Restructuring has taken a number of forms and firms have proved remarkably resourceful. But internal or plant level changes, while necessary have seldom proved sufficient. In many cases firms have been forced to seek out a foreign partner. Foreign ownership or control in turn has had a number of effects on firm performance and prospects in areas such as exports, R&D and the use of domestic suppliers.

The industry has made substantial progress towards developing a more efficient and competitive structure. But difficulties remain as it attempts to attract investment in an increasingly competitive international environment. The scale of domestic production is still not sufficient to encourage high levels of localisation of components. That in turn means that assembly sector costs remain high because of the logistics costs associated with high import levels. The challenge for policy currently is to encourage investment in high volume, sustainable automotive production while at the same time gradually moving to more neutral and lower levels of support.

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This thesis has benefited from inputs and advice from a large number of people over a long period.

My main debt is to my supervisor, Professor David Kaplan, who has provided excellent and perceptive advice throughout. He has also displayed extraordinary patience while all sorts of other involvements, ranging from policy work and research to being head of department, distracted me from completing this project.

I would also like to thank the directors and participants in the Industrial Strategy Project. Involvement in this project in the early 1990s sparked a serious interest in the automotive industry, which has continued to this day.

Alec Erwin, in his capacity as a union official at the time, invited me to participate in the Motor Industry Task Group discussions in the early 1990s which led directly to extensive and ongoing involvement in policy making and policy implementation in the automotive industry. This thesis draws heavily on this experience.

I would also like to thank all industry stakeholders with whom I have had useful interviews and discussions since the early 1990s. They include managers in the various firms and industry federations as well government and trade union officials.

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Anthony Black
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This thesis is dedicated to my late father. He always took a keen interest in my work, but passed away shortly before the thesis was submitted.

ABBREVIATIONS

ADE	Atlantis Diesel Engines
AGOA	African Growth and Opportunity Act
AIDC	Automotive Industry Development Centre
BTI	Board of Trade and Industry
BTT	Board on Tariffs and Trade
CBU	Completely built up
CKD	Completely knocked down
COSATU	Confederation of South African Trade Unions
CPI	Consumer price index
DFA	Duty Free Allowance
DTI (later dti)	Department of Trade and Industry
FDI	Foreign direct investment
IDC	Industrial Development Corporation
IMVP	International Motor Vehicle Program
IRRC	Import Rebate Credit Certificate
ISI	Import substituting industrialisation
ISP	Industrial Strategy Project
ITAC	International Trade Administration Commission
JIT	Just-in-time
LDCs	Less developed countries
MB	Mercedes-Benz
MIDC	Motor Industry Development Council
MIDP	Motor Industry Development Programme
MITG	Motor Industry Task Group
NAACAM	National Association of Automotive Component and Allied Manufacturers

NAAMSA	National Association of Automobile Manufacturers of South Africa
NAFTA	North American Free Trade Area
NEF	National Economic Forum
NIC	Newly industrialised country
NUMSA	National Union of Metalworkers of South Africa
OE	Original equipment
OEM[1]	Original equipment manufacturer (vehicle producer)
PAA	Productive Asset Allowance
SAABC	South African Automotive Benchmarking Club
SACU	South African Customs Union
SADC	Southern African Development Community
SATMC	South African Tyre Manufacturers Conference
SKD	Semi knocked down
SMEs	Small and medium enterprises
SMMT	Society of Motor Manufacturers and Traders
SVI	Small Vehicle Incentive
TISA	Trade and Investment South Africa
TMC	Toyota Motor Corporation
TSA	Toyota South Africa
WTO	World Trade Organization

[1] This term is commonly used in the South African automotive industry to refer to vehicle producers and is different to the usage which originated among US computer firms in the 1950s to refer to East Asian suppliers who produced equipment for them (Hobday, 1997: 133).

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CHAPTER ONE

INTRODUCTION

1. INTRODUCTION

In 1985, MIT's International Motor Vehicle Program (IMVP) published its first influential book on the future of the automobile. It had little to say on the South African industry but what it did say was distinctly negative regarding its future prospects:

> *"Two countries outside the major auto-producing regions have had substantial auto industries for 30 years, fostered by a long history of government efforts to promote local manufacture. However, neither Australia nor South Africa has developed an export industry, and it is d cult to see any competitive superiority developing in these locales which share the disadvantages of relatively high wages rates, small domestic markets, long shipping distances to major markets and low labor productivity compared with Japan" (Altshuler et al., 1985: 34-35)*

In the early 1990s this gloomy perspective on future prospects was widely shared by all of the players (firms, unions and relevant government agencies) in the South African industry. For quite understandable reasons, they found it difficult to envision rapid expansion in the near or medium term. The South African economy was growing very slowly. It was widely agreed that the automotive industry was uncompetitive. South African cars were priced well above world market levels and received prohibitive protection from built up vehicle imports. The component sector also received high, albeit declining levels of protection in the form of local content regulations. Exports of components were growing but were heavily assisted. Productivity was very low and the industry, accordingly, approached the prospect of trade liberalisation with a high level of anxiety.

When I first started researching the automotive sector as part of the Industrial Strategy Project (ISP) in the early 1990s[2], it would have been easy to conclude along with the IMVP study,

2 For a detailed overview of this major policy study on the South African manufacturing sector, see Joffe et al. (1995). For the sectoral work on the automotive industry, see Black (1994).

quoted above that the industry was destined to decline further and indeed more rapidly with trade liberalisation. A number of factors led me to a somewhat different conclusion. Firstly, South Africa's political transition heralded better economic prospects and a recovery from the economic stagnation of the 1980s. Secondly, exports of components (but not of vehicles) were growing albeit from a low base. Thirdly, international developments were potentially very positive. One of the most striking features was the growth of the automotive industry in emerging markets. This reflected not only rapid growth of demand in those markets which boasted rapidly growing middle classes, but also a shift of production from the developed countries where rising costs, particularly labour costs, were making them increasingly high cost locations. The big growth areas were medium or large sized, middle income countries, which had the attributes of significant and growing domestic markets, high productivity levels in modern plants and relatively low labour costs. Although market expansion was slow and it suffered from the disadvantage of being remote from major markets, South Africa shared some of these attributes.

The first step to liberalise the industry took place in 1989 and accelerated with the introduction of the Motor Industry Development Programme (MIDP) in 1995. By the late 1990s, developments in the South African automotive industry were receiving considerable positive publicity and this has continued to the present time although increasing concerns have been voiced regarding the cost of the MIDP. Firstly, and most importantly, positive sentiment was a consequence of rapid export expansion, initially of components, but from 1999 also of vehicles. South Africa's automotive exports increased from R668 million in 1990 to R45 billion in 2005.[3] A second positive development was that the automotive sector has been the recipient of considerable foreign investment in a climate of falling import duties and, at least until 2003, of weak domestic demand. Thirdly, productivity has improved rapidly and there is substantial evidence of improvement in a range of benchmarks such as quality and operational shop floor efficiency. Fourthly, employment has remained relatively stable under difficult circumstances and with the recent growth in domestic demand, has expanded. Relative to the rest of the manufacturing sector, the automotive industry's share of sales, value added and investment have all increased over the period 1990-2005. On the whole, it appears that the industry has weathered import liberalisation rather well.

The above developments have been strongly influenced by the MIDP. As a result, the MIDP is frequently cited as a successful example of trade and industrial policy (Barnes et al., 2004; Hirsch, 2005; Roberts, forthcoming). While the industry remains protected and exports have been assisted, the past 15 years has been a period of remarkable industrial transformation in

3 See Appendix One for the rand exchange rate.

that a once protected and inefficient sector has become highly outward oriented and is now a leading export sector.

This thesis is essentially about how a sector and its constituent firms have responded to an automotive policy which has in part liberalised the industry, but has also introduced sector specific policies and incentives which have encouraged specialisation and exporting. Measuring and analysing these changes is one important objective of the thesis. But how should these changes be assessed? At one level the industry has become more competitive than would have been expected. This has been the result of a strong supply response by both domestic firms and much enhanced incoming FDI. This, in turn, is manifested in deep structural change within the industry, strong export expansion and significant technological accumulation, which has placed the industry in a better position to take advantage of growing international opportunities and the current boom in domestic sales. How did it come about? I argue that the international environment has been favourable — a number of global developments have created the *possibility* for expansion in middle-income countries. Secondly, policy has been highly supportive partly as a result of its deliberate design but with some element of luck as well. Thirdly, firms, both locally owned and foreign, have proved to be resourceful, adaptable and technologically dynamic.

However, vulnerabilities remain. There are other middle-income competitor countries with far more favourable geographical locations. Rapid export growth does not, in itself, signify success as exports have been strongly supported by and continue to rely on sector specific policy measures. Imports have been rising rapidly and there are weaknesses in the structure of the industry that has emerged from 15 years of gradual liberalisation. These factors raise critical questions for South Africa's automotive policy into the future. The difficulties have been exacerbated by the threatened challenge to the WTO by Australia in 2005 on the grounds of the MIDP constituting an export subsidy. Policy, therefore, needs to navigate a way forward which is able to deal with all these pitfalls.

South Africa's automotive sector thus constitutes a fascinating story of industrial transformation, one that is by no means complete. The objective of this thesis is to probe these developments by examining government policy and the process of international integration in the automotive industry in some detail. But the experience also contains important analytical implications for key questions in economic development such as the role of government and industrial policy, protection and trade liberalisation, comparative advantage and competitiveness and also for understanding the dynamics of global value chains and the strategies of international firms.

There are many aspects of the development of the automotive industry that this thesis could have analysed — the costs and benefits of protection and trade liberalisation, for example. While these issues are indeed touched upon, the focus of research is on the policy dimension and how the industry has responded to changes in the policy regime. How did firms respond in terms of their export, import and investment behaviour and to what extent did their behaviour accord with the objectives government sought for the MIDP? A central question is the extent to which the structure of the South African industry been strengthened as a result of these developments? Chapters four, five and six examine these questions by considering issues such as the sustainability of export development, the extent to which economies of scale have been achieved and the impact of growing foreign ownership on the strength of the automotive value chain. The answers are of more than academic interest. An understanding of the impact of past policy will be critical in developing the design of the new regime.

1.1 Background to the Research and Methodology

This thesis draws on over fifteen years of academic research, policy advisory work and involvement in policy implementation in the automotive industry. Because of the way in which this personal experience has been integral to the thesis it is necessary to recount it in some detail.

Involvement in research on the automotive industry started with participation in the Industrial Strategy Project (ISP) in 1990. The first stage of the ISP involved a large team of researchers working full time for a period of 15 months and was aimed at developing policy options for the anticipated new democratic government. The project was initiated by a group of academics together with the Confederation of South African Trade Unions (Cosatu). My own involvement was focused on researching the automotive industry and the outcome was a book on South Africa's automotive policy (Black, 1994).

As the project drew to a close, a major governmental review of automotive policy got underway with the appointment of the Motor Industry Task Group (MITG) by the then Minister of Trade and Industry, Derek Keys in 1992. This was a time when major political change was imminent and the democratic movement was already involved in policy making through institutions such as the tripartite National Economic Forum (NEF). The MITG was, therefore, conceived of as a tripartite venture with a wide range of stakeholders including the National Union of Metalworkers of South Africa (NUMSA). In 1993, I was invited by the then education secretary of NUMSA, Alec Erwin[4], to advise NUMSA in its input into the

4 Erwin is currently Minister of Public Enterprises and previously was Minister of Trade and Industry and Deputy Minister of Finance.

MITG. Negotiations dragged on for two years and eventually the Motor Industry Development Programme was introduced in 1995. As a result of my involvement in this process, I also joined a study tour by human resources managers and union shop stewards to visit assembly plants in Australia, Germany and the United Kingdom and co-authored the final report on the visit and subsequent negotiations.[5] The objective of this study tour was to assess (and learn) from best practice in the area of assembly plant labour — management relations. If the South African automotive industry was to survive growing international competition, greater co-operation between management and labour was essential.[6]

I was then asked by the Department of Trade and Industry to assist with the implementation and monitoring of the MIDP and did this in a part-time capacity from late 1995 to 1999 This involved also the establishment of the Motor Industry Development Council (MIDC) which I chaired from 1996 to 1999. It continues to operate as an important industry grouping with all stakeholders represented. From 1997 to 1999, I led the Mid-Term Review of automotive policy which set policy until 2007 and also collaborated closely with the industry to set up an industry model, which has been used extensively to develop the scenarios used in policy formulation. In late 2001, I was approached to advise government on a further extension of the MIDP until 2012, which I carried out with Dr Justin Barnes of the University of Natal during 2002. These adjustments were announced in December 2002. I have, therefore, had some influence on automotive policy especially while acting in an advisory capacity from 1995-1999 and during 2002. In a sense, therefore, I am more than a disinterested observer and hope that this thesis has been able to reflect the many problems with policy as well as its successes.

Involvement in the policy process has enabled me to interact closely with all stakeholders in the industry during a dynamic phase of its development. It has allowed me to obtain a level of access to senior management, which would not normally be possible in the course of academic research. An important source of information has therefore been literally hundreds of interviews and meetings conducted over a period of over 15 years, partly while undertaking academic research but also while acting in an advisory role.[7] In the course of research and policy work I have had the opportunity to visit vehicle assembly and/or component plants in a range of countries outside of South Africa: Australia, Taiwan, Brazil, Germany, Poland, the United Kingdom, Mozambique and Tunisia. In addition, I have had access to data, which is not normally available to academic researchers. While the confidentiality of this information

5 See Black et al. (1995).

6 For an account of the rise of corporatism in the South African automotive industry, see Desai and Habib (1997).

7 See Appendix Two for a list of firms interviewed.

has naturally been respected, it has lent a depth of insight into the policy process, which has been invaluable.

During this time, I was also involved in a series of more formal academic projects. A number of component firm case studies were conducted under the auspices of Phase Two of the Industrial Strategy Project.[8] Further case studies were conducted in 2000-2001 for the research project on 'Acquisition strategies in emerging markets', based in the Centre for New and Emerging Markets (CNEM) at the London Business School.[9] These have been updated by follow-up visits to the firms concerned.[10] Two small firm surveys were conducted at various stages." The first of these was during the Industrial Strategy Project and the second was a postal survey to component suppliers conducted during 1994.[12] During this period I have also gathered large amounts of data both in my personal research capacity and in the course of setting up a monitoring function for the DTI. Apart from a number of national projects, I also participated in a number of international studies." This thesis draws heavily on this published and unpublished work.[14]

1.2 A Word on the Literature

This is an industry study and the approach is eclectic. It is located broadly within the political economy of development and draws centrally on economics, but also on the related disciplines of economic geography, political economy, sociology and management. The thesis covers the period 1990-2005 and in part constitutes an economic history of the sector. There are a number of cross cutting themes: globalisation, trade liberalisation, industrial location, competitiveness, foreign direct investment, firm strategy, industrial organisation, economies of scale, industrial policy, industrial restructuring, technological capability, innovation and learning. All of these themes have a considerable body of theoretical and applied literature of their own. For this reason there is no one body of literature that underpins this thesis. Accordingly, the literature is not reviewed in this opening chapter but is dealt with in the individual chapters. Chapter Two starts with an overview of the debate regarding the global location of the automotive industry and draws also on the literature on new production systems and on global value chains and global networks. Chapter Three is concerned with national automotive policy in developing countries and draws on a quite specific literature.

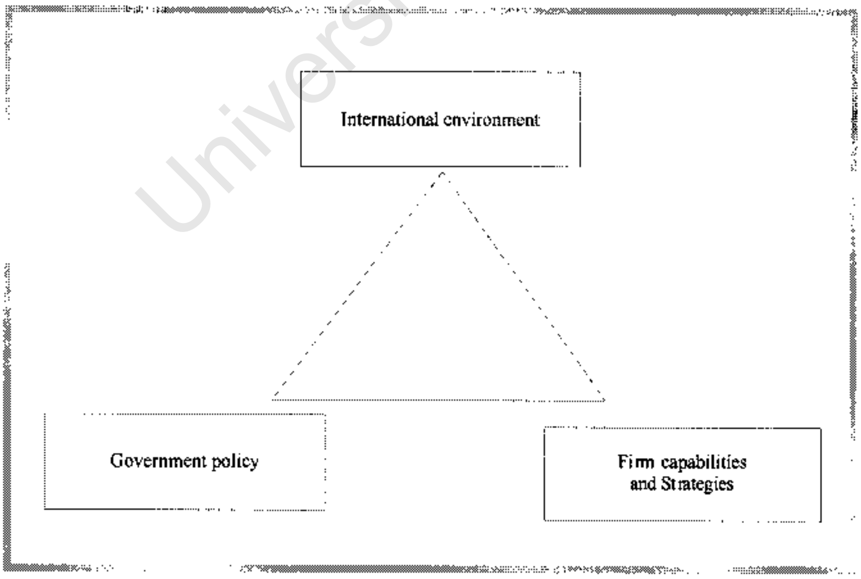
8 See Black (1996).
9 The full automotive case studies together with studies in other sectors are contained in Gelb and Black (2004).
10 See Chapter Six.
11 See Appendices Three and Four.
12 See Appendix Four.
13 These included the Globalisation, project of MIT's International Motor Vehicle Program and the Paris based GERPISA study on regionalisation in the automotive industry.
14 See Bibliography for details. Some of this material has been published jointly. Where the thesis draws on co-authored material, this is pointed out in the text.

The context of Chapter Four is the impact of globalisation, trade liberalisation and industrial policy at the sector and firm level. Chapter Five concerns economies of scale and the political economy of industrial policy. Chapter Six addresses the literature on the trade regime and technological capability in developing countries and the implications of ownership (foreign or domestic) at the firm level.

1.3 Structure of the Thesis

For the growth of an industrial sector in a developing economy to take place, three interconnected elements are crucial. First, there is the international environment. Clearly, the global economy represents a large potential market as well as being a source of competition. It can also provide investment and technology. In particular, the trend of global shifts in the location of the industry would need to at least raise the potential for expansion in the sector and country in question. But a potentially favourable international environment is not by itself sufficient to bring about development. A second element is necessary, namely appropriate government policy. This entails an appropriate set of incentives in terms of the trade regime, other supportive policies and general institutional support. Finally there is a third element. Production takes place at the level of the firm. Firms, whether local or foreign, will need to make decisions to invest in order to initiate or expand production. For this they will need both the motivation and the capacity to successfully invest and engage in production. This thesis is concerned with the dynamic interplay between these three elements (see Figure 1.1).

Figure 1.1: Determinants of Sector Level Development



Chapter Two explores the global location factors in order to assess the implications of the development trajectory of the global automotive industry for South Africa. It argues that the trajectory of the automotive industry is moving inexorably in the direction of a shift in production from developed- to middle-income (and certain low-income) countries, but that this development is concentrated in a few favoured regions.

Chapter Three develops a typology of automotive policies in developing countries. Appropriate policy options are partly determined by variables such as country size, growth rate, level of average income, location in relation to the major centres as well as manufacturing and technological capabilities.

Chapter Four examines the interplay between South African automotive policy and sector level development. Indiscriminate protection produced an inefficient industrial structure. Since then the industry has been subjected to rapid structural change as a result of polices which have liberalised imports but also encouraged exports. This chapter examines, in detail, the impact on automotive trade, investment and industry structure.

Chapter Five examines the question of scale by assessing the costs of low volume production and analysing the responses both in terms of government policy and firm level strategy. The automotive industry is scale intensive, but in South Africa the sector has been characterised by low volume production. While the scale of production has increased, mainly as a result of a reduction in the number of models being domestically produced, it still remains very low according to international norms and constitutes a major stumbling block to the development of the industry. This chapter also examines the complexity of industrial policy aimed at dealing with this question.

Chapter Six uses a number of case studies in the component industry to examine a disparate set of strategic responses to the lowering of tariff barriers. Firms respond in a variety of ways to changes in the competitive environment. These responses incorporate elements such as learning, technical change and internationalisation.

Chapter Seven concludes the thesis. It considers the question as to whether a more sustainable industry has developed since 1990 and provides an overall assessment of the structural changes in the industry. It also draws some general implications for trade and industrial policy.

CHAPTER TWO

GLOBAL TRENDS IN THE AUTOMOTIVE INDUSTRY: IMPLICATIONS FOR PRODUCTION IN DEVELOPING COUNTRIES

1. INTRODUCTION

The production of motor vehicles is one of the world's largest industries. The sector has long been at the cutting edge of advanced technology and product development. It has pioneered new forms of production organisation and developments in the governance of spatially dispersed networks of assembly plants and supplier firms. It is also an industry in which significant shifts in the location of global capacity are occurring as large multinational firms internationalise production in order to supply new markets and reduce costs) This was encapsulated in the controversial "out of Germany or out of business" statement, in 2004, by Opel chief executive Carl-Peter Forster. [2]

This chapter surveys the key, recent international developments in the automotive industry focusing on global shifts in production and the implications for developing countries in general and for South Africa in particular. To examine this issue the central questions are, firstly, the extent to which the automotive industry is globalising and relocating investment and production to developing countries and, secondly, the factors that are driving this process. The chapter addresses these questions by analysing existing trends in the location of production and the strategies of international firms. These processes are, of course, also shaped by national automotive strategies, an issue which is discussed in Chapter Three.

Historically, large, high-income countries such as Germany, Japan, France and the United States have all been major vehicle producers, and for the most part also net exporters of automotive products. [3] A striking feature of the last two decades has been the rapid growth of

For overviews of global shifts in location in the automotive industry see Altshuler et al.(19 84), Hoffman and Kaplinsky (1988), Lung (2000, 2002), Dicken (2003) and Kaplinsky (2005).

2 Standort Deutschland — Zustand and Perspektiven, Rede beim Neujahrsempfang der IHK Bochum, 29 January, 2004, cited in Jurgens and Krzywdzinski (2007).

3 Since the 1970s, the US has been a large net importer.

the industry in a number of developing countries and this has led to an important debate on the extent to which the automotive industry is relocating production to lower wage countries.

The evidence clearly indicates a shift in global automotive production towards developing countries, but there is disagreement over the pace of change and over its future trajectory. Does the shift simply represent rapidly growing demand in developing countries or is it more indicative of an emerging new international division of labour in the global automotive industry with a much greater role for developing countries and corresponding decline for the advanced countries? Is the process of locational shifts more correctly described as regionalisation rather than globalisation? How important are labour costs in relation to the growing technological requirements of automotive manufacturing? What are the locational implications of changes in the production system and the configuration of global networks? These factors have a profound influence on the prospects of development in the automotive industry in emerging markets including South Africa.

An important literature on new developments in technology and production organisation emerged in the 1980s. A landmark was Piore and Sabel (1984). Fordism was being replaced by new modes of organisation variously described as flexible specialisation, post-fordism and systemofacture (Hoffman and Kaplinsky, 1988). In their influential book on the automotive industry Womack, Jones and Roos (1990) coined the term 'lean production'. Some of the grander claims made on behalf of this supposedly new production system proved exaggerated. Nevertheless, the changes that have taken place in the organisation of large automotive firms are very important for the analysis in this thesis and have important implications for location. Some have argued that they have limited the prospects for a global division of labour in the automotive industry. Early proponents of this view included Jones and Womack (1985) and Altshuler et al. (1984).

Jones and Womack (1985) argued that new developments in production organisation and technology, such as flexible automation, were reducing the amount of direct labour in assembly and component manufacture thus undermining the advantage of lower wage countries. There were three aspects to this argument. The first was that the "completely new standards of organisational efficiency established by the Japanese have pulled the rug out from under the feet of the developing countries" (Jones and Womack, 1985: 400), so that lower wages in developing countries were no match for the leaps in productivity that had been made in Japan.

A second strand in the new literature was the argument that these new technologies reduced minimum efficient scale in manufacturing (Kaplinsky, 1984; Jones and Womack, 1985; Piore and Sabel, 1984; Best, 1990). This also helped to reduce the importance of lower wages in international competition although, as Alcorta (1998) has pointed out, the labour savings resulting from flexible specialisation applied also to skilled labour which would have helped emerging market industries where skills were in short supply. Also, de-scaling could be helpful to developing countries because it reduced the relative disadvantage they might face due to smaller domestic markets (Jones and Womack, 1985). Alcorta (1998) investigated this question using a number of detailed case studies to assess the impact of flexible automation on scale. He found little evidence to support the notion that minimum efficient scale is being reduced by new flexible technologies. The evidence, if anything, seems to point to higher optimal plant size, albeit with greater product flexibility. [4]

A third consideration is the evolving nature of value chains or production networks within the automotive industry. [5] The global automotive industry may most usefully be conceptualised as a series of linked clusters or networks. Modularisation, outsourcing to global suppliers, just-in-time (JIT) supply and closer links between carmakers and first tier suppliers have important implications for the changing map of global output. Womack and Jones (1985) argued that innovations such as JIT, led assemblers to source their components from nearby locations reducing opportunities for far flung sources of component supply from developing countries.[6] The implications for aspirant developing country producers were highly significant. It meant the demise of the 'world car' and limited opportunities for component export from developing countries except for the more labour intensive, basic items.

Twenty years later, it is clear that automotive industry growth in the developing world has been more rapid than was previously foreseen. The last two decades have seen the rapid emergence of large scale clusters of assemblers and suppliers in emerging market locations ranging from Mexico to Thailand and central Europe. More recent expansion in China and India has led to increasing concerns that the industry in traditional locations faces the prospect of secular decline or 'hollowing out' in the face of the emergence of lower cost locations.

In their detailed study of globalisation in the automotive industry, Sturgeon and Florida (1999) identified two features that were new in the in the late 20th century. The first was the emergence of the global supplier and the second was the expansion of vehicle exports from locations with lower production costs back to the carmaker's home markets.

4 The question of scale and competitiveness is discussed in detail in Chapter Five.

5 The term 'value chain' was developed by Gary Gereffi. See for instance Gereffi et al. (2005). For an overview of the global production network literature see Henderson et al. (2002).

6 Their position was somewhat modified in a later publication (Womack et al., 1990).

The particular characteristics of an industrial sector partly determine the possibilities for the emergence of an international division of labour. This phenomenon is most apparent in the garment sector where labour accounts for the overwhelming proportion of variable costs. In this sector the relocation of production to low wage countries is far advanced. The process is much less apparent in the automotive industry. Lall et al. (2004) argue that the development of an international division of labour or industry `fragmentation' is likely to be limited in the automotive industry in comparison to sectors such as electronics because of the nature of the products in the sector. While both the electronics and automotive industries produce technically divisible products, electronics arguably has more labour intensive processes and a higher value to weight ratio, minimising the need for the proximity of suppliers. Nevertheless, high labour costs and, in some cases, inflexible labour regulations are increasingly a factor in the decision by automotive multinationals to seek new production locations. Equally important in this process is the ample evidence of high productivity and quality being attained in developing country plants.?

In his assessment of the 'hollowing out' thesis in the European automotive component sector, Sadler argued that the case was "not proven" but that there were reasons enough for public policy to take the matter seriously (1999: 118). Key determinants of future location trajectories would necessarily include the extent to which outward investment by European firms led to exports from these new bases back into Europe, as well as the extent to which hollowing-out was compensated for by inward investment (Tilling in') by American and Japanese firms establishing production in Europe (Sadler, 1999). Spatz and Nunnenkamp (2002) found extensive evidence of outsourcing of more labour intensive processes to lower wage countries especially in the same region.

Lung (2000) has cautioned against the view that relocation of the industry will be rapid, stating that there are many factors which may impede growth in emerging markets. These could include a reversal of the current liberalisation process as well as uncertainty regarding market demand and exchange rates in developing countries. He argues that similar predictions were made when Spain emerged as a low cost production centre in Europe in the 1970s. In the face of growing assembly capacity in developing countries, Pries (2007) has argued that institutional factors will act as a stabilising influence, slowing the shift of both assembly and component production capacity to developing locations. These institutional factors include political pressures, for instance on European caretakers not to desert their home bases, as well as the existence of key supplier and R&D networks in established locations. Jurgens and

This is not a new development. See for example, Shaiken (1990) on the high productivity attained at Ford's Hermosillo plant in Mexico in the late 1980s.

Krzywdzinski (2007) emphasise the impact of company specific governance structures and compromises, which influence the location and the emerging division of labour. At VW for example the allocation of production is co-determined by management and works councils while General Motors Europe encourages direct competition between plants in western and eastern Europe (Jurgen and Krzywdzinski, 2007).

In the following sections these perspectives are assessed. Section two and three examine what is actually happening to markets, production and trade and the extent to which the location of production is shifting between countries and regions. Section four considers the strategies of multinational firms with particular regard to how they organise their production processes and global networks in response to changes in technology and global competition. Section five concludes the chapter. I argue that while wholesale relocation is not in prospect, the rapid pace of globalisation in the industry will be partly manifest in the continuing relocation of the automotive industry to middle-income (and some low-income) countries which are geographically well located and have adopted appropriate policies. South Africa is a middle income country with a rapidly growing market but its unfavourable location raises a number of difficulties.

2. MAPPING THE INDUSTRY — MARKETS, PRODUCTION AND TRADE

An assessment of the relocation thesis requires evidence, not just of the growing share of production in developing countries, but also that these countries are becoming net global exporters of automotive products. These questions are examined by an assessment of recent developments in global markets, production and trade.

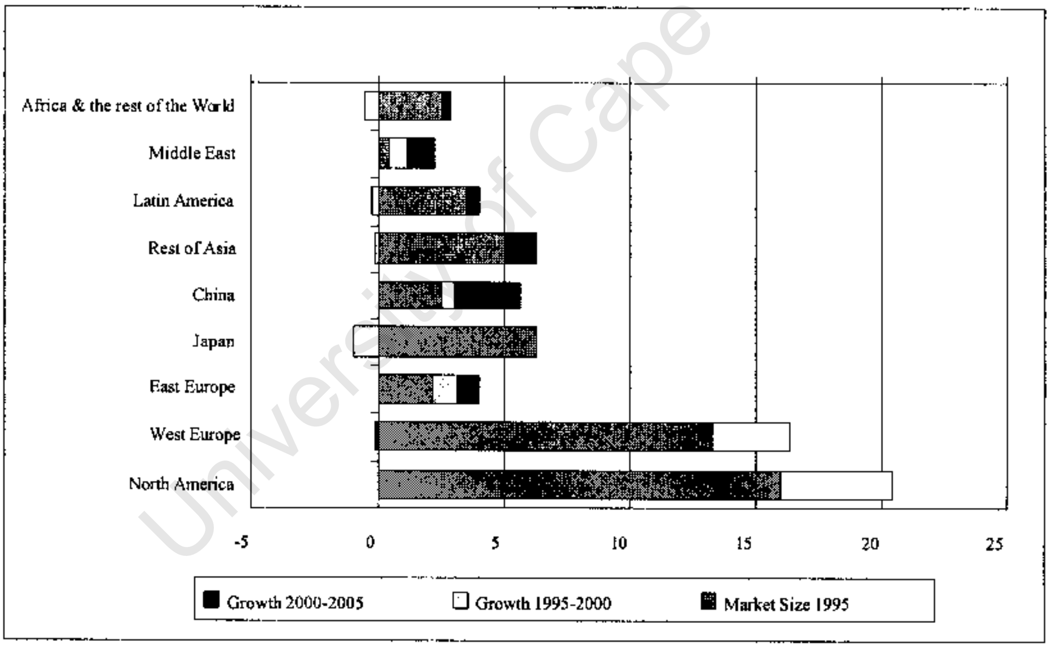
2.1 Global Markets

The location of global vehicle production is strongly related to the expansion of regional and national markets. For this reason, the main automotive industry centres have developed within large, high-income countries which not only had developed industrial and technological capabilities but also had markets, which were large enough to provide for economies of scale (Dicken, 2003; Kaplinsky, 2005). These centres were the US, the larger western European countries and Japan and these regions remain the largest markets. But in these mature markets, approximately 85 percent of demand is replacement demand and future growth is therefore limited.

While the demand for vehicles has always been cyclical and very sensitive to changes in the business cycle, there are important long term changes taking place. Car ownership is closely correlated with per capita income levels but there are significant variations resulting from taxation levels, controls on imports, the availability of credit and the level of development of infrastructure. For middle-income and upper, low-income countries with reasonable growth rates, the rate of increase in vehicle ownership can be very rapid as the burgeoning middle-class reaches the income threshold at which vehicle ownership becomes affordable.

A key feature of the past two decades has, therefore, been the rapidly increasing share of developing countries in global demand. Market growth has been uneven across regions. From 1995 to 2000 booming sales in north America and western Europe accounted for the bulk of global growth (Figure 2.1). Over the period 2000-2005, Asia accounted for no less than 66 percent of global growth with China alone accounting for 45 percent of the global expansion in sales. Other markets in Asia have also been growing rapidly.

Figure 2.1: Vehicle Sales by Country and Region, 1995 and 2005



Source: Chotai (2007)

Developing countries clearly also represent a huge potential market and although the vast majority of new cars will be sold in OECD countries during the next decade, the rate of expansion will continue to be much higher in developing countries. China, with its rapid growth and low rates of vehicle ownership, will continue to be one of the fastest growing markets. In 2005 it already ranked as the third largest market in the world and is expected to account for over a quarter of global expansion through to 2011. [8] A number of major new markets, especially India, are emerging from within the ranks of the developing countries

2.2 Global Production

In spite of intermittent recession, global production has grown rapidly over the past three decades. World vehicle production increased from 28 million units in 1970 to 48.6 million in 1990 (VDA, 1991) and 66.5 million units in 2005 (OICA, 2006). The US has remained the largest producer accounting for 18 percent of total global vehicle production in 2005 (Table 2.1). But a large share of this output consists of light commercial vehicles and the US is of lesser importance in the production of passenger cars. Its share of world output of passenger cars fell steeply from over 50 percent in 1960 to 17 percent in 1995 and amounted to only 4.3 million units or 9.3 percent of world production in 2005 (OICA, 2006). Japan rose to prominence in the 1970s and by 1980 accounted for 29 percent of world vehicle output. Its global share has declined but it continues to be by far the largest producer of cars accounting for 19.6 percent (9 million cars) of global output in 2005.

Over the past two decades the automotive industry has also been characterised by worldwide overcapacity and extensive restructuring by American, European and Japanese firms. The widely held view in the late 1980s was that the US manufacturing base was being decimated by Japanese competitors with superior manufacturing techniques (Womack et al., 1990). The US market had become increasingly penetrated by Japanese imports leading to a US automotive trade deficit with Japan of $25.9 billion in 1986. Growing trade friction led to `voluntary' export restraints being imposed against Japan. This led Japanese firms to establish plants within the US. By 1992 these plants had already taken a share of close to 20 percent of the American car and light truck market up from just six percent in 1986. These plants have for the most part been extremely successful, matching Japanese levels of productivity and quality. This, coupled with the strengthening of the yen against the dollar, meant that by the early 1990s, Japanese firms were building cars more cheaply in America than in Japan. [9]

By the late 1990s, the US economy was booming and the market share of US carmakers appeared to have stabilised. In part, this was due to rapid assimilation of Japanese manufacturing techniques by US firms who were quick to learn from the new Japanese transplants. But more recently General Motors, Ford and Chrysler have again found

8 See Price Waterhouse Coopers Autofacts, Global automotive industry, May 2004

9 'Impact of strong yen depends on its stability' ,*Aut omotive News,* 1 March, 1993.

themselves in a parlous state in the face of declining market share and heavy welfare liabilities. [10]

Table 2.1: World Vehicle Production: Major Producing Countries, 1980, 2005

	1980		2005	
	Production (Vehicles)	% of world production	Production (Vehicles)	% of world production
United States	8,009,841	21.0	11,980,912	18.0
Japan	11,042,884	29.0	10,799,659	16.2
Germany	3,878,553[a]	10.2	5,757,710	8.7
China	300,000[e]	0.8[e]	5,707,688	8.6
Korea, Rep. of	123,135	0.3	3,699,350	5.6
France	3,378,433	8.9	3,549,008	5.3
Spain	1,181,659	3.1	2,752,500	4.1
Canada	1,374,299	3.6	2,688,363	4.0
Brazil	1,165,207	3.1	2,528,300	3.8
UK	1,381,292	3.6	1,803,049	2.7
Mexico	490,006	1.3	1,670,403	2.5
India	113,917	0.3	1,626,755	2.4
Russia	2,197,500[b]	5.8	1,351,199	2.0
Thailand	25,000[f]	0.1	1,125,316	1.7
Italy	1,619,287	4.3	1,038,352	1.6
Belgium	929,005	2.4	928,965	1.4
Turkey	100,194[F]	0.3	879,092	1.3
Iran	145,000	0.4	817,200	1.2
Poland	480,500	1.3	625,443	0.9
Czech Rep.	238,000[c]	0.6	604,930	0.9
Malaysia	62,781[f]	0.2	563,837	0.8
South Africa	405,000	1.1	525,271	0.8
Indonesia	171,987	0.5	494,551	0.7
Taiwan	40,000[e]	0.1	445,345	0.7
Australia	365,227	1.0	394,713	0.6
Sweden	298,400	0.8	338,578	0.5
Argentina	281,793	0.7	319,755	0.5
World total	38,071,413[d]		66,465,768[d]	

Sources: SMMT (1983); OICA (2006); Layan (2000); Sugiyama and Fujimoto (2000); Bhaskar (1980).
Notes: a Federal Republic of German; b USSR; c Czechoslovakia, estimate; d World total in 2005 is the total of countries listed by OICA though others are negligible; e Estimate; f. 1976/77 data

The position of the industry in Japan has changed markedly over the last two decades. At the beginning of the 1990s, the Japanese industry was seen as globally dominant (Womack et al., 1990). Non Japanese carmakers raced to emulate its world beating production system while governments erected trade barriers against Japanese imports. Since the early stages of its development in the 1960s, the Japanese industry has been highly export oriented. Domestic

10 'Engaging reverse gear', *The Economist*, 26th August, 2006.

production was equal to 247 percent of domestic sales in 1980 (van Tulder, 2004), placing the industry in a vulnerable position when the US and EU launched various retaliatory measures to curb vehicle imports from Japan. This retaliation combined with recession in Japan during the 1990s resulted in a steep decline in Japan's share of global production. This was particularly problematic for firms which were heavily reliant on exports and Mitsubishi, Mazda and Nissan were all forced into new ownership arrangements with US or European firms. But over the last few years production has expanded rapidly, spurred by exports. For the first time since the early 1990s, new capacity is being installed and reversing the trend of declining production. The success of Japanese brands, especially Toyota, has been a major contributory factor. Needing new capacity, it has been relatively easy to establish this in Japan with its established pool of high level skills and suppliers."

In the 1980s, Japan's exports into the more protected European market were at lower levels than into the US. Starting in 1986, Japanese firms built a series of assembly plants in Europe, initially in the United Kingdom. These facilities were producing 1.2 million vehicles by 2000. New Japanese plants led to the resurrection of the British automotive industry albeit under foreign ownership. As was the case in North America, concerns that these would be `screwdriver' plants using imported components proved exaggerated. Nissan, for example, soon achieved UK requirements of 80 percent local (European Community) content in its Sunderland plant.

Taken together, the EU constitutes the world's largest producing region and produced 20.8 million vehicles in 2005 (OICA, 2006). The industry in the EU has been subject to a number of conflicting forces. These have included the increasing presence of Japanese and American firms, but also strong regionalising tendencies and the emergence of a European division of labour (Lung, 2003; Layan and Lung, 2004). Germany, followed by France, remains the major producer but within Europe there have been significant shifts in production. The most important shift in the 1970s was the emergence of Spain as a major regional production centre. [12] Only 43,000 cars were produced in Spain in 1960, but by 1990 it was the world's sixth largest producer with output of 1.7 million cars (NAAMSA, 1991). More recently there has been rapid expansion in central Europe, especially in Poland, Slovakia and the Czech Republic.

Germany, the world's third largest vehicle producer in 2005, saw rising output during the 1980s with reunification providing a powerful boost. But the productivity gap with other

11 Interview: Ashwin Chotai, Director, Global Automotive Research, Global Insight (May, 2007).

12 For an account of the integration of Spain into the European production system,se e Layan (2000).

European countries was closing. The German industry managed only a two percent productivity growth rate during the 1980s and unit labour costs rose at nearly 2.5 percent per annum over the decade compared to 0.5 percent in the UK. In 1991, German compensation costs for production workers ($28.06 per hour) were the highest in the world and compared to $24.31 in the US, $18.16 in Japan and $15.14 in the UK. Opel, GM's European subsidiary, claimed that it cost an additional DM750 to make the Vectra in Russelsheim than it cost for Vauxhall to make the same vehicle at Luton in England in spite of lower productivity in the UK.[13] One result was that all the German producers started to cut jobs at their older plants during the 1990s. This process has continued and in spite of the opening of new assembly plants in the east, Germany's share of global vehicle output fell from 10.2 percent in 1980 to 8.7 percent in 2005. In 2006, automotive labour costs in France were 84 percent and in Poland only 14 percent of the German level (Verband der Automobilindustrie, 2007).

France remains the second largest producer in western Europe but output has stagnated since 1980. The French share of global output declined from 8.9 percent in 1980 to 5.3 percent in 2005. A feature has been strong state support for national car companies which, in turn, has deterred foreign investment until recently. Italy has declined sharply in relative importance reflecting mainly the misfortunes of Fiat, which in Europe remains very much bound to the domestic market.

3. PRODUCTION IN DEVELOPING COUNTRIES

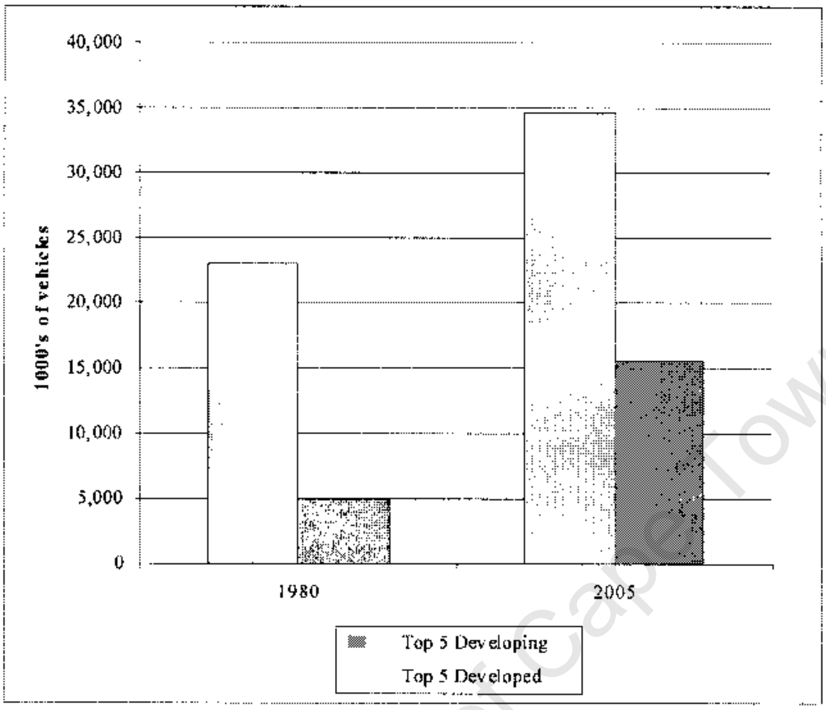
The assembly and production of cars has increased dramatically in developing countries during the last two decades. The most striking increases have occurred in Asia where firstly South Korea and more recently China and India have become major producers (see Table 2.1). In Latin America, Brazil and Mexico are major producers. The share of global output of the top five developing country producers increased to 23.4 percent of global output in 2005 compared to only 6.9 percent in 1980 (Figure 2.2). The rapid pace of growth in Asia is set to continue with major new investments under way in countries such as China and India. Global Insight estimate that India and China alone will account for 57 percent of the expansion in vehicle production from 2006 to 2012.[14] Production has also grown rapidly in Turkey and Iran which both produced over 800,000 vehicles in 2005. The new member states of the EU in particular, Poland, the Czech Republic, Hungary and Slovakia have experienced large increases in assembly and component production capacity as central Europe has been rapidly

13 *Financial Times,* 23 June, 1992

14 See Chotai (2007)

incorporated into the European Union's automotive industry. South Africa rated 22nd as a vehicle producer in 2005 with a 0.8 percent share of world, down from 1.1 percent in 1980.

Figure 2.2: Vehicle Production of Top Five Developing Countries versus Top Five Developed Countries, 1980-2005



Source: SMMT

Notes: In 1980 the top five developed country producers were Japan, USA, Germany, France and Russia and the top five developing countries were Brazil, Mexico, South Africa, Argentina and China. In 2005 the top five developed countries were USA, Japan, German, France and Spain and the top five developing countries were China, Korea, Brazil, Mexico and India.

Rapidly growing demand in developing countries has been accompanied by an enormous expansion in production capacity which has contributed to overcapacity problems impacting the industry globally. In 2003, global capacity utilisation was only 73.4 percent and was below 60 percent in South America, eastern Europe and Africa-Middle East.[15] This has been a result of overambitious investment by carmakers not wanting to be left behind in emerging markets with large potential growth. Carmakers' projections of vehicle demand made ahead of the 1997 Asian crisis proved to be hugely optimistic although Asian car markets have since recovered rapidly. The huge investments made in Brazil in the 1990s also proved over ambitious and currently there are concerns as to whether the enormous additions to capacity in China will be justified. Booming global sales over the past few years have, however, prevented the capacity issue from becoming a major problem.

15 Price Waterhouse Coopers, Autofacts July 2004

3.1 Global Automotive Trade

Shifts in global production have been accompanied by a rapid increase in international trade in the automotive industry. Global trade in automotive products grew by an average annual rate of over eight percent from 1980 to reach $914 billion by 2005, accounting for 9.0 percent of total merchandise trade and 12.5 percent of total trade in manufactures (WTO, 2007).

A number of changes in the composition of this trade are of particular significance. Firstly, as indicated in Table 2.2, the bulk of trade is regional, either intra-Europe or intra-north America. Trade within Asia is growing rapidly off a relatively low base. The importance of the regional dimension to global automotive trade has led some to argue that regionalisation is a more important force than globalisation.[16] While the EU and NAFTA have been of great significance in promoting regional integration, the same cannot be said for other regional formations such as Mercosur (Laplane and Sarti, 2004) and ASEAN (Shimokawa, 2004). In these entities the relatively small size of the economic groupings as well as difficulties in actually abolishing trade barriers has limited progress until recently. Very small regional groupings such as the Southern African Development Community (SADC) are of no consequence in an industry where economies of scale are so important (Black and Muradzikwa, 2004).

A second feature is the changing trade share of the major producing regions. The share in global exports of the US and particularly of Japan has declined (Table 2.3). The US remains a very large net importer of automotive products, from the rest of North America, from Japan and increasingly also from Europe. The relative decline of Japan as an exporter reflects the shift away from extreme export orientation, partly as a result of the growing importance of Japanese transplant capacity in North America, Europe and elsewhere. Japan remains a small importer of automotive products, given the size of its domestic industry and market. The export share of the EU has increased but most of this is intra-EU trade and is indicative more of the growing integration and eastward expansion of the EU than the growing competitiveness of traditional production centres. The 25 countries of the European Union accounted for 53.2 percent of global exports and 44.6 percent of imports in 2005. But their global share of extra-EU exports and imports was much lower; 14.6 percent and 6.0 percent respectively.

16 See, for example, van Tulder and Audet (2004).

Table 2.2: Major Regional Flows in World Exports of Automotive Products, 2005

	Value ($bn) 2005	Average annual % change 2000-5
Intra-Europe	391.3	11
Intra-North America	156.8	2
Asia to North America	74.3	6
Europe to North America	51.3	12
Intra-Asia	47.2	17
Asia to Europe	37.8	12
Europe to Asia	21.7	12

Source: WTO

South Africa's share of global automotive exports has grown significantly but so has its share of imports, which in dollar terms, grew by 31 percent per annum from 2000 to 2005. Imports of automotive products into Brazil, which has a much larger market and industry, were only half of the import level into South Africa. Even Japan's automotive imports were only 40 percent higher than imports into South Africa (Table 2.3).

The third key trend is the growth in developing country exports. Automotive exports from the 20 major developing country exporters increased to $137.4 billion in 2005 from $12.3 billion in 1980, representing an increase from 3.9 percent of global automotive exports to 15 percent (Table 2.4). The main exporters are Korea, Mexico and Brazil; and more recently also China, Turkey and Thailand.[17] South Africa ranks seventh among developing countries (excluding EU member states) as an exporter of automotive products.

Korea is the world's sixth largest vehicle producer and also exports components to the assembly plants of Korean car companies in foreign locations. Mexico and Turkey both have medium sized domestic markets and have benefited from becoming integrated into major regional markets. Mexico's role within North America has increased rapidly. Thailand has become a hub within south-east Asia by pursuing a more successful strategy to facilitate inward investment than its ASEAN neighbours." But in many developing countries the industry is not yet very export oriented. For instance, China, Brazil and India have large, rapidly growing domestic production, but exports are limited in relation to overall industry size. Nevertheless, China's automotive exports grew at 44 percent per annum during the period 2000-2005 and its share of global automotive exports will expand rapidly over the next decade. South-south trade has been heavily constrained by trade restrictions but is likely to

[17] Individua1 EU member states are not 1isted separately.
[18] See Shimokawa (2004)

expand rapidly both as trade barriers fall and as efficient capacity is established in developing countries. [19]

Table 2.3: Leading Exporters and Importers of Automotive Products, 1980-2005

	Value of exports/ imports ($bn) 2005	Share in world exports/imports (%) 1980	1990	2000	2005	Annual % change 2000-2005
Exporters						
European Union (25)	486.83	-	-	49.9	53.3	11
extra-EU (25)	134.21	-	-	12.4	14.7	13
Japan	122.90	19.8	20.8	15.3	13.5	7
United States	85.99	11.9	10.2	11.7	9.4	5
Canada	66.75	6.9	8.9	10.5	7.3	2
Korea, Rep. of	37.75	0.1	0.7	2.6	4.1	20
Mexico [a,b]	35.38	0.3	1.5	5.3	3.9	3
Brazil	11.97	1.1	0.6	0.8	1.3	21
China [b]	9.96	0.0	0.1	0.3	1.1	44
Turkey	9.36	0.0	0.0	0.3	1.0	43
Thailand [a,b]	7.98	0.0	0.0	0.4	0.9	27
South Africa	4.35	0.1	0.1	0.3	0.5	21
Taiwan	3.82	...	0.3	0.4	0.4	11
Australia	3.52	0.2	0.2	0.4	0.4	10
Russia [a]	2.44	-	-	0.2	0.3	26
Argentina	3.05	0.1	0.1	0.4	0.3	8
United Arab Emirates [c]	2.97	...	...	...	0.3	...
Total of 16 listed countries	892.60	-	-	98.7	97.7	
Importers						
European Union (25)	407.54	-	-	41.9	44.1	11
extra-EU (25)	54.91	-	-	5.5	5.9	11
United States	205.45	20.3	24.7	28.9	22.2	4
Canada [c]	57.61	8.7	7.7	7.9	6.2	4
Mexico [a,b,d]	25.14	1.8	1.6	3.4	2.7	5
Australia [d]	15.19	1.3	1.2	1.5	1.6	12
China [b]	13.55	0.6	0.6	0.6	1.5	29
Japan	13.17	0.5	2.3	1.7	1.4	6
Russia [a]	12.90	-	-	0.4	1.4	40
Turkey	11.96	...	0.4	1.0	1.3	15
Saudi Arabia [a]	11.64	2.7	0.9	0.6	1.3	25
South Africa [a,d]	9.27	...	0.4	0.4	1.0	31
Switzerland	8.52	1.8	1.9	1.1	0.9	6
United Arab Emirates [a,c]	6.05	0.4	0.3	0.5	0.7	...
Norway	5.25	0.6	0.4	0.4	0.6	15
Thailand [a]	4.62	...	0.8	0.4	0.5	19
Brazil	4.51	...	...	...	0.5	1
Total of 16 listed countries	807.72			90.7	87.5	

Source: World Trade Organisation

Notes: a Includes estimates by the WTO Secretariat; b Includes significant shipments through export zones; c 2004 data, not 2005; d Imports are valued f.o.b.

19 Interview, John Humphrey, Institute of Development Studies, June 2006. See also Kaplinsky (2005).

Table 2.4: Exports of Automotive Products from Developing Countries, 1990-2005

	Value $ millions			Share in economy's total merchandise exports	
	1990	2000	2005	2000	2005 a
World	318959	575650	913606	9.2	9.0
Korea, Republic of	2301	15194	37748	8.8	13.3
Mexico[b, c]	4708	30655	35382	18.4	16.6
Brazil	2034	4682	11970	8.5	10.1
China[b]	258	1581	9957	0.6	1.3
Turkey	153	1557	9360	5.6	12.8
Thailand[c]	108	2401	7983	3.5	7.2
South Africa	249	1708	4352	5.7	8.4
Taipei, Chinese	829	2221	3820	1.5	2.0
Argentina	200	2105	3047	8.0	7.6
Russian Federation[c]	-	875	2440	0.8	1.0
Singapore	348	678	2310	0.5	1.0
domestic exports	82	90	273	0.1	0.2
re-exports	266	588	2037	1.0	1.9
India d	198	640	2588	1.4	2.6
Hong Kong, China	354	764	1549	0.4	0.5
domestic exports	27	23	9	0.1	0.0
re-exports	328	741	1540	0.4	0.6
Philippines[b, c]	23	583	1538	1.5	3.7
Romania	354	195	1357	1.9	4.9
Indonesia	22	369	1266	0.6	1.5
Belarus	-	740	1176	10.1	7.4
Malaysia[b]	121	307	725	0.3	0.5
Colombia	6	226	645	1.7	3.0
Venezuela	73	223	340	0.7	0.6
Developing countries[e]	12296	67542	137357		

Source: WTO

Notes: EU member states are not listed individually. a Or nearest year; b Includes significant exports from processing zones; c Imports are valued f.o.b; d 2003 instead of 2004; e Top 20 exporters; f Excludes South Africa's significant catalytic converter exports

Important shifts in the location of components production have taken place. Component suppliers have become more internationalised, following assemblers to new locations and establishing networks of second and third tier suppliers within these locations. [20] In the advanced countries, Japanese component firms followed the transplants first to North America and then to Europe, especially the United Kingdom. European and American firms have been investing heavily to support growing assembly capacity in central and eastern Europe and component suppliers from all countries have been expanding operations in Asia, especially China.

The US remains by far the largest importer of automotive components with much of the growth over the past two decades accounted for by Japanese imports, mainly to supply the

[20] See for example Humphrey and Salerno (2000) and von Corswant and Fredriksson (2002).

growing production of Japanese transplants being established in the US. Growing integration within the North American industry is evident in the growing imports of components from both Canada and Mexico.

In Europe, the use of components from outside the EU has traditionally been limited. But the German industry, in particular, has been seeking to increase international sourcing since the late 1980s. This is the case both among volume producers (VW) and speciality firms such as BMW. The major reason has been the high cost of labour in Germany.[21] Most of this growth in outsourcing has taken place in lower wage countries of the EU, initially Spain and the UK and more recently from central Europe. Imports from developing countries have also increased rapidly.

With the establishment of Nissan, Toyota and Honda assembly plants, the UK in the 1990s had the fastest growing industry of all the major European producing countries. Component imports grew much faster than vehicle production and the fastest growing component exporters to the UK were developing countries with many exporting over long distances (Table 2.5). Growing regional integration has also been an important factor as indicated by the rapid expansion in imports from central Europe and countries such as Turkey.

Japan has historically relied much less than any other major producer on component imports and vehicle imports are also minimal. Total automotive imports in 2005 were only $13.17 billion. To the extent that imports have expanded, this is mainly as a result of pressure from trade partners and also as Japanese plants established overseas export back to Japan. But imports from developing countries especially in Asia are increasing. These have frequently resulted from foreign exchange balancing requirements in the new entrant producers but rising costs in Japan over the last two decades also make such arrangements increasingly attractive.

21 Interviews with PJ Weber, Director of Subsidiary Companies, Volkswagen AG and E Papke, Manager-Corporate Planning, BMW (SA).

Table 2.5: Imports of Parts and Accessories into the UK (£ millions)

Source Country	1982	Rank – top 15 (1982)	1990	Rank – top 15 (1990)	2004	Rank – top 15 (2004)
Germany	564.6	1	2 060.5	1	3113.0	1
France	281.9	2	879.3	2	1891.0	2
Japan	119.1	4	404.4	4	841.8	3
Belgium & Lux.	202.1	3	424.9	3	762.6	4
Italy	91.1	6	88.7	9	715.9	5
Spain	86.3	7	365.0	5	676.1	6
Netherlands	55.5	8	207.8	6	503.6	7
USA	107.7	5	163.5	7	463.3	8
Poland					208.2	9
Austria	8.4	12	72.6	9	185.4	10
China					182.1	11
Czech Republic					162.8	12
Turkey	0.2		13.7		146.8	13
Brazil	1.8		63.3	10	137.9	14
Sweden	46.1	9	120.4	8	105.6	15
Portugal	3.5	14	41.0	12	97.3	
S.Korea	3.3	15	57.1	11	89.2	
Hungary					80.7	
Taiwan	8.0	13	17.8	15	80.4	
Indonesia					60.6	
Denmark	23.1	11	39.4	13	57.5	
India					57.4	
South Africa	1.1		6.0		56.7	
Ireland	30.5	10	29.8	14	53.9	
Finland					37.8	
Total (All Countries)	1730.8		5434.9		11102.2	
No. of vehicles produced (000)*	1156		1565		1856	

Source: SMMT, 1991; 1993; 2005

4. THE STRATEGIES OF MULTINATIONAL FIRMS

The key decisions about the global location of automotive production are made by a small group of multinational firms. Faced with increased competition, global firms have developed a range of strategies to reduce costs and risk and increase their flexibility. The prime focus is on strategies which have implications for the location of the industry.

This section starts by outlining some of the major changes in the industry with regard to increasing concentration and changes in the system of production. It then goes on to examine location strategies in the assembly and supplier industries.

4.1 The Concentration of Ownership

The top 15 multinational auto companies accounted for 87 percent of global light vehicle production in 2005 (Table 2.6). In the case of passenger cars, the top 15 firms accounted for 80 percent of global production in 1994 (Dicken, 2003) but by 2005 this had increased to 93 percent. The level of concentration has been increased by a spate of takeovers and mergers over the last two decades. These included the takeover of Chrysler by Daimler-Benz in 1998 and of Volvo cars by Ford in 1999. The effective level of concentration is in fact higher if one takes account of the growing number of strategic alliances that have been established (Figure 2.3). Since 1998, Renault has taken a 40 percent stake in Nissan, GM a large stake in Fiat and DaimlerChrysler now owns 34 percent of Mitsubishi. There are also numerous joint ventures between the various 'groups'. These arrangements have been of particular importance in the development of shared platforms and components. But there are also countervailing tendencies including the rise of new producers such as Hyundai. Over the next decade, it is likely that major independent producers will emerge from China and perhaps also India. The trend towards mergers, however, is not a one way street as indicated by the recently announced break up of DaimlerChrysler.

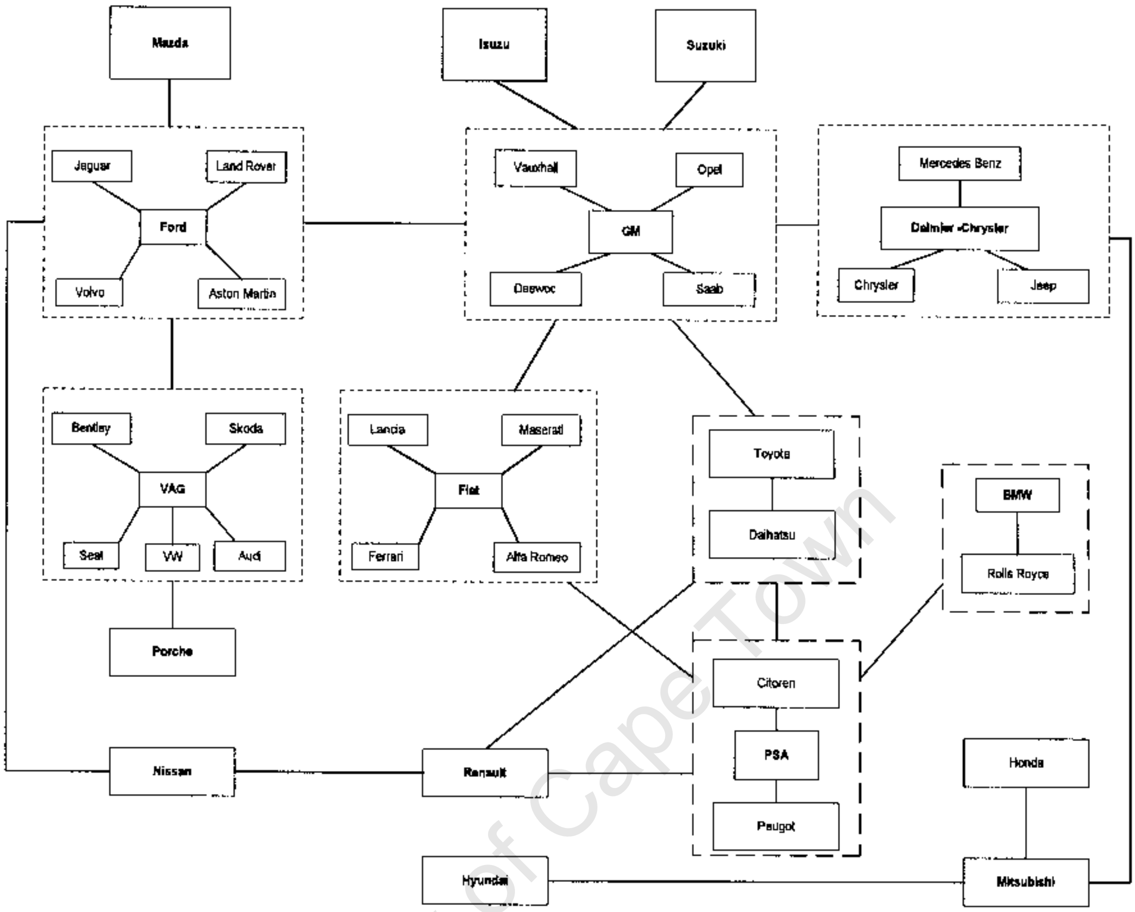
Table 2.6: Light Vehicle Production by Manufacturer, 2004-2005

	Production (units) 2004	Production (units) 2005	% of 2005 global production
Global Total[a]	60,388,010	62,513,186	
General Motors (Opel-Vauxhall)	8,033,447	9,040,309	14.5
Toyota	6,546,028	7,100,167	11.4
Ford (Jaguar-Volvo cars)	6,569,118	6,418,416	10.3
Volkswagen Group	5,061,369	5,173,351	8.3
DaimlerChrysler	4,282,130	4,319,399	6.9
PSA Peugeot Citroen	3,405,245	3,375,366	5.4
Honda	3,237,434	3,372,924	5.4
Nissan	3,039,521	3,348,033	5.4
Hyundai-Kia	2,524,429	2,853,436	4.6
Renault-Dacia-Samsung	2,471,654	2,616,818	4.2
Suzuki-Maruti	1,976,824	2,071,707	3.3
Fiat-Iveco	1,968,708	1,934,476	3.1
Mitsubishi	1,421,428	1,327,035	2.1
BMW	1,250,345	1,323,119	2.1
Mazda	1,270,918	1,285,130	2.0

Source: Compiled from NAAMSA (2005; 2006)

Notes: a Top 50 producers. Other small scale manufacturers account for less than a million additional units.

Figure 2.3: The Organisational Map of the Automobile Industry in 2000



Source: Dicken (2003)

Among component producers, the level of concentration is also high and this sector has also been characterised by a large number of mergers and takeovers in recent years. Even though there are a very large number of independent component suppliers worldwide, the top twenty multinational component firms account for the lion's share of global output with automotive sales in 2003/2004 amounting to $309 billion (Becker, 2006).[22]

The implications of a high degree of concentration in ownership are that the decisions on vehicle production location are made by a relatively small number of firms generally headquartered in the developed world. These caretakers also have a great influence on the location of first tier comment suppliers who will often be required to follow them to new locations.

[22] The top 50 globa1 component suppliers are 1isted in Appendix Three.

4.2 The Changing Production System

Over the past few decades, the automotive industry has been at the forefront of a revolution in production organisation both within plants and in the governance of global networks of plants and suppliers. These changes have important implications for the location of global capacity.

One way in which carmakers have sought to reduce costs while maintaining or even increasing product diversity is to develop platform strategies under which an increasing number of vehicles share the same basic platform. Cars with quite different external features can share common chassis and major mechanical components. This reduces the cost of product development and allows for economies of scale in production while maintaining the ability to differentiate products to local markets and maintain a wide variety of models. The idea is to design platforms in core locations and then introduce relatively minor modifications in various markets. For example, Volkswagen had 16 passenger car platforms for its VW, Audi, Seat and Skoda brands in the mid 1990s and has sought to reduce these to just four (Lung, 2003).[23] During the 1990s, the number of platforms being used by European manufacturers fell from over 70 to less than 40 (GPN, 2003: 11). Some vehicles are designed specifically for emerging markets. For instance the Fiat Palio was designed in Brazil and Italy for large emerging market plants worldwide (Sturgeon and Florida, 1999). One objective of building common platforms is the effort to build low volume, but efficient assembly plants that are both expandable and flexible in terms of the variety of models that can be built (Sturgeon and Florida, 1999). Toyota has recently introduced the International Multipurpose Vehicle (IMV) which is being built only in emerging markets using parts sourced from a network of developing countries with Thailand as the hub.[24] For the first time, all parts will be sourced from lower cost countries outside of Japan.

Carmakers are trying to reduce minimum efficient scale by moving to more modular forms of assembly. This involves the modularisation of major components and component systems.[25] Final assembly of pre-assembled modules then becomes a simpler process with a correspondingly smaller required investment. A negative implication for local suppliers of sub-components is that, if complete modules are imported, it becomes impossible to supply domestically produced sub-components for these modules. The flexibility and reduction in scale that carmakers are striving for in assembly can, therefore, be to the detriment of

23 This strategy was partly reversed due to concerns that customers might identify more down market vehicles with more expensive vehicles (GPN, 2003: 11).

24 See 'Toyota plants itself near emerging markets,' (*Wall Street Journal, 12* May 2005).

25 Modules are major components which constitute a coherent unit while component systems are located throughout a vehicle and define a function, for example, the steering system (GPN, 2003).

developing country producers which are trying to move beyond being final assembly `screwdriver' plants.

There have also been far-reaching changes in the relationship between vehicle producers and suppliers, which have important implications for the location of production and especially for developing country suppliers seeking to break into major markets. Traditionally, vehicle producers undertook design and placed orders with component suppliers who were kept at arms length although many firms including GM and Ford had large in-house component production capacity. With the advent of lean production, these relationships have changed fundamentally (Lamming, 1993). Outsourcing has increased among nearly all vehicle manufacturers and companies, such as GM and Ford, spun off their in-house component divisions to establish Delphi and Visteon respectively as independent supplier companies. However, while the level of outsourcing has increased this is not an irreversible trend and there are many cases where the process has been partially reversed (GPN, 2003). While the tendency towards outsourcing may have positive implications for the supplier industry, vehicle producers clearly prefer to use a smaller number of suppliers. In 1990, there were an estimated 30,000 suppliers in North America. This number fell to 10,000 in 2000 and it is anticipated that it will decline further to 3000-4000 by 2010 (GPN, 2003: 19).

At the same time the role of component suppliers has changed. First tier suppliers now have substantial design and engineering capacity and are specialists in their respective component systems. Tier two suppliers with lesser capabilities supply components to these systems producers and in turn are supplied with sub-components and raw materials by tiers three and four. There may even be a role for systems integrators, so-called 'tier 0.5' suppliers, who are responsible for designing and assembling an entire module such as the door or interior and are sometimes located within the assembly plant.

In response to these pressures, suppliers have consolidated and large global supply companies such as Delphi, Visteon, Bosch and Denso have considerable bargaining power of their own due to their highly developed technological and specialist capabilities in certain components. Technological leadership may in fact be a more important consideration than position in the supply chain in determining profitability (GPN, 2003).

These changing linkages between assemblers and suppliers have important implications for the power relationships within the automotive production chain and for the location of production. The auto industry has been characterised as a producer driven value chain controlled by a handful of major car companies (Gereffi, 1994). Car firms have been able to drive down prices of components and at the same time set more exacting requirements for quality and delivery. Vehicle producers also request that component producers follow them to new locations in emerging markets. 'Follow source' whereby the same supplier supplies the same component from a plant located within the country where vehicles are being assembled is the most desired option. This has meant greater reliance on multinational suppliers in developing country locations such as Mexico, Brazil, central Europe and South Africa.[26]

Just-in-time (JIT) supply has clear implications for location because of the requirement that first tier suppliers locate close to assembly plants. Major suppliers are following assemblers to new locations and establishing their own networks of subcomponent suppliers in reasonably close proximity. Two decades ago, Jones and Womack (1985) argued that the requirement to locate close to assembly plants had negative implications for developing country component industries as component suppliers increasingly located themselves within their major (developed country) markets. These concerns turned out to be exaggerated (Black, 1994) but as is demonstrated below, with a growing proportion of new assembly capacity being located in emerging markets, first tier suppliers are following so the locational impact is rather the reverse of that argued by Jones and Womack.

4.3 The Internationalisation of Investment and Production in the Assembly Sector

The multinational car companies have all become more global over the past three decades as they have developed multiple bases and become involved in corporate tie-ups and joint ventures with foreign firms.[27] Important shifts have taken place in the location of new investment as firms have sought footholds in new markets, established capacity behind protectionist barriers or in lower cost production sites. With the exception of Ford, which was in any event highly internationalised, every one of the top 12 car producers increased their share of output produced abroad over the period 1989-1994. This was not a new phenomenon in the sense that by as early as 1928, Ford and GM were assembling vehicles in 24 countries including a number of developing countries (Sturgeon and Florida, 1999). But the share of their output located in developing countries was minimal. In 1989 the average share of production abroad for the top 12 firms was 21 percent and by 1994 this had increased to 33.4 percent.

The factors, leading firms to invest outside of their home markets, vary with a key distinction being between 'cost-cutting' and 'market seeking' investment locations (Sturgeon and

26 The implications of this, for the South African case, are discussed in Chapter Six.

27 For detailed overviews see the two volumes edited by Freyssenet et al. (2003a; 2003b).

Florida, 1999). Based on this distinction, Sturgeon and Florida (1999) use the typology of Large Existing Market Areas (LEMAs), Peripheries of Large Existing Market Areas (PLEMAs) and Big Emerging Markets (BEMs) to categorise the types of production locations that are available to vehicle producers. [28] LEMA's refer to existing developed markets, examples being investment by Japanese firms in the US or western Europe. This is clearly market seeking investment. PLEMA's include locations such as Mexico and the new EU member states. In the 1970s and 1980s, Spain was in this category. Investment in these locations is motivated at least in part by cost cutting, obtaining free access to major markets but at the same time access to lower wages. Investment in BEMs can also be classified as being of the market seeking type.

The type of investment made, depends very much on the multinationals perception of the market concerned. LEMA plants are generally state of the art, large scale facilities because they compete directly with advanced capacity in those locations. PLEMA type plants tend to have capacity levels not much lower than plants in developed markets, high levels of automation and productivity and medium but rising levels of integration and local supply (Sturgeon and Florida, 1999). They are also highly export oriented. In big emerging markets (BEMs) the main attraction is the (protected) domestic market. These plants tend to have low capacity levels, low productivity and low levels of integration into the operations of parent companies.

While the big US based firms have been internationalised for some time with both having very large operations in Europe, this is a more recent development for Japanese firms. Japanese car producers have traditionally concentrated production within their home country to a far greater extent than American or the major European producers. This was the case especially for the largest firm, Toyota, which in 1988 produced 89 percent of its output in Japan. But by the late 1980s, Japanese firms were rapidly globalising their activities in North America and Europe. More recently, Japanese firms have been investing heavily in Asia including China and Thailand.

Volkswagen is the only European producer with a true multinational presence (Pries, 2003). In 2005, only 36 percent of VW's global output was being assembled in Germany (Verband der Automobilindustrie, 2007:43). [29] Labour costs have long been an important factor in

28 Humphrey and Oeter (2000) use a similar typology in their study of developing country automotive policy. In their schema, Protected Autonomous Markets (PAMs) include countries such as China, and India; Integrated Peripheral Markets (IPMs) include Mexico and central European countries such as the Czech Republic and Emerging Regional Markets (ERMs) include regional groupings such as ASEAN and Mercosur. This typology has been used in an adapted format in the discussion on policy in Chapter Three.

29 This includes Audi which has a high share of production in Germany.

Volkswagen decision making. Its labour costs in the early 1990s at 25 percent of sales, were among the highest in the industry and compared to 17 percent for the French carmakers, the next highest cost producers.[3] In the early 1990s, Mexico was seen as the most cost efficient production site followed by the Czech Republic.[31] VW's long term strategy has seen the German share of output falling as production was moved to lower cost locations. This was in spite of the fact that in the early 1990s VW already had the lowest home market share (59 percent in 1992) of any major producer. The only significant recent additions to domestic capacity have been in eastern Germany and VW now has substantial operations in Spain, Mexico, Brazil, China, Belgium, the Czech Republic, Poland and South Africa. Volkswagen's main assembly facilities are located in northern Germany and it draws on a supply network which is located at substantial distances. The production of components has been shifted increasingly onto outside suppliers. High levels of vertical integration (around 40 percent of the production process was performed in-house in the early 1990s) have been reduced to 25 percent in the new production sites in eastern Germany. Global sourcing is also growing in importance.

The German luxury carmakers have also looked to increase non-German production and sourcing in response to rising domestic costs. Both Daimler-Benz and BMW, for example, built plants in the US in the early 1990s. According to BMW, the main reason was to get closer to their second largest market but an additional factor was that production costs were approximately 30 percent less than in Germany.[32] The German firms have continued to rapidly increase production in foreign sites, most notably China. In 2006, the share of foreign built vehicles reached 47 percent, up from 35 percent in 1996 (Verband der Automobilindustrie, 2007: 17). The other European producers initially remained more dependent on their home markets and during the 1990s struggled to adapt to growing competition from, for example, the new UK based Japanese transplant firms.[33]

As Table 2.7 indicates, the major multinationals were already well established in developing countries by the early 1990s. At the same time, it is clear that one cannot generalise about the various strategies of the major firms. Of the principal producers, Volkswagen, Fiat and Chrysler were the only ones to have located over 15 percent of their production in developing countries by the mid 1990s.

30 The information in this section is based on interviews with senior management at Volkswagen AG in Wolfsburg, Germany.

31 Interview with PJ Weber, Executive Director of Subsidiary Companies and Projects, Volkswagen AG.

32 *Financial Times*, 24 June, 1992

33 During the 1990s the Nissan plant in the north of England was regarded by many observers to be the most efficient plant in Europe. The relative strength of sterling and the advent of the Eurozone has undermined the competitiveness of the UK as a location for automotive investment.

The rapid expansion of investment in emerging markets is evident when comparing the various panels in Table 2.7. The ten carmakers listed in the table increased the number of main assembly plants in the leading emerging markets from 34 in the early 1990s to 69 by the late 1990s and 80 in 2005. Firms which were already established in countries such as Brazil and Argentina opened up additional assembly plants. There was considerable investment in central Europe by American and European firms. In large, rapidly growing markets such as China and India, there was very rapid expansion as American, European and Japanese companies established new plants. In addition, Japanese firms moved into Latin America and American firms invested in ASEAN markets (Humphrey and Memedovic, 2003). Links also became closer with joint ventures being replaced by wholly owned subsidiaries especially in India and South Africa. In the period to 2005, there was limited new entrant investment into the major producer countries by carmakers which did not already have a presence. More evident was a process of expansion and consolidation as plant volumes increased in response to a more competitive environment. But in China, in particular, carmakers built additional plants. In some cases, for example in Argentina, multinationals withdrew from production in developing countries.

4.4 Regional Complementarities

While the major automotive groups have all increased their global reach, many of their strategies are more correctly described as 'regional' rather than `global'. [34] Firms may seek to establish regional complementarities as a way of achieving scale economies and to create a division of labour which could facilitate the location of more labour intensive operations in low wage regions. In order to placate national governments within a region, firms may also seek a semblance of balance in their automotive activities across the various countries in the region. Another reason to spread their activities has been to offset exchange rate risk.

34 See, for example, van Tulder and Audet (2004)

Table 2.7: Main Light-Vehicle Assembly Plants in Emerging Markets, Early 1990s to 2005

Country	GM	Ford	VW Group	Daimler/ Chrysler	Fiat	Renault	PSA Group	Toyota	Nissan	Honda
					Early 1990s (34 Plants)					
Mexico	Xa	X	X	X					X	
Argentina		X	X			X	X			
Brazil	X	X	XX		X					
Malaysia								X	X	
Thailand								X	X	X
Indonesia								X		X
Czech/Slovakia			X							
Poland	X				X	X				
Hungary										
India										
China			X	X			X			
South Africa	X	X	X	X				X	X	
					Late 1990s (69 Plants)					
Mexico	Xa	X	X	XXb					X	X
Argentina	X	X	X	X	XX	X	X	X		
Brazil	XX	XX	XXX	X	X	X	X	X		X
Malaysia							X	X	X	
Thailand	X	X						X	X	X
Indonesia	X							X		X
Czech/Slovakia			X							
Poland	XX	X			XX	X				
Hungary	X		X							
India	X	X		X	X			X		X
China	X	X	X	X			X		X	X
South Africa	XX	X	X	X				X	X	
					2005 (80 Plants)					
Mexico	XX	X	X	XX				X	X	X
Argentina	X	X	X			X	X	X		
Brazil	XX	XX	XXX	X	XX	X	X	X	X	X
Malaysia							X	X	X	X
Thailand	X	X						X	X	X
Indonesia	X							X		X
Czech/Slovakia			X				X			
Poland	XX	X			XX	X				
Hungary	X		X							
India	X	X	X	X	X			X		X
China	XXX	X	XX	X	X		X	XX	XX	X
South Africa	XX	X	X	X				X	X	

Sources: Humphrey and Memodovic (2003: 7), NAAMSA, Chotai (2007), OICA, Domanski et al (2006).
Notes: Plants producing more than 20,000 units only. XX denotes two assembly plants

As indicated in Table 2.8, central Europe has been rapidly integrated into the existing western European industry. Many older plants have closed in traditional locations with a number of new plants being opened in the east. This trend is even clearer if account is taken of the fact that nearly all of the new plants built in Germany since 1991 have been located in what used to be the GDR. Central Europe has taken over from Spain and Portugal as Europe's low cost manufacturing region. In April 2006, Peugeot announced the closure of its assembly plant in the UK and plans to build the successor model in Trnava, Slovakia. Some have argued that the BMW plant being built in Leipzig in eastern Germany may be the last large scale car plant built in western Europe although it is likely that smaller plants (e.g. for luxury vehicles) will continue to be built. [35] On the other hand, it has been argued that BMW's choice of Leipzig, in competition with locations in the new EU member states to the east, demonstrates the strength of institutional factors, including dense networks of suppliers, in maintaining the competitiveness of high wage locations (Pries, 2007).

Labour costs are an important consideration. As Table 2.9 indicates, there are considerable labour cost differentials between the high wage countries in western Europe and the new EU members in central Europe such as Poland and the Czech Republic. This is in spite of the fact that labour costs have been rising quite rapidly in central Europe. For instance, in 1996, labour costs in the Czech Republic were 8.8 percent of the German level while by 2006, they had increased to 19.2 percent of the German rate. Romania in turn has even lower labour costs.

35 See 'Peugeot packs its bags' *(Economist,* 22 April, 2006). This view was supported by interviews with industry analysts in the UK (June, 2006) and with senior staff in the Verband der Automobilindustrie (German motor federation) in February 2007 and with Garel Rhys of Cardiff Business School in May 2007.

Table 2.8: Assembly Plant Openings and Closures in Europe, 1991-2005

Year	Closure	Opening
1991	Renault, Valladolid (Spain)	Eurostar, Steyr (Austria)
	Saab, Malmo (Sweden)	
1992	Renault, Billancourt (France)	Opel, Eisenach (Germany)
	Rover, Cowley (UK)	Mercedes, Rastatt (Germany)
	Lancia, Desio (Italy)	Honda, Swindon (UK)
	Lancia, Chivasso (Italy)	Toyota, Burnaston (UK)
	Innocenti, Lambrate (Italy)	Suzuki, Esztergom (Hungary)
		General Motors (Poland)
1993	Volvo, Uddevalla (Sweden)	Seat, Martorell (Spain)
		Volkswagen, Bratislava (Slovakia)
1994	Volvo, Kalmar (Sweden)	Sevelnord, Hordain (France)
		AutoEuropa, Palmela (Portugal)
		Volkswagen, Mosel (Germany)
		Fiat, Melfi (Italy)
1995		NedCar, Born (Netherlands)
		Ford, Plonsk (Poland)
1996	Seat, Barcelona (Spain)	Autonova, Uddevalla (Sweden)
	Chausson, Creil (France)	
1997	Renault, Vilvorde (Belgium)	MCC, Hambach (France)
1998	Renault, Setubal (Portugal)	Opel, Gliwice (Poland)
		Audi, Gyor (Hungary)
1999	GM-Opel, Szengotthard (Hungary)	
2000	Ford, Azambuja (Portugal)	
	Ford, Plonsk (Poland)	
	Foden, Sandbach (UK)	
2001	GM, Luton (UK)	Ford (Turkey)
	Fiat, Rivalta (Italy)	Toyota, Valenciennes (France)
2002	Ford, Dagenham (UK)	Volkswagen, Dresden (Germany)
		Porsche, Leipzig (Germany)
2004		Toyota (Poland)
2005	Nissan, Cuatro Vientos (Spain)	PSA – Toyota (Czech Republic)
		BMW, Leipzig (Germany)

Sources: Lung (2003:8); Rhys (2004), European Restructuring Monitor (2007)

Table 2.9: Labour Costs in the Automobile Industry (€/hour)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Germany	34.44	34.08	35.02	37.29	37.78	36.98	38.68	40.72	41.39	41.62	42.29
France	23.12	23.61	23.93	24.68	24.84	25.15	29.46	30.68	33.24	34.37	35.52
Italy	19.46	19.89	19.93	19.28	20.45	20.85	22.08	22.88	23.08	23.90	24.68
UK	16.11	19.95	21.41	22.47	25.81	25.82	29.35	26.37	29.04	29.55	30.71
Spain	17.33	17.18	17.33	18.25	18.63	18.93	19.41	19.79	20.34	21.17	21.99
Poland	2.68	3.15	3.54	3.64	3.97	5.31	5.15	4.64	4.70	5.46	6.00
Romania	-	-	-	1.33	1.55	1.70	1.81	1.85	2.16	2.80	3.23
Slovakia	1.93	2.15	2.36	2.54	2.81	3.04	3.27	3.61	3.77	4.31	4.80
Czech Rep.	3.02	3.49	3.85	4.07	4.37	5.17	5.72	6.01	6.52	7.22	8.10
USA	22.91	26.42	26.53	28.14	33.43	35.81	36.19	31.44	29.46	31.07	31.66
Japan	23.38	24.80	23.32	28.03	33.74	31.43	30.18	27.47	25.85	25.58	23.95

Source: Verband der Automobilindustrie (2007: 66)
Note: Includes all employees including indirect labour costs

Wage costs are an important determinant in location. In a survey of 200 western European suppliers which already have operations in eastern Europe or China, 75 percent rated wage costs as a very important factor when choosing a production location (Ernst and Young, 2005: 13) compared to proximity to attractive sales markets (39 percent) and proximity to vehicle manufacturers (39 percent).

Interestingly, Germany with among the world's highest labour costs, has continued as a major exporter and has a rising automotive trade surplus. Its trade surplus in automotive products in 2005 was nearly €90 billion compared to just €33 billion in 1990 and €62 billion in 2000 (Verband der Automobilindustrie, 2007). The recent growth in German exports reflects both the rapid expansion in the industry in central Europe and the competitive edge derived in part from sourcing lower cost components from central Europe. [36]

Lung (2007) has argued that, within the EU, the shift in production may be from previous low cost centres such as Spain rather than from core countries such as Germany and France. Home country political pressures on German and French carmakers are certainly a consideration in location decision making. Countries such as Spain have traditionally specialised to a degree in smaller cars where assemblers now clearly favour central Europe. Spanish output has declined in recent years.

An important aspect of the American automotive industry's response to the competitive challenge by Japanese firms in the 1980s and 1990s was the spatial dimension — the

[36] Interview with VDA, February 2007

reorganisation of the industry on a continental level and the drawing in of both new regions within the United States as well as the incorporation of the Canadian and Mexican industries (Carrillo, 2004a). The Big Three US carmakers started to invest heavily in Canada as a lower cost alternative from 1965. The US-Canadian Auto Pact was followed by the Canada-US Free Trade Agreement in 1989, which laid the ground for the establishment of NAFTA itself. The weak Canadian dollar in the late 1970s and 1980s ensured that Canada was a lower cost location than the US.

The integration of Mexico came later but the high productivity achieved in world scale engine plants (Shaiken, 1990) in the early 1980s encouraged the big US producers that Mexico had potential as a low cost production centre (Carrillo, 2004a). The advantages were high productivity in their custom-built export plants in north and central Mexico coupled with wages that were approximately one fifth of the US level. This process began in the late 1980s and the percentage of Mexican produced vehicles exported, climbed from 16 percent for the period 1983-87 to 41 percent for the period 1988-94. The establishment of NAFTA in 1994 consolidated the open North American market but also protected it from the outside competition by imposing rules of origin requiring 62.5 percent North American content.

As far as regional specialisation and relocation is concerned, Mexico initially became the base for very labour intensive processes such as the manufacture of wiring harnesses and currently accounts for 90 percent of North American supply. But the reliance on simpler, more labour intensive production started to change with new investments in automated second generation plants and more recently with the establishment of 'third generation' plants which included substantial design and research capacity (Carrillo, 2004b). Mexico's share of NAFTA vehicle production was 10.3 percent in 2005 (VDA, 2007:8) and looks set to climb given the growing tendency to locate new North American assembly plants in Mexico. Carrillo (2004a) argues that there is no clear trend away from locating assembly in the US or Canada although new investment in the US has taken place outside of the traditional core auto manufacturing region. Certainly, investment has continued apace in both the US and Canada. However, the bulk of recent investment in the US has been by Japanese or European firms and Ford and GM are set to reduce capacity by closing two dozen North American plants and cutting 60,000 jobs in the US by 2012.[37] This process has been replicated in components. By 2002, GM's component arm, by then operating as a separate company (Delphi Mexico), had nearly 60 plants employing more workers (71,000) than in the US (Carrillo, 2004b).

37 See 'Detroit, Far South' *New York Times,* 21 July, 2006.

`Guided integration' [38] has been a successful strategy for Mexico and it appears likely that the country will grow in importance for three reasons; its greater potential for market growth, its lower labour costs and the high productivity achieved by modern plants. Ford's massive new $1.8 billion expansion at Hermosillo in Mexico at a time when large cutbacks are being announced in the US exemplifies this trend. For Ford this expansion is explicitly an attempt to restructure production and lower costs in the face of severe difficulties in its home market.

Carmakers also played an important role in the establishment of Mercosur, as it was clear that co-operation between their subsidiaries in Argentina and Brazil could reduce costs. Protracted negotiations led to the establishment of a system under which bilateral trade between Argentina and Brazil was regulated by quotas and trade compensation requirements. While the objective was to rationalise capacity it may have led to the establishment of new plants because firms with plants on both sides of the border benefited most from compensatory arrangements.

ASEAN is far more fragmented than the EU or NAFTA but its move towards regional integration continue to make progress. ASEAN has established a Common Effective Preferential Tariff scheme (CEPT) but countries maintain protection on vehicles and there are all kinds of complexities. For instance, Malaysia's national Proton project continued to receive large scale government support and protection to the detriment of foreign owned firms. The vehicle market in each country is supplied mainly by domestically located firms.

There has been more success in achieving regional integration in component manufacture. For example, in ASEAN, Toyota produces transmissions in the Philippines, diesel and petrol engines in Thailand and Indonesia respectively and steering gear in Malaysia. All these parts are exported to the other three countries thereby achieving economies of scale in the production of major components (Shimokawa, 2004).

Regional specialisation can be effective in reducing costs and carmakers have frequently played a role in promoting the establishment of regional trading blocs. The benefits for favoured countries can be considerable. Examples include Spain in the 1970s, Canada in the 1980s and more recently Mexico (in relation to North America), the Czech Republic, Hungary, Poland, Slovakia and Turkey in relation to the EU and Thailand in south-east Asia. For locations which are not favoured by multinational car companies or for countries not located adjacent to major markets the implications are much less positive. Clearly too, there are implications for domestic component suppliers, which may be poorly equipped to

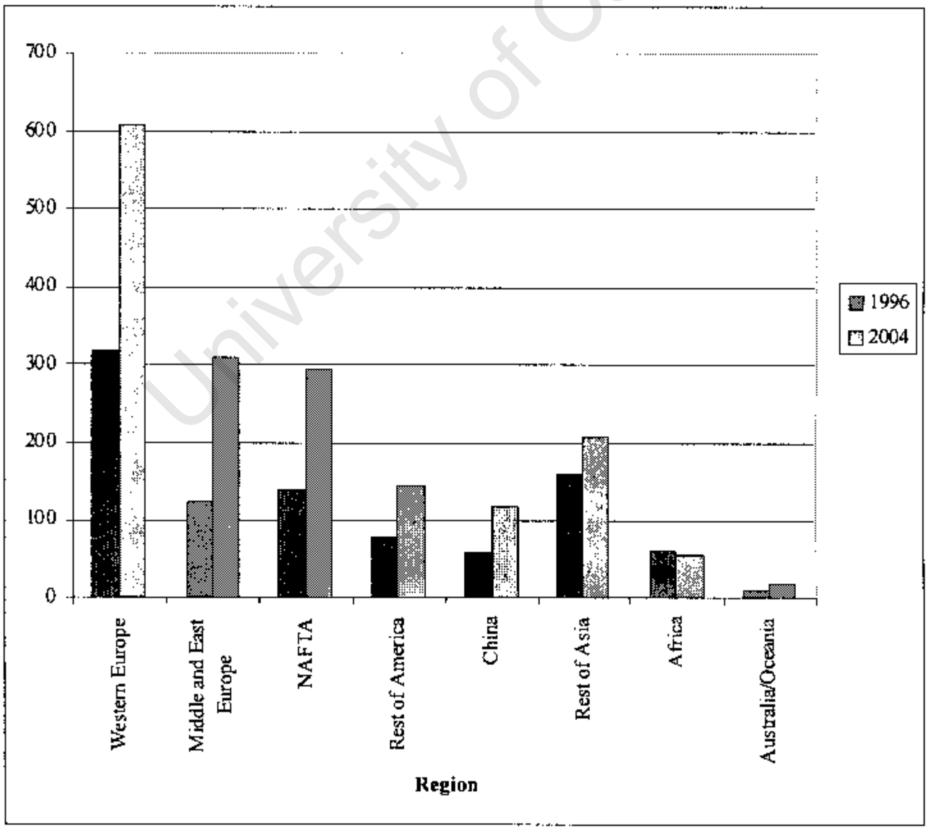
38 This term was used by Womack (1989) to define Mexico's automotive strategy.

compete with the inward rush of FDI and need to find themselves new markets or new partners. In many cases they have struggled to find a niche for themselves within these new supply chains and have frequently been relegated to the manufacture of less complex sub-components or excluded altogether.

4.5 The Globalization of the Supplier Industry

The internationalisation by vehicle producers has been replicated in the component industry. In a survey of first tier suppliers, von Corswant and Fredriksson (2002) found that these firms had increased the number of countries in which they had production plants from 5.8 in 1988 to 12.2 in 1998 with a further increase planned by 2003. A number of these features are evident in the establishment of new capacity by German suppliers. From 1996 to 2004 the number of foreign production locations of German suppliers increased from 953 to 1758. This included rapid growth in established automotive centres such as France, the UK, Spain, Italy and the US, but there was also rapid expansion in fast expanding emerging locations in central and eastern Europe, Brazil, Mexico, India and China (Figure 2.4). Africa's share of the production locations, of which South Africa is by far the largest component, declined sharply.

Figure 2.4: Foreign Production Locations of German Component Producers, 1996-2004



Source: VDA (2005: 13-15)

This trend is continuing but it appears that expansion in western Europe will slow significantly. A survey of 200 western European suppliers[39] by Ernst and Young (2005) found that 38 percent already had operations in eastern Europe or in China and a further 16 percent were planning production activities in these two locations. More telling was the fact that 90 percent of those firms, with operations in eastern Europe or China, were planning further production shifts. The number of firms already operating or planning to increase their presence was heavily biased to larger firms. Eighty nine percent of firms with sales in excess of €100 million already had operations in eastern Europe and/or China or were planning to establish production activities (Ernst and Young, 2005: 11).

But it is clear that this new investment is highly concentrated in favoured, emerging market locations. For the 50 percent of western European suppliers planning location shifts, central/eastern Europe (39 percent) was the favoured location followed by China (23 percent). Only five percent of firms were planning to shift to other locations (Ernst and Young, 2005: 12). In central Europe, preferred locations were Poland, Hungary, the Czech Republic and Slovakia. Some 41 percent of firms regarded western Europe as very attractive or 'more or less attractive' while there was much less interest in locations such as Thailand (13 percent), Vietnam (10 percent) and Russia (8 percent). Over the longer term (10-15 years) none of the respondent firms with production capacity in eastern Europe or China believed that a large number of production plants would be built in western Europe.

The case of the French multinational, Valeo, is typical. The firm increased its number of plants from 40 in 1986 to 104 in 1997 and 129 in 2006 (Table 2.10). The bulk of new expansion has taken place in emerging markets in South America, Asia and central Europe.[40] Another example is the German multinational, Behr, a producer of air-conditioning and engine cooling systems. Behr increased its production outside of Germany from 37 percent of total sales in 1996 to 49 percent by 2000. This included plants in Brazil, India, the Czech Republic and South Africa (Gelb and Black, 2004: 215). These new facilities supply local assemblers but also export back to established assemblers in high income countries. The US component giant, Delphi, now has six plants in Poland and sales have increased from €30m in 1995 to nearly €800 million in 2005, with exports accounting for 80 percent of output. Another major US firm, Lear Corporation increased its share of employment in low cost countries from 34.7 percent in 1995 to 55.4 percent in 2004 and then announced in 2005 that it was accelerating the move to low cost countries (Jurgens and Krzywdzinski, 2007).

[39] 35 percent of surveyed firms had sales in excess of E 100 million.

[40] See also Laigle (2003)

Table 2.10: Global Expansion at Valeo

	Number of plants		
Location	1986	1997	2006
France	21	27	70
Europe, excluding France	12	34	
Asia	0	10	26
North America	4	12	14
South America	3	21	10
Africa	0	0	9
Total	40	104	129

Sources: Humphrey and Memedovic (2003: 24); Valeo Annual Report (2006)

Perhaps most importantly, firms constantly report that they intend to move to low cost locations. The term `LCCs' (low cost countries) has become part of the business parlance in the automotive industry and is contrasted to high cost countries, for example, those of western Europe. For instance, in a series of presentations by leading multinational component firms in Krakow, Poland, senior management from NSW, Delphi and Valeo all referred to growing expansion in central Europe vis-à-vis western countries.[41] According to these executives, not only was labour significantly cheaper, but productivity at these new locations was at least equal to that in western Europe, partly because plants were new.

For supplier firms surveyed by Ernst and Young (2005) expectations regarding the future division of labour were very clear. While component manufacture and final assembly are expected to decline in western Europe it was expected that design and branding would grow in importance. While labour intensive activities lead the way, it would be an over-simplification to say that the industry in these new locations is focused on such activities. While a large share (43 percent) of firms that had located production in eastern Europe or China, produced only labour intensive components, 53 percent produced both labour intensive and capital intensive components and four percent produced solely capital intensive components. Development activities are also being transferred. Thirty six percent of firms with production activities in eastern Europe or China already carried out development activities in these locations or were planning to. The large scale automotive clusters developing in central Europe include research and development centres. For example, the

[41]Presentations by the country director of Delphi in Poland, the nationa1 director for Valeo and the president of NSK Steering systems, Europe at the conference on 'The changing role of emerging markets in automotive industry,' Krakow, Poland, 2007.

Delphi centre in Krakow, Poland was originally planned to have 250 engineers; this had risen to 700 in 2007. [42]

Another important set of questions concerns the sequencing of the development of these new agglomerations and the extent to which they become fully fledged clusters. Sadler (1999) argues that in Europe, component firms tended to internationalise production much earlier and to a greater extent than has been the case for European carmakers. But it is quite evident that investments by suppliers in new emerging market locations, has frequently been as a direct consequence of the opening of new assembly plants. With a lag, first tier suppliers will in turn look to develop local sources of supply.

> *"Quite clearly our goal is ultimately to develop manufacturing plants in lower wage cost countries. We will develop a supply base around those. In simple terms, the route we are taking at the moment is that we take a UK assembly plant and a UK supply base and the first thing we move is the assembly, then we need to develop the infrastructure around the new locations" (Supplier company interview, cited in GPN, 2003: 25).*

First tier suppliers are also increasing purchases of sub-component purchases in developing countries. For instance, Valeo recently reported that it is planning to increase its purchasing of parts and tooling in low cost countries from one-third in 2006 to 70 percent by 2010. [43]

Significant new automotive clusters are emerging in Latin America and Asia involving not just assembly, but extensive investments by first and second tier suppliers. Two initial trends are evident; first tier suppliers are following assembly plants to new locations and stand alone second tier suppliers, especially those which have a high labour component are being established in low cost locations. A somewhat more recent development has been the large scale establishment of R&D capacity in selected developing countries. To a much greater extent than previously, these supplier investments are driven not by protection but by a combination of two other factors; proximity to growing markets and the desire to minimise production costs.

42 Vist to Delphi Technical Centre, Krakow, Poland, February, 2007

43 See "After slow start, Valeo's China purchases grove' *(Automotive News Europe,* 5 February, 2007)

5. CONCLUSION - PROSPECTS FOR EXPANSION AND UPGRADING IN DEVELOPING COUNTRIES

This chapter has addressed the question of shifting production locations in the global automotive industry and the implications for automotive development in emerging markets. I have argued that the shift in the location of production, goes well beyond the consequences of more rapid market growth in developing countries relative to advanced countries and represents a more fundamental change in the centre of gravity from high income to developing countries. This shift is an outcome of the maturation of global automotive industrialisation. While vehicle production is a sophisticated activity, the main production processes are well established. Productivity levels attained in modern plants in many middle-income developing countries approximate those in advanced countries. In many newer locations, lower plant costs are offset by higher logistical costs but this too is changing as denser networks of suppliers are established in new production sites.

These global shifts will also be driven by the relative change in global demand resulting from rapidly rising incomes in many developing countries. A striking feature is that demand growth will increasingly shift to lower, middle-income and lower-income countries. China and India, with large populations and very high growth rates are particularly significant in this respect. This is somewhat different from the earlier phase when it was mainly middle-income countries where vehicle demand growth was rapid. Trade is growing more rapidly than demand and this is expected to continue. Much of this has had a regional dimension, in part driven by facilitative trade arrangements. A growing feature is likely to be the impact of South-South trade, investment and production networks.

But these global shifts are a contradictory and uneven process. While substantial cuts in production capacity are taking place in the US, Germany's automotive trade surplus has increased in recent years. Japan's share of global imports has declined since 1990 and it is now increasing domestic assembly capacity for the first time since the early 1990s.

The industry itself is changing with important implications for location. The changes in technology and production organisation that have happened cut both ways. While the introduction of methods of production organisation pioneered in Japan in the 1970s have revolutionised the industry, they produced at most a temporary respite for advanced country locations. In fact, a feature of the last two decades has been the rapid assimilation of these organisational forms both in developed and developing countries with some evidence that the process has been more rapid in developing countries, where work practices were less entrenched (Silva, 1992). Producers in many middle income countries have shown rapid increases in productivity and have an undoubted cost advantage. [44] On the other hand, although new technology may allow for greater flexibility, scale remains extremely important and is a key barrier to the expansion of the industry in countries with small markets. While the existence of well entrenched networks helps to anchor the industry in existing locations, these networks in high wage countries will become increasingly vulnerable as more extensive clusters are developed in lower wage countries.

In the establishment of new clusters, access to a market is clearly important although both Japan and Korea provide examples of major vehicle industries being established on the basis of exports over long distances. But there is a very key role for assembly plants. Larger assembly plants will tend to attract key first tier suppliers. These first tier firms, themselves frequently undertake considerable assembly type activity. In turn they may attract second tier firms although proximity in this case is less important. These networks offer external benefits to participant firms and will therefore have an internal coherence or 'gravitational attraction' as automotive regions. New locations do not have these agglomeration benefits so there need to be significant in-plant cost advantages. But, as plants are established in new locations, the centre of gravity shifts. External benefits in the old location decline but in the new location they increase. This could mean that the first plants established in the new location derive increasing external benefits as the cluster develops. So the very process of inertia which bound firms to the old location could lead to a more rapid ascendancy of the new location and a more rapid decline of the old.

It is, therefore, clear that while there are important forces pulling component suppliers and assemblers close to their major markets, developing countries are growing in significance, not just as markets in their own right, but as exporters of components to the major advanced country production centres. Slowing wage growth and increasingly flexible labour agreements in advanced countries, coupled with rising wages in middle-income locations, may act to slow this shift but will not stop it. Political pressures on multinationals to retain capacity in their home countries will also intensify as will protectionist pressures. I am not, however, suggesting that the sector will abandon rich country locations. Indeed, in high value segments such as R&D and marketing, their relative importance may well increase. The outcome is a developing international division of labour of a particular type. Traditional locations in advanced counties will remain significant. For emerging production centres, the existence of large, proximate networks of suppliers is crucial. Also, regionalisation is as important a factor in automotive industry location as globalisation.

44 See, for example, Shaiken (1990).

5.1 Implications for South Africa

So where does all this leave South Africa? Our analysis leads us to the following conclusions. Firstly, there are strong pressures pushing the industry to middle-income countries and more recently to large low-income countries with rapidly growing markets such as China and India. Middle-income countries with large populations are well placed, both because of their rapidly expanding markets and because they can attain high productivity in modern plants, but with low labour costs. In terms of market size, South Africa's population, income level and economic growth rate are at the low end of what is required.

Secondly, the growth in developing countries is becoming concentrated in a relatively small number of locations so there are losers as well as winners. Producer countries need to be part of an automotive region or 'space', unless they are themselves very large countries. In this sense, South Africa does not qualify. There are very few exceptions to this 'rule'. Korea is the most significant, its home grown industry has developed very rapidly albeit with huge state support. Japan was an earlier example. But both these countries developed exceptional manufacturing capabilities and growth was led by domestic firms. As an industry dominated by foreign firms, South Africa would require exceptional manufacturing capabilities to offset its relatively remote location and become an export platform. Given that much automotive trade takes place over large distances, geographical distance is not an insuperable obstacle but it is likely to discourage full integration into multinational networks. South Africa is accordingly more likely to play the role of a niche producer in the global arena, at least over the short term.

Thirdly, there are important policy choices to be made and these will have a major influence on the level and rate of development. But appropriate policy choices are heavily constrained by circumstances. In the South African case, policy needs to help 'anchor' the industry in its current location while avoiding excessive protection. [45] The domestic supply base is limited and in order to develop, it requires large scale vehicle assembly taking place within the country. The domestic market provides some leverage. These policy issues are the subject of the following chapter.

45 I am indebted to Garel Rhys for helpful discussions on the notion of 'anchoring' national industries.

CHAPTER THREE

NATIONAL AUTOMOTIVE STRATEGIES IN DEVELOPING COUNTRIES

1. INTRODUCTION

Within the fast changing milieu of the global automotive industry, many developing countries with relatively small markets and limited technological capabilities have sought to position themselves as producers of vehicles and components. The industry has frequently been seen as emblematic of national industrialisation and it has probably received greater support than any other non-state owned industrial sector. Partly, this is because it is a very large industry with very visible products. Demand is highly income elastic. Without domestic production, vehicle imports can rapidly become a major foreign exchange burden. The industry also encompasses a full range of industrialisation processes including metal fabrication, plastics and electronics and has considerable technological spillovers.

State intervention has been pervasive and governments have used tariff protection and a host of other measures to promote the sector and attract investment. The industry has played an important role in the successful national development of countries such as Japan and Korea. In many other countries, costly government support has not produced sustainable growth for the automotive industry.

Section Two provides a brief survey of global automotive policy historically and also considers the question of appropriate automotive policy, given the current trajectory of international investment and production and the specific conditions of developing countries. The following questions are considered. What constitutes a 'viable automotive space'? [1] Is protection appropriate and if so, to what extent and under what circumstances? What about trade balancing arrangements or other industrial policy mechanisms? How rapidly should countries open up their markets? Is there a role for a national strategy which promotes domestic firms above foreign firms?

The automotive industry is scale intensive and transport costs are significant so a large domestic market or proximate access to a large market are important considerations.

The objective is to highlight the impact of various types of broad policy interventions in a range of country specific situations. In the concluding section, direct implications are drawn for the assessment of the impact of automotive policy on the development of the South African industry, which is the subject of Chapter Four.

2. AUTOMOTIVE POLICY

The main form of state intervention in the automotive industry has been protection. Apart from industries, which have typically been under state ownership, the automotive industry has probably been the most protected sector historically. In spite of extensive global liberalisation, in many countries, automotive tariffs remain relatively high.

In line with the import substitution policies, which were being widely pursued until the 1980s, most developing country industries began with assembly for the domestic market protected by high tariffs.[2] The first step was usually to establish CKD plants and assemble vehicles from imported knocked down kits. This led typically to a proliferation of small scale assembly plants; either foreign owned or operating under licence. Carmakers sometimes entered into contract arrangements or joint ventures obviating the need for the construction of new plants. Such plants tended to operate at low rates of capacity utilisation, were relatively labour intensive and therefore more flexible. They were generally characterised by low labour productivity and high costs. The level of exports was minimal.

The next stage was the promotion of the component sector, usually through local content requirements. These requirements were initially set at low levels and then gradually increased. There were also attempts to rationalise the industry by reducing the number of makes and models being domestically produced. Efforts were made in some countries to standardise certain components and to set licensing requirements for new investments both to limit entry and to set certain objectives, for example, regarding export requirements. Such policies were frequently associated with high costs and met with limited success in reducing trade deficits within the sector.

Up to the late 1980s, high tariffs and local content requirements were common in developing countries. But this was a time of growing disillusionment with import substitution policies and a shift to export orientation. Many developing countries tried to expand automotive exports using mechanisms such as trade balancing arrangements to achieve this. The objective was both to reduce trade deficits and achieve higher volumes and economies of scale. So

2 For an account of this process in Latin America, see Jenkins (1987). South Africa was a pioneer of import substitution in the automotive industry, with the first plants being established in the 1920s (see Chapter Four).

during the late 1980s and 1990s, very high levels of protection and local content requirements were abandoned in many developing countries but frequently replaced with various forms of Trade-Related Investment Measures (TRIMs), although these were also supposed to be phased out according to WTO requirements. Non-tariff barriers were also extensively used but markets did become more open.

For developing countries, policies to develop the automotive industry in more open trading environments require the achievement of three policy objectives (Humphrey and Oeter, 2000: 43).[3] Firstly, it is necessary to define a regional or national automotive space, which is protected by policy measures. These measures need to be acceptable to trading partners and will in today's world most likely be phasing down. Secondly, effective policy needs to ensure that "the domestic motor industry is competitive within this space and able to attract FDI" (Humphrey and Oeter 2000: 43). Its attractiveness will depend on aspects such as the size and rate of growth of the market, the actual and potential competitiveness as an export location, the location with respect to other markets and producing regions and the general business environment. Thirdly, policy needs to prepare the industry for a more open trading environment, which could take the form of tariff reductions as well as reduced support in the form of TRIMs.

Within these broad parameters, the prospects for developing countries obviously vary widely and they have pursued very different policies with regard to the development of their industries. The discussion below draws on and adapts Humphrey and Oeter (2000) and Sturgeon and Florida's (1999) typologies of attributes to analyse national strategies. Attributes such as geographical location and market size clearly favour certain strategies and may rule out others. Brief examples are provided in each case.

2.1 Protected Autonomous Markets

A large protected market offers clear advantages to the development of this scale intensive industry. The growth potential in large countries with low levels of per capita vehicle ownership is clearly considerable. China and India are two classic cases [4], both with very large populations and dynamic economies. China has become the world's most rapidly growing vehicle market if measured by the annual addition to global vehicle sales. Rates of vehicle ownership remain low and if rapid economic growth continues, the industry will expand at a very rapid pace. India's market is currently much smaller but is also growing very rapidly.

3 See also Humphrey and Memedovic (2003)

4 Brazil could also be classified in this category but because of its membership of Mercosur we have classified it under the `emerging regional markets' category (see below).

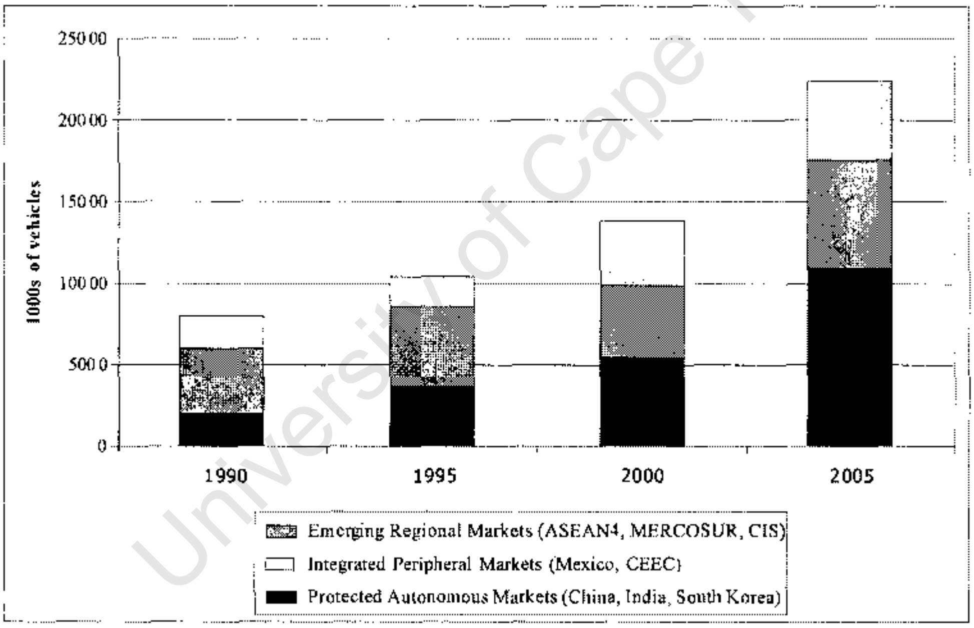
For countries in this category, rapid demand growth, huge market potential and protection will almost inevitably result in inward investment on a large scale. The key policy questions then become the pace of market opening, how to rationalise the sector and the stance towards indigenous versus foreign firms.

High tariffs and domestic content requirements have restricted imports of both vehicles and components to low levels. While there has been a degree of liberalisation in line with WTO requirements, it is clear that both countries will continue to limit automotive imports, particularly vehicles. In terms of China's accession to the WTO, tariffs will be phased down to 25 percent and this applies also to domestically produced vehicles with local content below a certain level. Historically, high levels of protection in China combined with internal protectionism between provinces (Thun, 2004) led to an extremely inefficient and fragmented production structure. In 1995, ten plants produced 352,000 passenger cars with dozens more producing trucks. By 2001, production had increased to 733,000 cars, but the number of plants had expanded to 17 with nine plants producing less than 25,000 cars per year (Francois and Spinanger, 2004: 90). Early state efforts to consolidate the industry were not very successful (Huang, 2002) but government has recently indicated that it will support only a limited number of larger vehicle producers in order to encourage some consolidation of the industry. Guidelines issued in 2004 by the National Development and Reform Commission, set minimum investments for truck, car and engine plants together with minimum production volumes (Bungsche, 2007). But the reality is that partial opening, rapid market expansion and growing competition will be more powerful drivers of rationalisation and large scale investments. For example, the new Toyota plant in Guangdong has a capacity of 350,000 cars.

Rapidly growing, large markets allow the Chinese government and to a lesser extent that of India, enormous room for manoeuvre in their relations with foreign firms. China, in particular, has been able to insist on joint ventures and certain export and technology transfer requirements. Foreign ownership in vehicle production remains restricted to 50 percent unless the firm produces solely for export. Both countries are keen to see indigenous firms emerge. In India, companies such as Tata and Mahindra have used joint ventures with major multinationals as a platform to develop their own designs (Richet and Ruet, 2007). Chinese firms such as Great Wall, Geely, Brilliance and Chery already export small numbers of vehicles to 50 countries (Donnelly, 2007). High levels of protection and a large, rapidly growing market mean that the rapid development of the industry is assured.

A key question for both China and India, as well as for aspiring producers in developing countries is the speed at which Chinese and Indian automotive products will enter global markets. China's joint venture arrangements in vehicles assembly are clearly aimed at the domestic market and it would take considerable pressure by the Chinese authorities to encourage multinational firms to undertake large scale export from these bases given the fact that they only have a 50 percent shareholding. But the government is clearly anxious to develop the capacity of locally owned firms. So key questions which may impact on the speed at which Chinese made vehicles enter world markets are whether the joint venture requirement will be relaxed and the extent to which domestic firms will receive favourable treatment. In the component sector where restrictions on ownership do not apply, large scale exports are already underway. Total Chinese automotive exports, primarily consisting of components increased by 44 percent per annum from 2000-2005 to reach $9.96 billion. India's exports are also growing rapidly, having expanded from $640 million in 2000 to $2.59 billion in 2005. Vehicles account for a higher percentage of automotive exports and according to some analysts, India is better placed as an export platform for foreign multinationals because of fewer restrictions on ownership (Chotai, 2007).

Figure 3.1: Production According to Various Market Configurations, 1990-2005



Source: Adapted from Lung (2007).

Among emerging market producers, Korea is a highly exceptional case both because of its rapid growth but also because it has succeeded in developing substantial, domestically owned firms. Founded in 1962, the Korean industry produced 1.3 million vehicles in 1990 and output rose to 3.7 million units in 2005 making the country the world's fifth largest producer. Korean policy was strongly influenced by prior Japanese experience. Government policy played a major role in the pursuit of a strategy, which maximised independence from established

OECD producers.[5] Korea also avoided the pitfalls of many developing country producers by specialising in a fairly narrow range of vehicle types and producing these in high volume (Oman, 1989; Huang, 2002). The state allocated certain market segments to the three major producers and new entrants were restricted. The industry grew under heavy protection from imports and was export oriented from the early 1970s. The first indigenous model, Hyundai's Pony was introduced as early as 1975 and later versions (Pony Excel) were extremely successful in the US market. Hyundai joined the ranks of the major international producers during the 1990s as it moved into the areas of design and automation technology. The industry has remained highly export oriented with exports accounting for over two thirds of output in 2005.

Korea was also unusual in that it initially followed a policy of supporting exports and heavily taxing domestic sales (Jenkins, 1995). In 1986, taxes on purchases of cars were 46.5 percent in Korea, compared to 24.4 percent in Japan and 14 percent in West Germany. Taxes on annual operation were also high (Jo, 1988: 44). The domestic market remained virtually closed to foreign vehicles even after the outright ban on imports (it still applied to Japanese cars) was lifted in 1987.[6] Even by 2005, imported vehicles accounted for just 3.2 percent of sales (VDA, 2007).

2.2 Integrated Peripheral Markets

Integrated peripheral markets comprise those developing countries with direct and easy access to large advanced country markets. A reasonable level of technological capability, resulting from prior investment in the industry, together with relatively low wages and market access can lead to rapid expansion fuelled by foreign investment.

Mexico is a classic case. With a history of import substitution, the country has now become fully integrated into North American automotive production networks. Starting from a position of heavy protection and controls on foreign investment in components, the policy decrees of 1977 and 1983 established the principle of foreign exchange balancing allowing a lower degree of local content to be offset by greater exports. The state also sought to rationalise the supply structure through reducing the number of producers and models

5 See Kim (1997) for an account of how the Korean automobile industry rapidly developed indigenous technological capability.

6 Even with the reduction in tariffs from 60 percent to 30 percent in 1988, a Mercury Sable with a US wholesale delivery price of $15,000 would cost a Korean buyer $53,700 with the price inflated by special taxes and duties such as defence taxes ($ 2,305), special excise tax ($6,350), acquisition taxes $4,800), value added tax ($4,880) and high administrative expenses. Potential customers, not deterred by the inflated cost, still had to contend with a media campaign suggesting that buyers of imported vehicles would be subject to income tax audits! (*Ward's Automotive International,* February, 1989).

although large-scale production was only achieved later as the Mexican industry became integrated with that of the US following the Automotive Decree of 1989. This measure eliminated regulations governing entry authorisations and restrictions on makes and models. It also accelerated the process of trade liberalisation and international integration particularly into the North American market as it freed up imports of components and vehicles as long as foreign exchange balancing requirements were met.

Exports of vehicles increased from 162,000 units in 1987 to 1,424,000 units in 2000, by which stage they accounted for 76 percent of production (Carrillo, 2007). Vehicle exports have declined since then but in 2005, Mexico's total automotive exports still amounted to $35.38 billion, 3.9 percent of the global total. Mexico's share of North American vehicle production increased from 2 percent in 1970 to 10.7 percent in 2000 (Table 3.1) and then fell slightly as imports into the country increased as a result of the ending of all restrictions on vehicle trade within in NAFTA in 2003.

Table 3.1: Canada, Mexico and the US: Shares of Vehicle Production and Sales

	Mexico		Canada		United States	
	Production	Sales	Production	Sales	Production	Sales
1970	2.0	na	12.3	7.0	85.7	93.0
1980	5.0	3.5	13.9	9.6	81.2	86.9
1990	6.5	3.4	15.5	8.2	77.9	88.3
2000	10.7	4.3	16.7	7.8	72.6	87.9
2005	10.2	5.7	16.5	8.1	73.3	86.2

Sources: Carrillo (2004a); VDA (2006, 2007); NAAMSA (2006)

With wage rates that remain low, access to the North American market and impressive productivity levels in new plants [7], Mexico became one of the most favoured sites for investment by multinational producers and component firms and the three large US carmakers, Nissan and VW have all invested heavily. The Mexican automotive industry has therefore become well integrated into NAFTA as an important production centre, initially for the more labour intensive elements of automotive production but including vehicle assembly and engine manufacture. But more labour intensive production has not meant a subordinate role in terms of backward or obsolete technologies. Indeed, US based carmakers have used Mexico to experiment with new forms of production organisation in response to the growing competitive threat from both Japanese imports into the US as well as the establishment of Japanese transplants operating in the US (Shaiken, 1990; Layan, 2000). Less entrenched

7 See Shaiken (1990) for a detailed study of the impact of new technology and production re-organisation in Mexican assembly plants.

industrial traditions and more flexible labour regulations encouraged this process. Substantial upgrading has also taken place, mainly driven by foreign firms (Carillo, 2004b).

Mexico had an important advantage as the only low wage country within NAFTA. Its substantial and growing domestic market gave it substantial leverage following the introduction of NAFTA when trade balancing requirements were in place. An important question is whether this would have been so rapid if Mexico had not had an already established base of production capabilities in the automotive sector, established in the earlier more interventionist phase.

More recently, the integration of the countries of central Europe (e.g. the Czech Republic, Slovakia, Hungary and Poland) into the expanded EU provide a number of further examples of this growth path. [8] Countries in this category necessarily have to adopt strategies which liberalise the industry at least to a degree. They have sought to attract foreign direct investment because without it they are unlikely to be able to compete in the adjoining major market. They have also needed to be competitive not only to compete in the major regional market but also to attract investment in competition with other peripheral regions. For instance, there is considerable competition, including the use of tax incentives, between the new central European members of the EU to attract investment which is flowing eastward. The location of new assembly plants then becomes critical as they are likely to also attract new multinational investment in component production, which will in turn create opportunities for smaller, domestic suppliers. The expansion in investment has been enormous and has led to rapid expansion in exports back into the EU. The Czech Republic, Slovakia, Poland and Hungary all now run significant automotive trade surpluses. Polish automotive exports, for example, have increased from €0.6 billion in 1992 to €19.1 billion in 2006 (Domanski et al., 2007).

These central European countries have become heavily integrated into the automotive industry in western Europe, particularly with Germany but also with the rest of the EU. Predictably they dominate (intra- and extra-) EU exports of labour intensive items such as wiring harnesses but they also play a growing role in the export of vehicles, engines and other sophisticated components and a number of major new technical centres have been established.

Locational proximity is an important requirement for significant levels of integration on favourable terms for the country concerned. While international specialisation takes place across long distances, close integration is less likely. Countries on the periphery of major

8 See for example Havas (2000), Rhys (2004), van Tulder (2004), Domanski et al. (2006) and Pavlinek and Janak (2007).

markets have important potential advantages but if they are part of trade agreements they effectively lose their policy autonomy and are likely to become highly dependent on the vagaries of multinational investors. Policy, therefore, becomes centred on trying to secure investment in competition with other peripheral countries and encouraging upgrading by developing skills and perhaps supporting local suppliers. Foreign firms dominate the sector in all these countries, although domestic suppliers have expanded after initially scaling back when the sector was opened to competition (Contreras and Carrillo, 2007; Pavlinek and Janak, 2007). Nevertheless, competition in a large market will ensure that investments are large scale and efficient and therefore likely to reduce costs to the economy. For example, while vehicle production and exports in central Europe have rapidly expanded, domestic sales have fallen in some cases due to the import of low cost, used vehicles from western Europe.

2.3 Emerging Regional Markets

Emerging regional markets constitute a further category of viable 'automotive space'. This category includes developing countries within a region, which have established a trade preference area to promote specialisation and economies of scale. These initiatives have frequently been supported by automotive firms. Countries in this category include Thailand, Malaysia, Indonesia and the Philippines (in ASEAN) and Brazil and Argentina (in Mercosur). Smaller economic blocs such as the Southern African Development Community (SADC) do not constitute viable 'automotive spaces' (Black and Muradzikwa, 2004).

The objective of regional integration is to increase scale and achieve a degree of specialisation within the bloc. The problem is that there are usually a number of member states wanting to establish themselves in the automotive industry. Competition to attract investment can easily lead to sub-optimal outcomes for the region as a whole. The benefits and stumbling blocks of regional integration are evident in both ASEAN and Mercosur.

In the case of the ASEAN countries, a problem with the previous national strategies pursued by individual countries was simply small market size. The benefits of a large regional market of over 500 million people are therefore self evident. This was the reason why Japanese firms, which were dominant in all countries, have strongly supported regional co-operation and a common market. In ASEAN, the four major countries all have ambitions in vehicle manufacture and the result has been that progress has been held back due to delays in establishing an open automotive market in vehicle production. However, substantial rationalisation has been achieved in components. The Brand of Brand Complementation (BBC) scheme was established in the late 1980s and followed in 1996 by the ASEAN Industrial Cooperation agreement (AICO). The latter was a reciprocal complementation agreement. Within ASEAN, Thailand has deliberately set out to establish itself as the 'Detroit of Asia'. It has emerged as the hub, both because it represents the largest market and also because it has more liberal policies towards foreign investment than Malaysia, which has favoured the Proton national car. Indonesia has also favoured its national industry.

Mercosur represents a somewhat different case where one member state, Brazil, is significantly larger than the others. Historically, it has been more successful than ASEAN in increasing regional specialisation and scale. The establishment of Mercosur and the re-imposition of higher tariffs (on vehicles from outside the bloc) in 1995 led to a rapid expansion of automotive trade within Mercosur. A division of labour emerged on the basis of smaller, high volume cars being produced in Brazil and low volume, mainly medium sized cars in Argentina. Component exports took place mainly from Brazil which resulted in a large trade surplus. Regulation limited the shift to Brazil, which in the late 1990s was the favoured location. By 1997, exports to other Mercosur member states accounted for 50 percent of Brazil's vehicle exports. And with booming sales in the 1990s, there was an enormous increase in multinational investment into the region. But investment has been primarily aimed at the Mercosur market rather than using the region as an export base (Laplane and Sarti, 2004).

Uncertainty about policy within Mercosur, economic instability in Argentina and Brazil's own volatile market have held back progress since that date. Full free trade was initially supposed to be established in 2000 but this was further delayed until 2006 with various mechanisms established to ensure that Argentina continued to retain a significant share of production (Laplane and Sarti, 2004). With rapidly growing sales in 2004-2005 and a relatively weak Argentine peso, further investment has in any event taken place in Argentina more recently (Venkatakrishnan, 2006).

The main impact of Mercosur, therefore, has been regulated trade in automotive products and has been of particular assistance to the assemblers with operations in both Argentina and Brazil. They have been able to establish a partial division of labour although not complete rationalisation with most assemblers having operations in both countries (Laplane and Sarti, 2004). The common external tariff remains high at 35 percent with a 60 percent regional content requirement.

2.4 Independent Strategies

This category includes a diverse range of countries and strategies. The common attribute is that they lack major market potential in terms of large populations or current access to a regional grouping and are not favoured by membership of a large trading bloc such as NAFTA or the EU. For these countries, the prospects are more complicated and appropriate strategies are not immediately apparent. Below, we briefly discuss a variety of strategies that have been pursued by countries in this group.

Taiwan is a relatively small country with a rapidly growing automotive industry. It also faced the problem of a history of protection which resulted in a proliferation of relatively small scale producers.[9] In 1987, seven producers competed in a market of only 220,000 vehicles. Cars were priced at well above international levels protected by a 55 percent tariff and a ban on Japanese imports.

However, Taiwan did not adopt the high risk Korean strategy of promoting the rapid development of a few large-scale export oriented producers. It followed a policy of first developing the components sector to be internationally competitive and this provided a viable basis for the production of built up vehicles for export. In terms of the six year programme introduced in 1985, the components industry was encouraged through a range of measures including export assistance, local content requirements[10] and tariff protection, support for R&D and the establishment of national standards for automotive components (Bosman, 1992). Under the programme, protection on built up vehicles was reduced from 65 percent to 30-50 percent.

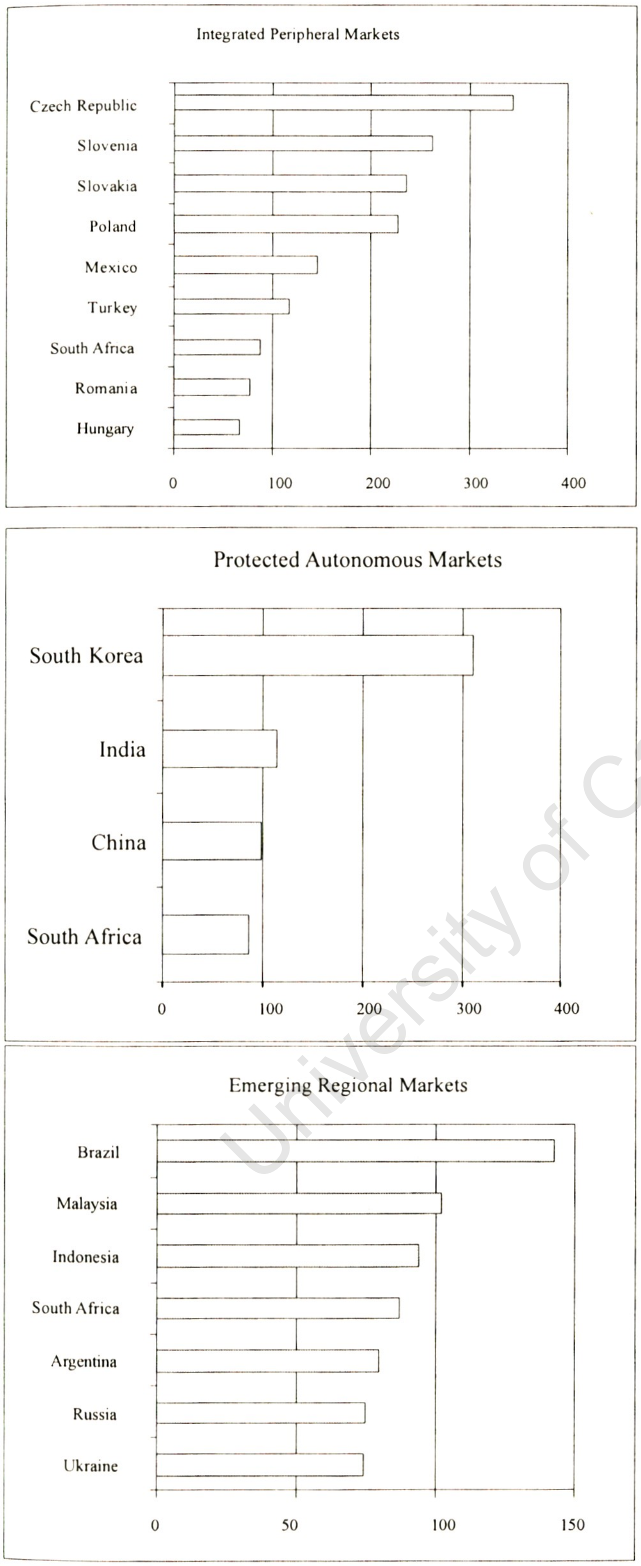
Local content requirements were reduced and limited Japanese imports allowed following the introduction of the Automobile Development Industry Plan in 1992. Improved competitiveness was later spurred by reduced protection accompanied by a host of complementary measures aimed at increasing investment in R&D, improving links between assemblers and suppliers and also increasing the scale and volume of production. Nevertheless, volumes were well below minimum efficient scale. A typical firm was Sanyang, which started production of small motorcycles and scooters in 1962 and from 1969 started producing cars under licence from Honda.[11] In the early 1990s annual output of approximately 60,000 vehicles was spread across two basic models the Sanyang Civic and Accord. Sanyang produced cars for the domestic market and due to a lack of economies of scale, the Sanyang Civic sold in Taiwan was approximately 50 percent more expensive than the Civic produced by Honda in Japan. Local content levels were 50 percent for the Accord and 70 percent for the Civic.

9 For the political economy of Taiwan's early automotive policy see Arnold (1989).

10 These included regulations specifying that five of the following components had to be produced in Taiwan: cylinder block, cylinder head, crankshaft, camshaft, piston pin and connecting rod, clutch system, transmission, gearbox, drive axle, steering wheel and column, steering gear, brake system, door, chassis or cross frame, bonnet or boot lid.

11 Visit to Sanyang Industry Company, 1992

Figure 3.2: Domestic Production as a Percentage of Domestic Sales According to Market Category, 2005



Source: Adapted from Lung (2007).

Note: South Africa included in all panels as a comparator.

Australia is a developed country with a long established automotive industry, the development of which has taken place on the basis of high levels of assistance in the form of local content requirements, tariffs and quotas.[12] As a result, it has experienced many of the problems afflicting the South African industry, namely a limited domestic market and a fragmented production structure leading to it being a high cost producer. Low volumes and multiple models also impact on the component industry and both South Africa and Australia have suffered from what Lamming (1990) terms the 'transplant/outpost' problem.[13] The Australian experience has also influenced South African policy development and the Motor Industry Development Programme draws heavily on the architecture of Australia's Button plan with some important distinctions most notably higher tariff levels.[14]

By the early 1960s, very high levels of local content and reasonable production volumes had been achieved in certain makes, in particular, the Holden which was the market leader. At this time the tariff on imported vehicles was 35 percent but pressure from imports (especially of smaller vehicles) and declining industry performance led to the imposition of higher levels of protection, which by 1975 reached 57.5 percent. An export facilitation scheme was also introduced for assemblers and component producers in 1982 as the sector sought to more closely integrate with the world industry as a way of circumventing the problem of the small domestic market. This allowed producers to reduce local content in return for automotive exports.

Problems of frequent changes to policy, inward orientation and the cost of protection remained.[15] As a response to these problems, the Button Car Plan was introduced in 1985. Its objectives were to increase the industry's production efficiency to enable it to compete with imports at lower levels of assistance, to give consumers access to better quality and more affordable cars and to minimise disruption to production and employment (AIA, 1991: 8).

The major strategies to achieve this were a reduction in tariffs to 35 percent in 1991 and down to 15 percent by the year 2000, the abolition of local content requirements and an improvement in plant and model volumes to be achieved by increasing specialisation through

12 For assessments of Australia's automotive policy see Conlon and Perkins (1995), Owens (1995) and Sohal et al. (2001). For a study of the welfare effects of tariffs in the Australian automotive industry see Tcha and Kuriyama (2003).

13 Lamming cites the example of a car built at an annual rate of 20,000 in Australia but at a rate of 750,000 in Japan. This places the low volume Australian component producer in the difficult situation of competing with imports from the high volume Japanese supplier shipped in at marginal cost.

14 See Chapter Four.

15 Even at the end of the decade by which time substantial liberalisation had taken place the Industry Commission reported that assistance to the industry cost the country A$1.6 billion per annum, an effective subsidy of A$25 000 for each of the 60,000 jobs in the industry.

export facilitation and penalising low volume production.[16] A target industry structure (three manufacturing groups and a maximum of six models) was specified for 1992. Penalties in the form of higher excise duty on imported components were applied to low volume models (Industry Commission, 1990). Average production volumes per model have risen significantly since the plan was introduced.

Australia thus followed a route of quite rapid integration into the global industry and both imports and exports have risen sharply. By 1996, imports accounted for 55 percent of the total market of 650,000 cars and trucks while 39,600 vehicles were exported. Both the assembly and component industries have become smaller (in terms of number of firms and employment) but these firms are better able to cope with increased international competition. A number of world class, first tier component suppliers have emerged although most are foreign owned.

3. CONCLUSION: IMPLICATIONS FOR DEVELOPING COUNTRIES AND SOUTH AFRICA

The attributes and policies of a number of major producer countries in the developing world are summarised in Table 3.2. This does not include dozens of mainly smaller countries, which have at various times tried to promote assembly with no lasting benefit and also at considerable cost to consumers and the economy as a whole.

It is clear from the above discussion that a range of national strategies are possible. These strategies will be significantly influenced by attributes such as country size, level of development and location in relation to major market and treading blocs. State intervention has been important in all cases. Key policy considerations have been the level of protection and pace of liberalisation, the degree of support for exports, the extent to which the state intervenes to limit entry and rationalise the industry and policies regarding foreign versus local ownership. Then, of course, there are also policies to promote R&D and technological upgrading, which are not the main concern of this thesis. But it is important to note that the level of such support and its effectiveness has varied widely."

16 See Chapter Five for more detail on Australia's efforts to rationalise industry structure

17 Such support has typically been most effective in east Asia. For Korea see Kim (1997), for Taiwan see Amsden and Chu (2003).Non-governmental organisations have played a role, for instance, in developing the supply chain. For examples, see Addis (1999) for Brazil; Contreras (2007) for Mexico and Barnes, Kaplinsky and Morris (2004) for South Africa. For an account of how assemblers created institutional mechanisms to upgrade suppliers in India, see Okada (2004).

3.1 Trade Policy

Many countries have historically used high protection including local content requirements to develop the industry. Tariff and/or non-tariff barriers remain high in many Asian producer countries and imports of built up vehicles are very limited in ASEAN countries, China, India and even in Korea where tariffs have ostensibly been quite low. Policy in developing countries typically began with efforts to protect assembly followed by local content requirements of varying degrees of stringency. This led to substantial industrialisation in many cases although in smaller, less developed countries with very low volumes, the establishment of small CKD assembly plants provided little of lasting value. Generally, these protected industries were very inward oriented and the next step was frequently some form of export support through foreign exchange balancing, perhaps coupled with a degree of rationalisation. It was typically difficult for policy to simultaneously provide a degree of protection, avoid anti-export bias as well as encourage efficient (i.e. large scale) integrated investments. Effective rates of protection on assembly were generally high, leading to excessive entry. On the other hand, high local content requirements reduced the effective rate of protection on assembly but coupled with high tariffs tended to produce a situation where production costs were very high and assemblers avoided the high cost of tooling up for new models by skipping new model introductions and continuing to assemble obsolete products.

The discipline provided by lower tariffs and external competition can have the adverse effect of reducing the share of local production in the domestic market share and limiting output growth. This in turn may in fact reduce economies of scale. Foreign exchange balancing has its own complications. It has frequently been difficult to get the 'balance' right which has led to severe distortions. Allowing exporting firms to offset import duties can reduce protection below intended levels and place considerable pressure especially on the component sector. Such foreign exchange balancing clearly also constitutes an export subsidy and can lead to unsustainable export growth." Brazil allowed firms to count foreign investment as a contribution to foreign exchange balancing requirements but this led to excessive investment with the industry burdened with overcapacity when domestic sales fell. But generally export support is likely to lead to far more efficient outcomes than heavy handed protection because it is more likely to produce large scale investments.

18 The South African experience in this regard is discussed in detail in Chapter Four.

3.2 Regional Groupings

In countries which have joined major trade blocs, the automotive sector has effectively been very rapidly liberalised. For countries with significant automotive development this has frequently been in their favour and the trick has been to negotiate asymmetrical tariff phase downs which provided some pressure on multinationals to establish world scale plants in the new locations where lower wages alone were not a sufficient incentive. This was helpful in Mexico and also with regard to domestic firms supplying Skoda in the Czech Republic (Pavlinek and Janak, 2007). There are many cases, of course, where small, mainly assembly operations simply disappeared as countries joined major trading blocs. In the case of new EU member states, for instance, the automotive industry has clustered in few selected countries leaving the less favoured states with negligible new investment.

3.3 Rationalisation

Another key feature of automotive policy has been the efforts on the part of government to rationalise production. Typically in developing countries, protection led to excessive entry and a proliferation of models being built in low volumes. Failure to achieve economies of scale in assembly imposed severe problems on the component sector which faced the problem of trying to compete against foreign suppliers on the basis of very low domestic volumes. Korea used heavy intervention to restrict entry. This example is generally regarded as having been successful especially as it was complemented by major initiatives to promote upgrading. Australia, where the focus was much more on the liberalisation of the industry and reducing costs to consumers, was successful with more market based measures in achieving a certain degree of industry rationalisation and preserving the bulk of its industry at least over the medium term. But more typically, such measures have been absent or ineffective. In the early development of the Turkish truck industry under import substitution, in spite of heavy regulation in what was seen as a leading sector, there were no measures to restrict entry (Ansal, 1990). In spite of clear policy statements in this regard, China has been unsuccessful in rationalising the industry because of the weakness of central government in relation to local and provincial interests, which have supported local car makers. Industry rationalisation has been an important issue in the South African policy experience, as explained in Chapter Five.

Table 3.2: Summary of Emerging Market Attributes and Policies, 1995-2004

	Size of domestic market	Regional groupings/ trade agreements	Tariffs (passenger cars, 1998)	Vehicle tariffs (2005)	Other
Protected autonomous markets					
China	Very large	China-ASEAN Free trade area (signed 2002)	100%	30%	Car dealers required to obtain an import license and pay 30% on imported vehicles at the port rather than when they are delivered to the buyers.
India	Large	Agreement with Thailand to eliminate tariffs on some components (2006)	45%	100%	New Auto Policy (March 2002) -100% foreign ownership allowed and minimum investment conditions discontinued.
Korea	Large	Growing cooperation with ASEAN	7%	8%	Various forms of export support.
Integrated peripheral markets					
Mexico	Large	NAFTA Joining Mercosur Japan-Mexico trade agreement	Low within NAFTA	50%. No duties within NAFTA.	
Poland	Medium	EU		10%	
Turkey	Medium			10%	Import licensing system used on motor vehicles.
Emerging regional markets					
Argentina	Medium	Mercosur		35%	Trade balancing arrangements. Incentive regime (July 2005) to promote component sector. Local content requirement from 30% to 20% in 2002.
Brazil	Large	Mercosur	50%	35%	Trade balancing arrangements
Thailand	Medium	ASEAN Thailand- China free trade agreement	50%	MFN: 56% Mean: 80%	Tax benefits for exporters and reduced trade barriers within ASEAN especially for components.
Malaysia	Medium	ASEAN	300%	MFN: 36.5% Mean: 50%	Heavy state support for national car projects. Permits required for imported cars. High excise taxes.
Independent strategies					
Taiwan	Medium	US-Taiwan free trade agreement	35%	60%	Various forms of export support. Taiwan Automotive Research Consortium (2004).
Australia	Medium but limited potential	Australia-US free trade agreement from 2005	15%	MFN: 6.7% Mean: 10%	Production allowance for vehicle producers and R&D support in terms of Automotive Competitiveness and Investment Scheme (ACIS) from 2001.
South Africa	Medium	SADC not significant. AGOA, EU Free Trade Agreement	54%	34%	Import-export complementation. Investment incentives for qualifying projects.

Sources: WTO, UNCTAD – TRAINS database, Ford Motor Company.

Note: Market size is defined as 'large' if it exceeded 1,000,000 vehicles in 2004.

3.4 Foreign versus Domestic Ownership

More than in most other industries, the promotion of indigenous, nationally owned firms in the automotive sector is problematic. The industry is dominated by a handful of multinational producers whose size and technological superiority create major barriers for independent new entrants. Korea is the only developing country, which has been able to successfully pursue a strategy of promoting indigenous carmakers and that was only with technological and design tie ups to MNCs, the massive resources of the chaebol and active state support. This is not a strategy which can be easily replicated and Malaysia and Indonesia have been demonstrably unsuccessful. Malaysia's national car maker, Proton, has absorbed considerable governmental resources but has continued to make large losses and VW is poised to take over a 50 percent stake and management contro1. [19] However, national firms are emerging in both India and China, in both cases with state support. Some of these firms are likely to become major international players, which may in turn encourage countries such as Vietnam and Indonesia to pursue this model (Bungsche, 2007).

All countries have to deal with MNCs, and many have sought to try and maximise technology transfers while ensuring that the scope of operations of local subsidiaries are not restricted by parent company strategies. The reality is that one of the characteristic features of globalisation has been increasing levels of foreign ownership in many instances. Most countries have sought to attract foreign investment and the location strategies of these MNCs are, therefore, of critical importance to the future prospects of the various developing country industries. This is made all the more evident by the location strategies of the major international components firms, which in many cases tend to follow the assemblers to new locations. The impact of multinationals on the host country sector has long been a subject of major debate. Concerns exist around the impact on local technological capabilities and the displacement of domestically owned forms for instance. [20]

The way in which developing countries have managed the relationship with the major MNCs has been crucial. Many countries, South Africa included, initially attracted foreign investment on the basis of tariff protection and local content programmes. MNCs were able to operate profitably as small-scale assemblers for the local market using a certain percentage of domestically produced (high priced) components. But under this regime, these subsidiaries were isolated from the global production networks of the parent firm. Liberalisation has led to

19 See 'VW closer to buying Proton factory unit', *Business Report,* 20 March, 2007.

20 The implications for South African firms are discussed in Chapter Six. For a variety of country perspectives, see Carrillo (2004b) for Mexico; Pavlinek and Janak (2007) for the Czech Republic and Barnes and Kaplinsky (2000b) for South Africa.

closer integration with these networks. So for most developing countries, even those with large domestic markets, the future of the automotive industry is to an important extent dependent on securing a growing niche within these global networks.

3.5 South Africa's Position

The South African automotive industry, like the industries in other emerging markets, faces major challenges as it seeks to establish a sustainable basis for expansion. South Africa's domestic vehicle market is limited and until recently has been growing only slowly. In 1960, South Africa was the leading developing country producer but in 2005 the industry ranked twelfth among emerging market producers in Asia, Latin America, the Middle East and eastern Europe (NAAMSA, 2006). The other countries of the southern African region are characterised by low income levels and correspondingly low levels of vehicle ownership. For these reasons, South Africa does not constitute a 'large protected market area', an 'integrated peripheral region' or an 'emerging regional market'. Clearly, if reasonable rates of economic growth continue in the region, South Africa will become a significant market in the medium term and will also be well positioned to supply the regional market. Currently, however, South Africa's domestic market and regional location pose clear disadvantages in terms of attracting international investment in vehicle production and first tier components and raise difficult questions for both firms and policy makers with regard to appropriate strategy.

Appropriate policy choices are, therefore, heavily constrained by South Africa's specific circumstances. South Africa has had to follow an independent strategy in terms of the classification above. At the same time there has been no prospect of establishing an independent manufacturing base. South Africa has tried to integrate the industry into global networks on favourable terms, a policy which has been referred to in the Mexican context as `guided integration' (Womack, 1989). This experience is discussed in the following chapter.

CHAPTER FOUR

THE POLICY REGIME AND THE DEVELOPMENT OF THE SOUTH AFRICAN INDUSTRY

1. INTRODUCTION

As was the case in many other developing countries, the South African automotive industry grew under high levels of protection. While considerable diversified development took place under this protective regime, the industry was also afflicted by the common ailment of a high cost production structure exacerbated by excessive proliferation apparent in the large number of models and makes being assembled in low volume. As a result, the industry was also highly inward oriented.

In a process, which began haltingly in 1989 and accelerated with the introduction of the Motor Industry Development Programme (MIDP) in 1995, the automotive industry has become increasingly exposed to international competition as government has sought to make it more competitive and also to encourage exports and a more rational industry structure. At the policy level, this involved initially the ability to offset local content requirements by exporting. From 1995, phased reductions in tariffs on both built up vehicles and components were introduced amidst a generalised lowering of tariffs partly prompted by WTO obligations. Lower tariffs in the automotive industry were accompanied by import-export complementation arrangements, which enabled firms to rebate import duties by exporting. As a result of these measures, the industry has been through a period of rapid international integration and structural change. It thus provides an important case study at the sector level, of trade liberalisation and industrial restructuring as well as of the impact of industrial policy measures such as import-export complementation)

There is a huge literature on trade liberalisation in developing countries. Winter (2004) provides a comprehensive recent review of liberalisation and economic performance. Matusz and Tan (1999) survey the literature on the costs of adjustment and also argue the case for liberalisation. Rodrik, (1995, 1999) provides a more sceptical view on this question. Tybout (2000) reviews the evidence on the performance of manufacturing firms in developing countries. See Bell (1997) and Edwards (2005) for contrasting assessments of South Africa's policy of trade liberalisation. Black and Kahn (2002) provide an overview of the expansion of South Africa's non-traditional exports. Kaplan (2004) reviews South Africa's manufacturing performance and policy over the last decade. For accounts of the interaction between liberalisation, foreign investment and restructuring in developing country automotive industries, see Miozzo (2000) for

Trade liberalisation reduces the prices of liberalised products relative both to other goods in the domestic market and to similar commodities internationally. Both standard trade theory and the general equilibrium models used to analyse the sectoral impact of tariff reductions predict a fall in output for the affected sector with the benefits accruing to the rest of the economy in the form of lower prices and a more efficient allocation of resources. But reality at the sectoral level is more complex especially in the context of import-export complementation arrangements and there are a number of important dynamic effects, which impact on outcomes in the sector in question. While the reduction in relative prices would of itself be to the detriment of the sector, these changes are refracted through the prism of variables such as domestic demand (influenced by lower prices), structural change (which may reduce production costs), growing international integration (which will impact on investment and trade in the sector) and productivity enhancement (influenced by the level of investment and by growing competition). These dynamic effects are of particular importance in a sector such as the automotive industry where economies of scale are important and where a handful of multinational vehicle producers dominate global production and exercise considerable influence over the location of new investments by first tier component suppliers. In this environment, comparative advantage is much less a function of existing endowments as suggested by conventional trade theory. Rather, comparative advantage emerges as the outcome of three complex, interrelated forces: the global strategy of multinational corporations, host country policy and domestic market conditions. Consequently, rather than producing a standard outcome, as conventional trade theory would predict, liberalisation in the automotive industry has resulted in a number of divergent outcomes. To take two extreme examples, liberalisation in small, relatively isolated markets such as Chile and New Zealand led unsurprisingly to the virtual demise of those industries. By contrast, in the case of Mexico and, previously, Spain, liberalisation (in this case achieved through joining major trade blocs) has led to a very significant expansion in investment and output.

As mentioned in Chapter One, the MIDP has been widely regarded as a very successful programme. Barnes, Kaplinsky and Morris (2004) focus on the development of dynamic competitive advantage in the industry. Black (2001), while acknowledging continuing low volume production, argues that the MIDP has facilitated a strong supply response to the changed incentive regime because it encouraged international automotive firms to integrate

Argentina; Zilbovicius et al (2002) for Brazil; Carrillo (2004b) for Mexico; D'Costa (1995) for India and Thun (2004) for China.

South African based producers into global networks. In his overview of economic reform since 1994, Hirsch (2005) cites the MIDP as one of the "notable successes" (p. 159) of this period and argues that "the automobile assembly and component sectors were strongly assisted by a well-designed Motor Industry Development Programme" (p. 250). While acknowledging the strides made in productivity, earlier work by Barnes and Kaplinsky (2000a, 2000b) pointed to weaknesses in the domestically owned component industry and the growing role of foreign ownership. Flatters (2005) takes a more critical view, citing the costs of the MIDP and arguing for more rapid liberalisation.

The MIDP has also received considerable positive media comment over a long period. [2] This has focused on what has been achieved, for example, in terms of export expansion, new foreign investment or vehicle prices. More recently, there has been a greater focus on negative attributes, especially the costs of the programme.

The objective of this chapter is to assess the impact that the programme has had in moving the industry towards a sounder structure. It does this by illustrating the interplay between domestic economic conditions and the incentive structure (specifically changes to the regime of protection and export assistance) on the one hand and firm behaviour (in the form of the supply response of local producers and strategic decisions of major international firms) on the other. Section two provides an overview of the industry. Early policy developments are analysed in section three and section four explains the workings and objectives of the MIDP. The impact of the MIDP on automotive trade is examined in section five which also makes use of conventional welfare analysis to illustrate the impact of import-export complementation under various assumptions. Sections six and seven respectively examine investment and productivity and employment. Section eight concludes the chapter.

2. INDUSTRY OVERVIEW

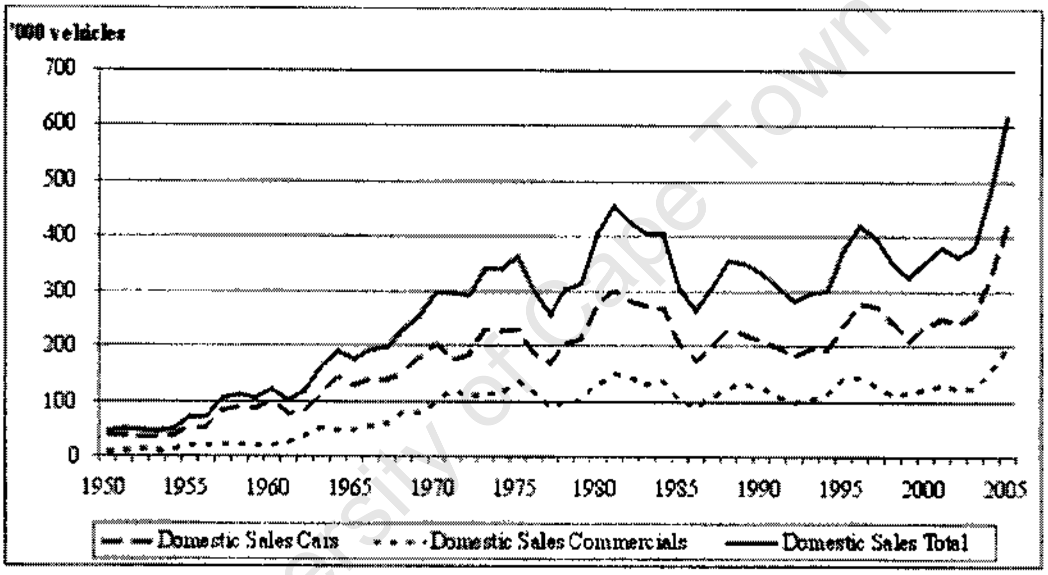
2.1 Market Overview

As Figure 4.1 indicates, the South African market grew very rapidly from 1950 to the early 1980s. With minimal trade in built up vehicles, production tracked sales until the mid 1990s, when both imports and exports became a significant factor. In 1960, South Africa was the largest vehicle producer in the developing world with significantly higher output than countries such as Brazil, Mexico and Korea. Sales reached 453,541 units in 1981 but then

2 See for example 'Development programmes SA's biggest success story' *(Sunday Times, Business Times,* 25 March, 2007); 'State motor plan a success says KPMG' *(Business Report,* 7 March, 2007); 'Export deal revs SA car industry into life' *(Sunday Times, Business Times,* 21 September, 2003)

went through a phase of 'volatile stagnation' as the economy entered a period of very slow growth, constrained by political instability and increasing international isolation as well as a decline in gold revenues. The positive impact of economic reforms introduced by the new democratic government since 1994 was delayed by the repercussions of the Asian economic crisis of 1997-99. An indication of the impact of the economic slowdown is that it was not until 2004 that vehicle sales exceeded the 1981 level. But since 2002, sales have grown strongly boosted by rising incomes, a strong rand and low interest rates. Sales in 2005 were 56 percent higher than in 2002. For the period 2000-2003, the number of exported vehicles exceeded imports but booming domestic demand reversed this position from 2004. Nevertheless, production has grown strongly on the basis of domestic demand and exports.

Figure 4.1: Vehicle Sales in South Africa 1950-2005



Source: NAAMSA Annual Reports (various years).
Note: 1995 total sales figure onwards include non NAAMSA sales.

2.2 The Structure of the Industry

There are currently seven producers of light vehicles in South Africa. In 2005 they assembled 497,000 units of which 28 percent were exported. There have been no major new entrants into the assembly industry over the last decade. The last assembly plant to be built was the new Delta plant which was opened in 1996. However, all companies have invested substantially in their existing facilities.

There has been a significant increase in foreign ownership since 1990. As Table 4.1 indicates, all assemblers are now wholly or mainly owned by the parent company in Japan, the US or Europe. This was not the case in the early 1990s, when most assemblers were under majority local ownership. At that point, the South African operations still maintained close links with their licensor companies producing standard, if somewhat dated, products with minor modifications. In spite of the high level of domestic ownership, technologically they remained almost totally dependent on their respective multinational licensors.

With the political developments of the early 1990s, this position started to change rapidly. In 1992, DaimlerBenz raised its 50.1 percent stake in Mercedes Benz South Africa (MB SA) to 76.6 percent by buying out a stake held by the local bank, Volkskas. Two years later Ford purchased a 45 percent stake in Samcor[3] which was raised to 90 percent following an agreement with Samcor's parent, Anglo American, in 2000. In 1995, Nissan Diesel and Mitsui together purchased a 12.9 percent stake in Automakers and two years later Nissan purchased a further 50 percent stake.[4] In 1996, Toyota Motor Corp (TMC) purchased a 27.8 percent stake in Toyota (South Africa) and increased this to 35.3 percent in 2000. TMC's stake was increased to 75 percent in 2002. In 2004, General Motors acquired the outstanding 51 percent stake in Delta and the firm was renamed General Motors South Africa. By 2005, therefore, all firms had become wholly owned subsidiaries of their respective parent companies with the minor exception of Toyota, where a minority local shareholding was retained.

The component industry consists of approximately 350 firms and employment in 2005 was 78,000. It produces a full range of components for the domestic and export market. Foreign ownership has also increased in this sector both as a result of new greenfield investments by firms such as Lear, Lemforder and Johnson Controls as well as the purchase of stakes in local firms by multinationals. Of the 27 firms with over 500 employees, 13 are now foreign owned (Table 4.2).

3 See 1100m deal cements Ford's return to SA' *(Business Report,* 29 November, 1994).

4 'Japan boosts SA motor industry' *(Business Report,* 14, September, 1995); 'Nissan to buy half of Automakers' *(Business Report, 10* March, 1997).

Table 4.1: Assembly Firms Operating in South Africa (1990 and 2005)

1990			2005			
Assembler	Ownership	Makes	Assembler	Ownership	Makes	Production (units)
Automakers	Local (Sankorp), 100%.	Nissan, Fiat	Nissan	Nissan, 87% ; Nissan Diesel, 4.3% ; Mitsui, 8.7%.	Nissan, Fiat	45,288
BMW (SA)	BMW AG, 100%	BMW	BMW(SA)	BMW AG, 100%.	BMW	43,356
Delta	Local management, 100%	Opel, Isuzu	General Motors SA	GM, 100%.	Opel, Isuzu, GM	61,785
Mercedes Benz (SA)	DaimlerBenz, 50%; Local, 50%	Mercedes, Honda, Mitsubishi	Daimler Chrysler(SA)	Daimler Chrysler AG, 100%.	Mercedes, Mitsubishi	51,129
Samcor	Local (Anglo American), 100%	Ford, Mazda	Ford Motor Company of Southern Africa	Ford Motor Company, 100%.	Ford, Mazda Land Rover	61,468
Toyota SA	Local, 100% (Wesco, 72.2%; listed on the Johannesburg Stock Exchange)	Toyota	Toyota SA	Toyota Motor Corp, 75%. Wesco, 25%.	Toyota	120,338
VW (SA)	Volkswagen AG, 100%.	VW, Audi	VW(SA)	Volkswagen AG, 100%.	VW	113,690

Sources: Barnes and Morris (2004: 795), interviews, media reports.

Table 4.2: Component firms with over 500 employees, 2005

	Product	Employment	Ownership
Atlantis Foundry	Engine components	1200	German
August Lapple SA	Body Pressings	980	German
Aunde (SA)	Leather seat covers, trim parts	1300	German
Automotive Leather Co	Leather seat covers, trim parts	500	Local
Behr (SA)	Engine cooling systems, air conditioners	1500	German
Bosal Afrika	Exhausts, jacks, catalytic converters	1099	Dutch/Belgian
ArvinMeritor	Shock absorbers, catalytic converters	900	US
Control Instruments	Electrical components, brake components, security systems	725	Local
Dorbyl Automotive Technologies	Wheels, seats, propshafts, steering systems	na	Local
Faurecia	Interior trim, front end modules	551	French
Federal Mogul	Brake pads, spark plugs, engine components, gaskets	1784	US
Feltex	Automotive leather, interior trim	2906	Local
First National Battery	Batteries	681	Local
G.U.D. Holdings	Filtration systems	836	Local
Hella	Automotive lighting	523	Local
Hesto Harnesses	Wiring harnesses	1200	Local
Johnson Controls	Leather seat covers, cockpit seat and front end assembly	1300	US
Lear Corp.	Leather seat covers, seat assemblies	1600	US
Murray and Roberts Foundries	Engine components	950	Local
Pasdec Automotive Technologies	Wiring harnesses	500	Local
Robert Bosch	Motors, engine control units, security systems	925	German
Shatterprufe	Windscreens	1350	Local
Smiths	Airconditioners, trim components	1483	Local
Supreme Spring	Suspension components	550	Local
Tenneco	Catalytic converters, exhaust systems	820	US
TSW Manufacturing	Alloy wheels	523	Local
Venture	Plastic trim components	1450	US

Source: Compiled from NAACAM (2006); Interviews; Personal communication, Justin Barnes.
Note: Excludes tyre manufacturers.

3. EARLY POLICY DEVELOPMENTS

3.1 Tariffs and the Local Content Programme

In order to understand the early development of the South African automotive industry, it is necessary to examine the impact of protection and, in particular, the series of local content programmes that were adopted. [5] In many respects, South Africa followed a programme of import substitution similar to that adopted in other developing countries especially in Latin America. High tariffs were placed on built up vehicles which when combined with a rapidly growing market, acted as a magnet to a large number of (initially foreign) companies which established assembly plants in the country. These operations, although in many cases highly profitable, were very small in international terms with correspondingly high unit costs. Production was aimed solely at the domestic market and the South African assembly plants were kept isolated from the global production networks of the parent companies except as markets for CKD packs.

Ford and General Motors were the first to establish a production presence in South Africa. They were granted protection and built assembly plants in Port Elizabeth in the 1920s. In order to save foreign exchange, the government introduced foreign exchange controls in the late 1940s which led to the establishment of additional assembly operations (Duncan, 1997). The domestic market expanded rapidly in the post-war period reaching 120,000 vehicles in 1960. The level of local content at this stage was only 20 percent. The adverse impact on the balance of payments led to increasing government support for greater usage of domestically produced components. As a result, the first in a series of local content programmes was introduced in 1961. Domestic sourcing of eleven peripheral items such as tyres, batteries and trim was required and higher local content levels rewarded with additional import permits (Duncan, 1997). Although it was recognised that the desirable objective of increasing plant and model volumes could only be attained through rationalisation and a reduction in the number of assemblers, it was argued by the Board of Trade and Industry (BTI) that this should be allowed to happen through normal market processes.

Net local content rose rapidly, reaching approximately 52 percent by mass by 1971, which marked the end of Phase II of the programme. Rising local content requirements did nothing to reduce the number of assembly operations and rapid growth was accompanied by a proliferation of assemblers and also by the development of a low volume components

For a detailed account of the first 70 years of the industry's existence in South Africa from 1924, see Duncan (1997).

industry oriented towards the production of heavier components such as body pressings (due to local content being measured on a mass basis).

Under Phase III, local content (on a mass basis) was to reach 66 percent by 1977 in the case of 'manufactured' vehicles. Phase IV was a consolidation period with no additional requirements and Phase V, which was introduced in 1980, applied a local content requirement of 50 percent to light commercial vehicles rising to 66 percent in 1982.

3.2 The Phase VI Programme

The problems inherent in the above approach to the promotion of local content had become obvious during the recessionary years of the 1970s. The situation was aggravated by the severe slump, which followed the gold boom of the early 1980s. Thus by late 1986, there were seven assemblers producing over 20 basic model variants for a market of 172,000 passenger cars.[6] These low volumes meant that the industry was uncompetitive. Exports were minimal (R105 million in 1985) and with the increased introduction of highly sophisticated components, it had become increasingly easy to meet mass based local content requirements, while increasing the value of imported components. Imports of vehicles and components amounted to R2,059 million during 1985, a year of weak vehicle demand.

According to the DTI, the local content programme up to and including Phase V had two main deficiencies. It led to:

> *"a tendency to produce low cost, low technology components which were unremunerative to export and were produced in uneconomic volumes so locking the industry into a low volume, high cost production structure; and....a very high import bill as source companies tended to load the price of components they supplied to local producers. As they were supplying largely high technology components which the local industry did not produce, this too tended to raise prices as there was no incentive to produce low mass, high cost components locally ".* (Department of Trade and Industry, 1992)

6 The issue of proliferation and low volume is dealt with in detail in Chapter Five.

The new Phase VI local content programme, introduced in 1989, was supposed to meet the following objectives (BTI, 1989):

a) The promotion of investment, job creation and growth

b) Satisfaction of the country's essential transport requirements

c) The improvement of productivity

d) Minimising price increases

e) Maintaining a high level of competition

Phase VI marked a significant change in direction. Local content was to be measured by value rather than mass. Most importantly, local content was to be measured not just by the value of domestically produced components fitted to locally assembled vehicles, but on a net foreign exchange usage basis. In other words, exports by an assembler counted as local content and enabled it to reduce actual local content in domestically produced vehicles.

The system operated through the imposition of an excise duty of 37.5 percent on all locally assembled vehicles. However, this duty could be rebated to the extent of 50 percent of the local content value so that if the local content target (75 percent) was achieved, no duty was payable. A minimum average level of 50 percent actual local content (i.e. irrespective of exports) had to be maintained across the model range but local content was defined very broadly as the ex-works vehicle price less foreign exchange usage. It therefore included assembly costs.

In addition to the protection added by the local content programme, the industry also received tariff protection on sub-sectors, which fell outside the ambit of Phase VI such as built up vehicles, spare parts and accessories. The duties, which were applicable included customs duties (ad valorem, specific or formula duties) designed to protect domestic industry as well as an import surcharge which was applied mainly for fiscal purposes. Built up vehicles received tariff protection of 100 percent and were subject to a further 15 percent surcharge. As a result, imports were minimal.

In assessing protection levels, it is necessary to take account of the way in which prices were determined for foreign components. Imported components were mainly brought into the country in the form of CKD packs. If an assembler opted to use a local component this was removed from the CKD pack and a 'deletion allowance' was subtracted from the cost of the pack by the foreign principal. Deletion allowances were widely held to be below competitive international prices.? The result was that a domestic component manufacturer was competing not with 'normal' international prices, but with the lower deletion allowance. While the component industry was previously excessively protected compared to the other intermediate goods sectors, under Phase VI this situation had changed dramatically.

The level of protection on built up vehicles, however, remained prohibitive. Nominal protection of 115 percent (100 percent ad valorem plus 15 percent surcharge) was unusually high even by the protectionist standards of developing country producers, although at the time a few new entrants such as Thailand and Malaysia applied even higher tariffs. Emerging market producers such as Mexico, Brazil, Taiwan and Korea had lower cost industries and lower levels of protection although both Korea and Taiwan still applied partial bans on Japanese imports. The calculation of effective rates of protection on built up vehicles is complicated by local content arrangements but because of reduced protection on components, effective rates of protection increased sharply under Phase VI.

Exports under Phase VI received a substantial effective subsidy in the form of a rebate of excise duty of 50 cents in the rand. All exports were channelled via assemblers and component exporters had to negotiate the extent of the 'subsidy' that they received. Component producers usually received 60-70 percent of the rebate or 30-35 cents per rand (of local content value) of exports. However, there was pressure to reduce this as assemblers approached their required local content levels.

3.2.1 The Impact of Phase VI

Phase VI was intended to encourage both local content and specialisation. However, it was introduced with insufficient consideration of its likely impact. There were a number of unintended outcomes and the programme came in for fierce criticism from large sections of the component industry.

Exports

Under Phase VI, exports rose faster than expected and this is one area where most observers would agree that the programme was successful. The growth trend was significant and exports increased from negligible volumes in the mid 1980s to 82,245 million in 1994. Export growth included a wide variety of components although catalytic converters and automotive leather comprised an important part of this expansion.

[7] Interviews

Under the Phase VI regulatory system, all exports (including components produced by independent suppliers) were channelled through the assemblers. Many component suppliers and all the assemblers instituted significant export drives. The benefit for assemblers was that they were able to offset part of their local content requirement through exports. They were, therefore, proactive in developing international marketing channels, frequently via their overseas principals, and identified the types of components where local producers had a competitive advantage.

In developing international networks and markets, the German based assemblers were in an advantageous position. Because they were wholly owned subsidiaries, there was more of an incentive for the parent multinational to incorporate them into global networks. BMW (SA)'s parent company in Munich was the first to incorporate its South African plant into an integral plan to internationalise production and component sourcing. For firms which were locally owned at the time, such as Toyota and Nissan, this course of action was more problematic. There was a much lesser incentive for the Japanese parent companies, which had no equity stake in the South African firms, to source from South Africa. Nevertheless, Toyota (South Africa) renegotiated the terms of the licence agreement with Toyota Motor Corporation and by the early 1990s was permitted to export vehicles to sub-Saharan Africa. Nissan set up an export company, Motorware, with offices in Europe and the Far East. Its main exports were vehicles, mainly to sub-Saharan Africa but also to Taiwan, original equipment components such as castings and catalytic converters mainly to Nissan and Fiat; and components to the international aftermarket (Black, 1994).

VWSA's exports rose from R30 million (mainly, used tooling) in 1989 to R500 million in 1992. Roughly half of the latter figure was accounted for by left hand drive Jettas exported to China. The other major export produced in-house was press parts, exported to VW plants in Europe. Other high volume exports included steel wheels and catalytic converters. At the time VWAG was considering using South Africa as a production base for right hand drive Audis or right hand drive components for the world market. Samcor's exports of vehicles, engine parts and brake components amounted to R50 million in 1991. Delta began large scale exports of catalytic converters in the same year. [8]

From an early stage, therefore, the vehicle producers played a key role in the export of components by providing access for suppliers into their global networks. The position of assemblers in the auto industry's producer driven value chain proved critical. As we will

8 See 'The lure of the right hand....' *(Company Motoring Export Survey*, 1991).

show in relation to the MIDP, the facilitative role played by assemblers has been a key factor in explaining the strong supply response to changes in the incentive regime.

For the component producers, foreign ownership or a joint venture arrangement with a foreign firm conferred significant advantages under this new scenario. Foreign owned firms were, in many cases, quickly incorporated into the worldwide sourcing arrangements of the parent company. Many domestically owned firms were dependent on licence agreements with principals and faced the problem of restrictions on exports in terms of these arrangements.

A survey of 17 component firms conducted by the author in 1992 indicated that 16 were already involved in exporting. [9] The most important factors motivating exports were the Phase VI incentives, low levels of demand in the domestic market and the desire to increase the scale of production and improve product quality. Phase VI was a critical factor. The programme led to some new investment and while most firms did not expect the level of incentives to be maintained, they were nevertheless planning export expansion. Some believed that they were competitive in certain products without incentives (Black, 1994: 57-59).

Most of the firms that were exporting by the early 1990s, were not doing so ten years previously and the incentives had played an important role in getting firms to consider exports as a growth area and to establish marketing and distribution channels. Original equipment and to a lesser extent aftermarket supply required large investments of effort in attaining the necessary quality certification. Firms fully understood that one could not move in and out of such markets according to the fluctuations of the South African business cycle. While margins were generally lower in export markets, this was dependant on the type of product and higher margins could be obtained in niche markets (Black, 1994).

The impact on investment and component sourcing

Rapidly rising exports gave assemblers considerably greater flexibility in their sourcing arrangements. By the end of Phase V, local content in terms of mass (which was the measurement used) had reached 66 percent but was lower in value terms. This definition of local content included only components and tooling. Under Phase VI, actual local content needed only be a minimum of 50 percent as long as the rest of the total 'local content' requirement was made up through exports. Furthermore, actual local content was defined

9 The survey was drawn randomly from the NAACAM membership of approximately 130 firms. It should be noted that that NAACAM includes nearly all larger component firms but many smaller and second tier suppliers are not members. For questionnaire see Appendix Three.

more broadly under Phase VI as value of sales less foreign exchange used. [10] It is clear, therefore, that with the growth in exports, assemblers were able to significantly reduce the `physical' local content in domestically assembled vehicles.

The short term impact of Phase VI was felt in three main areas (Black, 1994):

1. The switch from mass to value had a highly differentiated effect on the component sector. Assemblers began looking at ways of increasing local content by value rather than mass. Heavy components such as body pressings were no longer required and came under increasing pressure. Because of high tooling costs and short production runs, this was one of the most vulnerable sectors especially as it had enjoyed exceptionally high protection in terms of the mass based scheme. Pressing firms were forced to rapidly restructure by specialising in fewer parts and establishing export markets in collaboration with carmakers. There was also a limited shift into the increasing use of domestically produced, high value components such as electronics. For example, Bosch established a high technology plant to produce electronic control units.

2. Components which formed part of sub-assemblies also came under threat because it became cheaper to import these in a semi-assembled form thus simplifying assembly and limiting the problems of local re-engineering, quality and supply complexities.

3. Components with high tooling costs in relation to the cost of the component were also vulnerable (e.g. plastic moulded components). Again, low volume production for the domestic market made these uneconomic (Black, 1994).

However, for models introduced under Phase V, manufacturers tended to maintain their sourcing arrangements due to sunk investment in tooling and contractual obligations. Also, it took time to build up large export volumes. Thus the increased flexibility to source additional components abroad was most apparent with new model introductions and started to have a major impact during 1992. A survey conducted by NAACAM in that year revealed a significant drop in turnover of the components industry, which they attributed to reduced local content as a result of new model introductions under Phase VI (Black, 1994). Weak domestic sales were also a contributing factor. Reduced domestic sourcing was to some extent

10 Measurement and definitional issues regarding local content are discussed in Section Five of this chapter.

compensated for by exports although much of the expansion was in 'non-traditional' components such as catalytic converters.

Increased foreign sourcing was not the expected result of the programme. The component producer's federation, NAACAM, initially welcomed Phase VI expecting a substantial increase in local content. Component producers received a large increase in requests for quotations but orders did not materialise. The Board of Trade had also anticipated rapid growth in the component sector (BTI, 1989).

The impact on vehicle prices

In the early 1990s, South African car prices were well above international prices. Differentials varied and were generally higher at the luxury end of the market. Furthermore, prices had been rising at a higher rate than the consumer price index (CPI) at least until 1993. Phase VI was being widely blamed in the media and by industry analysts as being a contributing factor) I

As has been explained above, the growth in exports greatly increased the flexibility of component sourcing, allowing assemblers to take advantage of cheaper foreign components. This led to a substantial reduction in costs, especially as new models were introduced. Component suppliers, who were accustomed to prices being determined on a 'cost plus' basis, were forced to become more efficient and reduce their margins as they faced ultimatums to reduce prices in real terms or have the particular component placed back in the CKD pack.

Complaints about price increases under Phase VI related to the incentive structure, specifically the fact that the official definition of 'local content' included profit margins. Thus if one assumes that a vehicle with an ex works price of R100,000 used foreign exchange of R40,000, this implied a 'local content' level of 60 percent. Raising the vehicle's ex works price from 8100,000 to R120,000 therefore increased local content to 67 percent allowing the manufacturer to claim a higher rebate. Thus, a new element was introduced into the assembler's determination of the wholesale price. In a normal competitive situation, the assembler would have to weigh up the benefits of a larger price increase against the negative impact on sales and market share. This method of calculating local content clearly increased the benefit side of the equation.

11 See, for example, `Local content spectre haunts carmakers' *(Argus,* 21 September, 1991); 'Gone to pot: Car buyers can no longer finance special relationships' *Finance Week, 1* 0-16 September, 1992)

Proliferation of makes and models

A further defect of Phase VI is that it did not address the major factor impacting on the scale of production in the components sector — proliferation of makes and models in the domestic market. [12]

3.2.2 Conclusion

The series of local content programmes introduced in South Africa were seriously flawed. They were directly responsible for the development of a fragmented and non-competitive industry. Phase VI was an attempt to address this situation. It encouraged exports but the level of assistance was far too high. This led to booming exports but at the same time drastically reduced protection of the components sector. Also, Phase VI did nothing to reduce the proliferation of models being assembled domestically. This proliferation of models was one of the major reasons for the component sector being uncompetitive. A further problem was that Phase VI was introduced at a time of great political and economic uncertainty and a generalised lack of investor confidence. This provided an inappropriate environment for a programme of structural adjustment.

4. THE MOTOR INDUSTRY DEVELOPMENT PROGRAMME

4.1 The Introduction of the MIDP

Phase VI came in for heavy criticism with frequent changes adding to the atmosphere of uncertainty. [13] In particular, there was pressure from the component producer federation, NAACAM, who were concerned about rising import competition. In late 1992, the Motor Industry Task Group (MITG) was appointed to re-examine the programme and advise government as to the future development policy for the industry. [14] The MITG was a tripartite forum representing industry, trade unions and government. Government made it clear that tariffs had to be reduced in line with WTO obligations.

Early on in the discussions, it was implicitly decided that the basic architecture of the proposed policy would draw on the 1985 Australian Passenger Motor Vehicle Manufacturing Plan, more commonly known as the Button Plan. This involved four elements:

a) Significant duty phase downs

12 This issue is dealt with in greater detail in Chapter Five.

13 See, for example, 'The dubious working of Phase VI local content' *Sunday Times,* 12 July, 1992); 'Latest adjustments should satisfy OEMs' *(Company Motoring Export Survey,* 1992).

14 'Phase VI seems bound for the scrapyard' *(Sunday Times - Business Times,* 22 November, 1992).

b) A facility under which vehicles and component exporters could rebate duties on imported vehicles and components

c) A Duty Free Allowance under which a certain proportion of an assembler's component requirements could be imported duty free

d) Penalties, in the form of a lower Duty Free Allowance for not achieving specified model volumes

While all stakeholders were able to agree on the basic architecture, there were protracted and sometimes acrimonious discussions on the actual levels of these policy parameters, such as the extent of the duty phase down for vehicles and components and the level of the Duty Free Allowance. The most contentious issue was whether to introduce specific industrial policy measures to encourage higher model volumes.[15] The eventual outcome was the Motor Industry Development Programme (MIDP), which was introduced in 1995. The recommendations of the MITG were only partly accepted. Most notably, the contentious proposal to encourage higher model volumes and force a degree of rationalisation was not accepted, as a result of strong opposition from the vehicle producers' federation, NAAMSA.

The MIDP continued the direction taken by Phase VI and entrenched the principle of import-export complementation. However, it went a step further by abolishing local content requirements and introducing a tariff phase down at a steeper rate than required by the terms of South Africa's offer to the GATT.

The main elements of the MIDP were the following:

- The excise duty based local content system was dropped and replaced by a tariff driven programme.

- Tariffs on light vehicles were to be phased down to 40 percent for light vehicles and 30 percent for components by 2002 (Table 4.3).

- Manufacturers of light vehicles were entitled to a Duty Free Allowance. Components to the value of 27 percent of the wholesale price of the vehicle could be imported duty free.

- Import duties on components and vehicles could be offset by Import Rebate Credit Certificates (IRCCs) derived from the export of vehicles and components.

15 This issue is dealt with in more detail in Chapter Five

- Provision was made for a Small Vehicle Incentive (SVI) in the form of a higher Duty Free Allowance for low cost vehicles.

Table 4.3: Tariff phase down under the MIDP

	Built up vehicles %	OE components %
1995	65	49
1996	61	46
1997	57.5	43
1998	54	40
1999	50.5	37.5
2000	47	35
2001	43.5	32.5
2002	40	30

Source: Department of Trade and Industry.

While nominal duties on imported vehicles were set to remain quite high even until the year 2002, the ability to rebate import duties by exporting enabled importers to bring in vehicles at lower effective rates of duty. Import-export complementation also enabled assemblers to use import credits to source components at close to international prices. [16] Thus declining nominal protection on vehicles was to some extent being compensated for by reduced protection for components.

An important difference with the Australian plan was the fact that import credits could be earned on the full domestic content value of exports, including raw material content. In the Button plan only value added within the automotive industry qualified. The result of this distinction was that the MIDP gave very strong support to export products with high raw material content. High export growth in turn led to a rapid decline in protection for the component sector. The DTI was itself divided on this issue and after the introduction of the MIDP, the feasibility of a 'value added' system was investigated but never implemented.

4.1.1 Mid-Term Review

In order to assess the impact of the MIDP and provide long term policy certainty to the industry, the DTI conducted the Mid-Term Review of the MIDP in 1998, the results of which were published in 1999. [17] The Mid-Term Review extended the MIDP for a further five years on a phasing down basis. The gradual decline of tariffs was set to continue to 2007. One significant adjustment was that import/export complementation provisions were to continue to

[16] IRCCs could also be traded.
[17] See Republic of South Africa (1999) for further detail on the proposals.

2007 but on a phasing down basis. The qualifying value of eligible export performance was scheduled to decline from 2003 (Table 4.4). This meant that while exports of components with a local content value of R100 would allow the exporter to import R100 of components on a duty free basis in 2002, by 2007 only components to the value of R70 could be imported. Coupled with the continuing phase down of tariffs this meant that export assistance was being reduced quite rapidly. It also offset, to some extent, the liberalising effect of tariff reductions by requiring a greater level of exports to rebate duties on a given level of imports.

Table 4.4: The MIDP as Amended in the Mid-Term Review and the 2003 Review

Year	Import duty		Qualifying value of eligible export performance	Qualifying PGM content	Ratio of exports against imports		
	Built up light vehicles	Original equipment components	Built up vehicles and components (excluding tooling)	Catalytic Converters exported	Components, heavy duty vehicles & tooling exported: CBU light vehicles imported	Components, vehicles and tolling exported: Components, heavy vehicles and tooling imported	Built up light vehicles exported: Built up light vehicles imported
1999	50,5%	37.5%	100%	90%	100:75	100:100	
2000	47%	35%	100%	80%	100:70	100:100	
2001	43,5%	32,5%	100%	60%	100:70	100:100	
2002	40%	30%	100%	50%	100:65	100:100	
2003	38%	20%	94%	40%	100:60	100:100	
2004	36%	28%	90%	40%	100:60	100:100	
2005	34%	27%	86%	40%	100:60	100:100	
2006	32%	26%	82%	40%	100:60	100:100	
2007	30%	25%	78%	40%	100:60	100:100	
2008	29%	24%	74%	40%	100:60	100:100	
2009	28%	23%	70%	40%	100:60	100:100	
2010	27%	22%	70%	40%	100:60	100:100	
2011	26%	21%	70%	40%	100:60	100:100	
2012	25%	20%	70%	40%	100:60	100:100	

Source: Adapted from Black and Barnes (2003) and NAAMSA (2005)
Notes: The Duty Free Allowance of 27 percent remained unchanged during this period.
The Productive Asset Allowance (PAA) was put in place until 2007 to be reviewed later.

There were again extensive discussions regarding the imposition of direct industrial policy measure to rationalise the industry but these were not adopted. An important late change introduced into this process as a result of concerted pressure on the Minister of Trade and Industry by vehicle manufacturers, who were planning major export programmes, was the introduction of a Productive Asset Allowance (PAA). In terms of the PAA, firms making `qualifying investments' [18] receive import duty credits equal to 20 percent of the value of these investments, spread over five years.

4.1.2 The 2003 Review

A third review process was initiated in 2002 to provide clarity on policy until 2012. The brief was to maintain the basic architecture of the MIDP. Tariffs were set to decline at just one percent per annum from 2002 to 2007, to 25 percent and 20 percent for built up vehicles and OE components respectively (Table 4.4). There were also some other minor adjustments, the most important of which was a slight slowing in the phase down of the qualifying value of export performance. But the end point of 70 percent remained unchanged (Table 4.4). Because the PAA had only recently been introduced, it was recommended that this be reviewed later. [19] The clear direction of successive reviews of the MIDP, therefore, was to gradually reduce tariff protection for both components and vehicles and reduce the assistance to exporters by phasing down the qualifying value of export performance.

4.2 The Objectives of the MIDP

The orthodox rationale for tariff reductions is to realign relative prices, reduce input costs and correct anti-export bias. The expected result would be a shrinking of the sector concerned, with benefits being felt in other sectors of the economy. While these factors were important in the automotive industry phase down, policy makers also sought to rationalise the industry, which in effect meant encouraging a higher degree of specialisation, which could be achieved through greater levels of international integration.

The initial objectives of the MIDP were to provide high quality affordable vehicles, provide sustainable employment and through increased production, contribute to economic growth (Department of Trade and Industry, 1997). These, of course, are generic objectives, which are important to all sectors. More specifically, the MIDP was devised as a trade facilitating measure with very particular industry policy objectives. As a result of protection, the industry structure had historically been very fragmented and the resultant failure to achieve economies of scale has not only made the assembly industry inefficient, but imposed major negative externalities on the component sector. With the proliferation of makes and models being produced in low volumes in South Africa, component firms had in turn been required to

18 'Qualifying investments' had to contribute to the rationalisation of the industry. Component producers could also qualify but the vast share of the PAA went to vehicle producers.

19 For the policy recommendations, see Barnes and Black (2003).

produce at way below minimum efficient scale.[20] So an objective of the MIDP was to increase the volume and scale of production through a greater level of specialisation in terms of both vehicle models and components.

The MIDP seeks to provide support for the automotive industry on a gradually declining basis. This requires that it meet a number of objectives, including:

a) some protection of assembly

b) some protection for the component sector

c) some export support

d) investment assistance

The main instruments of the MIDP have been falling nominal duties combined with export assistance derived from the ability to offset import duties.[21] While nominal duties on imported vehicles remained moderately high, at least in the early stages of the MIDP, the ability to rebate import duties by exporting enabled importers to bring in vehicles at lower effective rates of duty. Import-export complementation also enabled assemblers to use import credits to source components at close to international prices. This has meant that there has still been a significant incentive to assemble locally. The various components of the system are interdependent. If credits can be generated too 'easily' then import protection is effectively removed, while if it is too difficult to earn these credits then the industry becomes more protected. The latter outcome would lead to rising car prices and also higher vehicle production costs. So the volume of credits being generated is a key policy issue as it affects the 'balance' of the programme.

Essentially what was sought was a transition from completely knocked down (CKD) assembly, which has typically been characteristic of vehicle production in protected developing country markets, through a transition stage to full manufacturing (Table 4.5). CKD assembly involves relatively light investments in spite of the fact that the need for precision welding and advanced painting processes in modem CKD plants increasingly require larger capital outlays (Sturgeon and Florida, 1999). Under CKD assembly, production costs are usually quite high especially if a high level of localisation is stipulated by government policy. High local content requirements would necessarily require much higher levels of investment and would tend to encourage rationalisation. The cost of tooling up for new models and domestic content also encourages assemblers to skip the introduction of new

20 See Chapter Five for more detail on this issue.

21 Since 2003 firms undertaking 'qualifying investments' could earn duty rebates under the Productive Asset Allowance but the level of this is relatively low.

models and introduce their own adaptations with the purpose of extending model life. As a result, in many protected, emerging economy markets, models have continued in production long after they have been phased out in advanced country markets. In South Africa, the VW Citigolf and Toyota Tazz are examples of this. In the CKD assembly stage, also, quality is likely to be below international standards.

Table 4.5: Stages in the Development of Vehicle Production in South Africa

	CKD assembly	Transition	Full manufacturing
Target market	Domestic	Domestic and export	Domestic and export
Level of integration with parent company	Low; import of CKD packs	Medium	High
Model line up	Many models	One or two	One or two
Derivatives	Limited to reduce costs	Full range to supply export market	Full range to supply export market
Local content	Generally low but may be quite high as a result of local content requirement	Moderate based primarily on cost factors	Medium to high
Quality	Below source plant	Equal to source plant	Equal to source plant
Production cost	High	Medium; penalties incurred by high logistics costs	Low
Domestic design	Local adaptations	None	None - may do world wide R&D in niche areas

Source: Interviews.

In the transition and full manufacturing stages, where exports may become substantial, both quality standards and the number of derivatives offered, need to be in line with international practice.[22] Production volumes per model also increase in the transition stage and under full manufacturing would approach world scale. Because firms are exporting, they would need access to components at world prices, so in spite of higher volumes in the transition stage, local content levels may not increase. In the full manufacturing stage, much higher volumes would normally be attained, encouraging vehicle makers to localise components on an economic basis.

4.3 The Anticipated Impact of the MIDP

International competition in the South African automotive industry has increased substantially as a result of the MIDP. Vehicle manufacturers faced the prospect of the domestic market

22 The term 'derivative' refers to the different permutations within a 'basic model'. Examples include engine size and body (e.g. saloon or hatchback) configuration. The carmaker would also have to offer more minor permutations such as a wide range of colours, types of steering wheel etc.

being eroded by imports as tariffs were reduced from prohibitive levels and as growing exports enabled firms to offset import duties. The component sector, which had only just begun the transition from low volume, flexible production faced further restructuring and consolidation.

The impact of the changes was awaited with a degree of trepidation by policy makers, the industry and trade unions. Clearly the outcome of this shift towards more open markets would depend not only on the level of import penetration, but also on the supply response of firms, especially in terms of investment and export expansion.

A survey of component firms undertaken by the author in 1995, just before the introduction of the MIDP, showed that firms were well aware of the changes that would have to be made in response to the new programme. [23] In spite of the fact that two thirds of firms expected competition in their product line to increase dramatically, as opposed to one third who expected the increase in competition to be slight or negligible, firms were generally adopting a positive approach. Figure 4.2 illustrates that firms planned to upgrade productivity by improving production efficiencies, expanding exports and increasing investment. There was much greater emphasis on a positive supply response (expanding exports and new investment) than on reducing employment and curtailing operations. The restructuring process, therefore, looked likely to be centred on efforts to improve in-house productivity including work organisation, by attempts to expand production volumes in a more focused range of products through exporting and to upgrade plant and equipment including increased use of automation (Black, 1995).

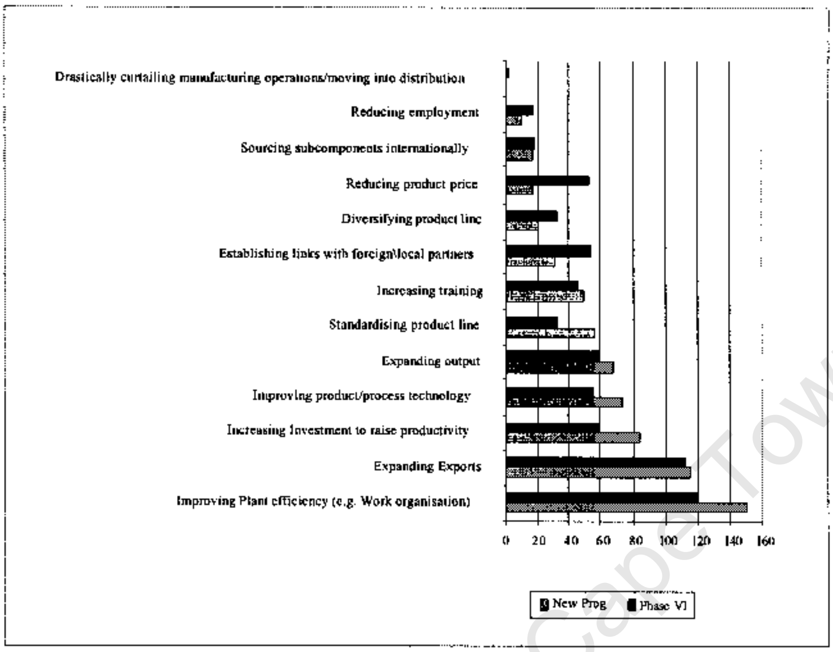
The respondents also proved to be remarkably accurate in forecasting the impact of the MIDP on exports, investment and employment. Firms anticipated a significant increase in exports, moderate increases in investment and roughly stable employment with two clear categories of firm emerging. Those who were linked into export markets expected to increase employment. Another group of more 'traditional' component suppliers linked to the domestic market, expected employment to decline (Black, 1995).

Of the 46 firms who responded, 83 percent were involved in exporting to some degree but the average percentage of turnover exported was only 11 percent. Forty nine percent of firms expected exports to increase by over ten percent per annum in real terms over the ensuing five years while a further 40 percent expected an annual increase in real terms of 1-10 percent per annum (Black, 1995). Firms also expected real levels of investment to increase over the

23 The results of this survey are set out in more detail in Black (1995). See Appendix Five for questionnaire.

following five years. Introducing new product/process technology ranked fourth as a response to the new programme and was the fifth most important response to the old programme (Figure 4.2).

Figure 4.2: Impact of Phase VI and expected impact of MIDP



Source: Own survey. For more detail see Black (1995).

Note: Firms were asked to rank the five most important responses to the pressures and opportunities resulting firstly from Phase VI which was introduced in 1989 and secondly expected to arise from the new programme.

The survey results were more positive than expected given the reductions in protection which would result from the new programme. It should be recognised, however, that the industry was experiencing boom conditions at the time of the survey, with sales growing rapidly and this is likely to have influenced expectations about the outlook for investment and employment. A further factor was that the component sector had already been exposed to quite severe international competition under Phase VI and a degree of painful restructuring had already taken place.

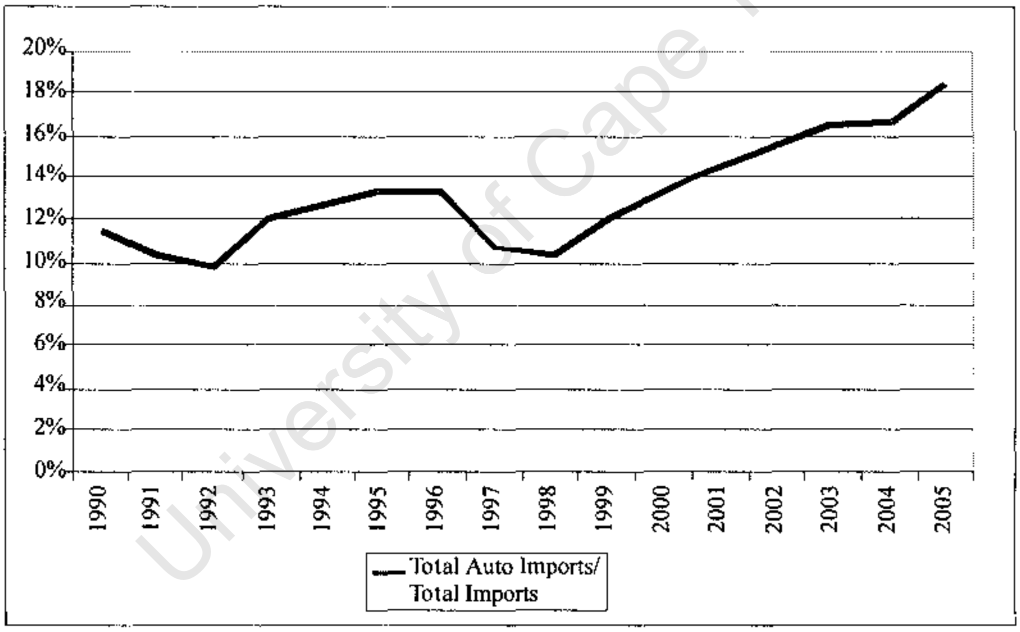
5. AUTOMOTIVE TRADE

5.1 Imports

As protection is reduced, imports can be expected to gain a larger share of the domestic market and rapid import expansion can threaten the viability of local producers, not only by eroding their domestic market share but also by limiting their capacity to take advantage of new export opportunities.

Total automotive imports increased from R18.0 billion in 1996 to R73.3 billion in 2005. The value of imported vehicles has increased even more sharply; from only R2.8 billion in 1996 to R28.3 billion in 2005, accounting for nearly 40 percent of the domestic market. However, imports of components are considerably larger although the growth rate has been less dramatic because they started from a higher base. Imports of original equipment and aftermarket components rose from R15.2 billion in 1996 to R45.0 billion in 2005. Automotive products constitute a large and growing segment of South Africa's total merchandise imports (Figure 4.3). Automotive imports as a share of manufactured imports increased from a low point of 12 percent in 1996 to 23 percent in 2005. Vehicle ownership is highly income elastic and with GDP growth in excess of four percent, further rapid increases in vehicle sales are likely. This means that automotive imports are set to remain an important component of the current account.

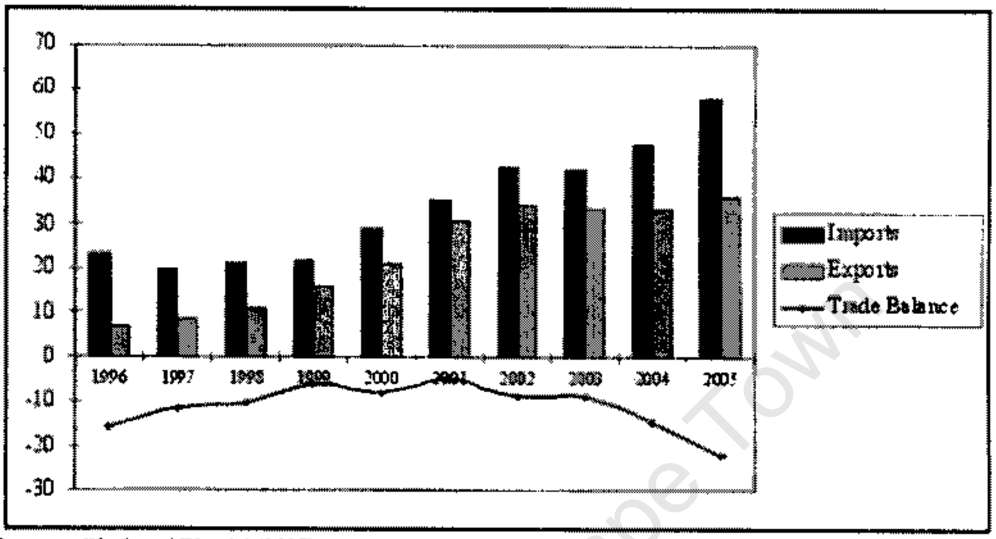
Figure 4.3: Automotive Imports as a Percentage of Total Merchandise Imports, 1990-2005



Source: Black and Bhanisi (2007).

As a result of growing component and vehicle imports, the overall automotive trade deficit widened dramatically from under R5.1 billion in 1992 (a year of weak demand) to R14.1 billion in 1996 before declining as a result of falling domestic vehicle production (requiring fewer imported components) and growing exports. In 1999, it had declined to only R8.0 billion as imports increased moderately while exports continued to grow rapidly. The rand value of imports has since grown rapidly, initially as a result of the weaker rand in 2001/2002. Since then the rand has strengthened but booming domestic demand for imported vehicles as well as components to supply the increase in domestic assembly has led to a further rapid increase in automotive imports and a negative automotive trade balance of R18.8 billion in 2004 and R27.7 billion in 2005.[24] In constant prices, the deficit in 1995 was significantly larger that the previous 1996 peak but the industry has grown substantially over that time (Figure 4.4).[25]

Figure 4.4: Automotive Trade Balance, 1996-2005 (R billion, constant 2000 prices)



Source: Black and Bhanisi (2007)

A number of macroeconomic factors have a bearing on imports. Since 2003, the recovery of the rand from very depressed levels has had an important impact by making imports cheaper relative to domestic output. While this reduced costs for local assemblers by lowering the costs of imported components, the impact on imported vehicle prices was correspondingly greater. The boom in the domestic market has contributed to growing imports since 2004. To some extent this has been due to capacity constraints among local assemblers, which has encouraged more aggressive marketing of imported vehicles. The focus of this chapter, however, is on the impact of automotive policy, in particular, tariffs and import-export complementation.

Declining tariffs

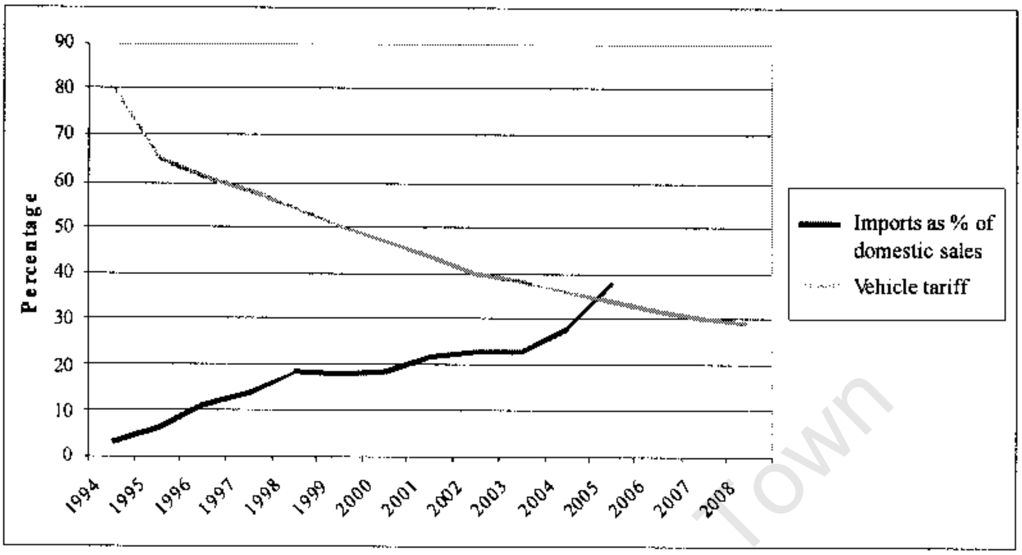
Declining tariffs have played a role (Figure 4.5). As tariffs are reduced, imports can be expected to gain a larger share of the domestic market and rapid import expansion can threaten the viability of local producers by eroding their domestic market share. Import duties have declined steadily from the 65 percent level at the beginning of the MIDP in 1995.

24 The growing deficit has received growing media attention. See 'Import braking point' (*Financial Mail*, 7 July, 2006).

25 For detailed nominal data see Appendix Seven.

Nevertheless, the nominal import duty on light vehicles, at 34 percent, remained quite high in 2005 and does not on its own explain the rapid increase in automotive imports.

Figure 4.5: Tariffs and the Share of the Light Vehicle Market taken by Imports



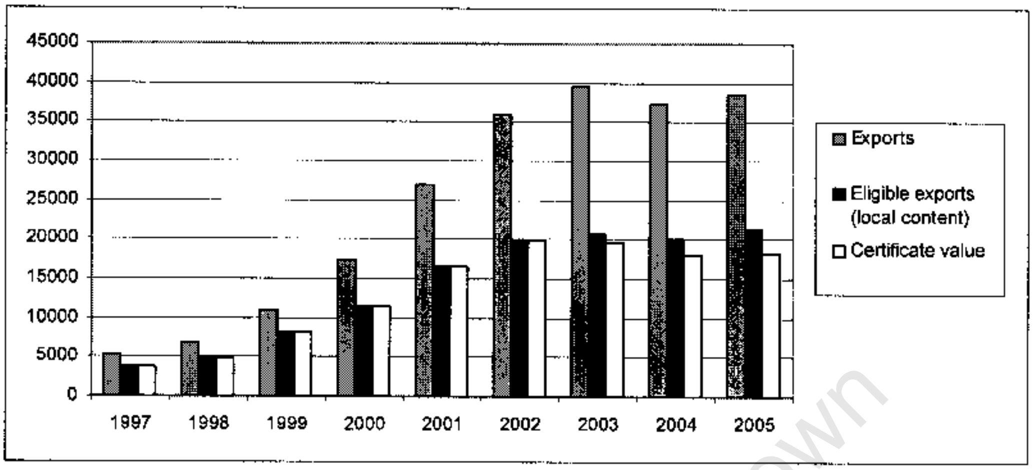
Source: Compiled from dti data

Rebating import duties by exporting

The MIDP enables firms to rebate import duties by exporting. A key element of the strategy of the carmakers operating in South Africa is to expand market share via a combination of local production and vehicle imports. Importing vehicles and components incurs import duties and much of the strategic behaviour of firms is, therefore, directed at optimising their duty position. Minimising duty payments can be achieved in a number of ways. Firstly, firms can limit vehicle imports. Secondly, local content in domestically produced vehicles can be increased. Thirdly, vehicle producers can expand exports either of vehicles or components. As exports have increased so has the ability to import automotive products without paying duty. In addition, carmakers undertaking specified investments which qualify under the Productive Asset Allowance, also receive import credits although these are currently at a low level in comparison to the credits earned via exporting.

The key to understanding the impact of exports on the ability to import is the value of IRCCs. Exports grew rapidly until 2002. The certificate value has, however, grown less rapidly over the period because of lower local content in total exports as a result of the growth in the relative importance of vehicle exports, which have much lower local content than components (Figure 4.6). Additional factors are the phasing down in the qualifying percentage of platinum in catalytic converter exports from 1999 and the phased reduction in the qualifying percentage of all exports from 2003. In spite of the phasing down of export assistance, the incentive structure has continued to encourage export growth.

Figure 4.6: Value of IRCCs Generated by Exporting

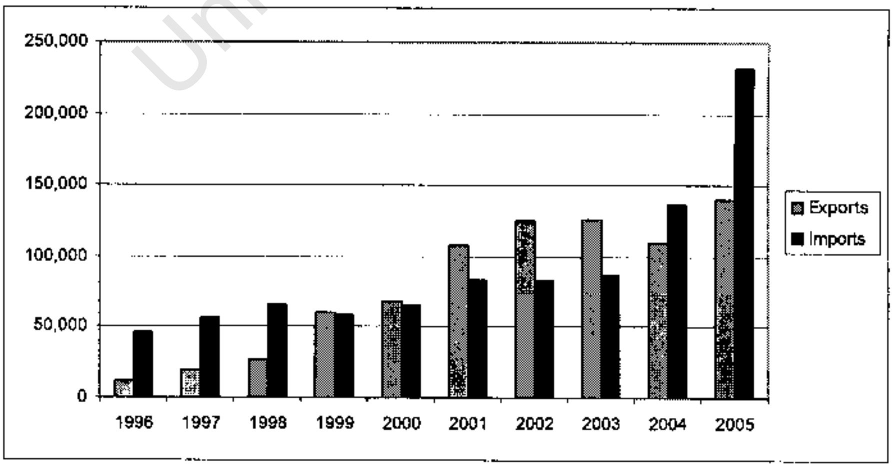


Source: Compiled from dti data

5.1.1 Vehicle Imports

Until the early 1990s, prohibitive tariff levels resulted in negligible imports of vehicles into South Africa. Vehicle prices were significantly above international levels The opening up of the economy and the phasing down of tariffs have led to an increased level of light vehicle imports which increased from under two percent of the market in 1990 to 13.9 percent[26] in 1997 and nearly 40 percent in 2005. Until the surge in imports during 2004-2005, increases were roughly in line with the expectations of policymakers and as indicated in Figure 4.7, the numbers of vehicles exported in some years exceeded imports.

Figure 4.7: Exports and Imports of Light Vehicles, 1996-2005



Sources: NAAMSA, Department of Trade and Industry (various years)

26 This includes imports of semi-knocked down vehicles imported under a temporary concession.

Domestic vehicle producers, especially those firms, which have already established large-scale vehicle export projects, account for the major share of vehicle imports. In interviews conducted in 2002, all assemblers were planning to expand imports of models, which they did not produce locally.[27] This was clearly related to plans to rationalise production in the domestic market to a reduced number of platforms, raise production per model and export part of the expanded output. This strategy generally required an export allocation by the parent company, which in turn was seeking to expand market share (including the sale of imported models) in South Africa.

By 2001, vehicle exports accounted for over 30 percent of the IRCCs being generated, up from only ten percent in 1996. This percentage has continued to increase. Independent importers, such as Renault and Hyundai, have also been able to partly offset duties on vehicle imports by facilitating component exports into their global networks, but have less capacity to do this compared to the vehicle producers with large established production facilities in South Africa.

5.1.2 Components and Local Content

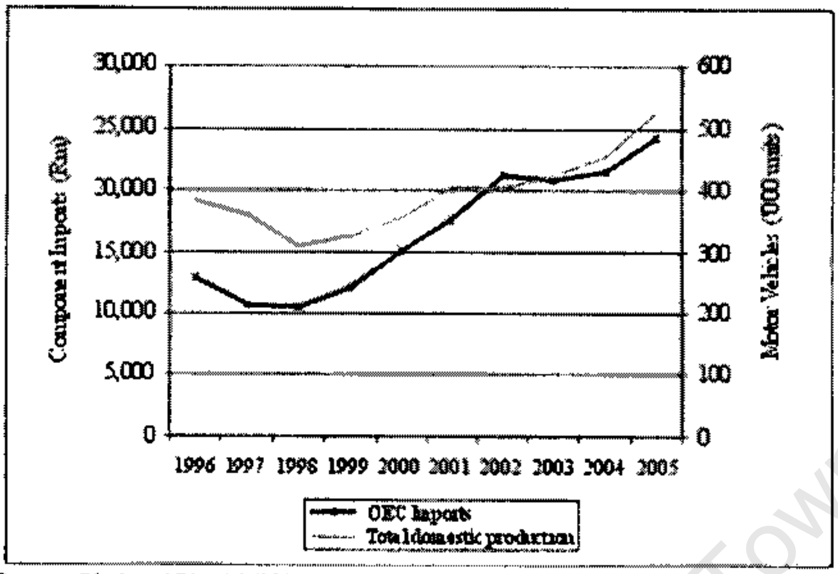
A key policy issue in the development of the automotive sector both in South Africa and other developing countries has been the level of local content in domestically assembled vehicles. Many countries including South Africa introduced local content requirements but all too frequently, vehicle assembly has been characterised by low volumes, which has left the sector uncompetitive and vulnerable to declining protection.

The measurement of local content

Figure 4.8 shows that, in real terms, the value of original equipment components imported per vehicle assembled domestically has increased significantly. Measuring the volume and value of vehicle and component imports is simple enough, but the level of local content in the South African industry remains a major issue of debate between government and the various industry federations.

27 Interviews with senior management at all seven caretakers were conducted in 2002.

Figure 4.8: Motor Vehicle Production and Original Equipment Component Imports (constant 2000 prices)

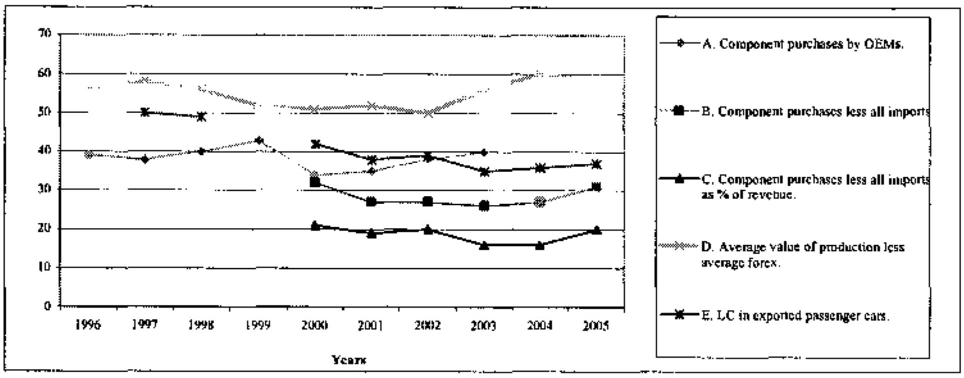


Sources: Black and Bhanisi (2007)

Local content is notoriously difficult to measure. As Figure 4.9 indicates, it can be defined in a number of ways and there are significant differences between the various measures. Each definition is also subject to measurement difficulties and the 'level' of local content is also subject to the vagaries of the exchange rate. For example, the 'official' definition of local content as vehicle wholesale price (value of production) less import content (Measure D) leaves much room for changes in vehicle prices, assembly costs and profit margins. With no change in the actual sourcing of components, higher prices and profits would mean a 'higher' level of local content. In fact, this is what has happened recently in South Africa. The widely used local content measure based on wholesale price (value of production) has ranged between 50 percent and 60 percent and shows a slight upward trend (Figure 4.9). But this reflects a stronger rand from 2003 as well as rising assembly industry profitability. The latter dimension is reflected in the assembly contribution and hence higher 'local content'. The data based on other definitions show a stable or declining position, which may in fact indicate that actual physical local content based on the number of domestically produced parts incorporated in locally assembled vehicles is declining.

What is also evident is the low level of local content (between 32 percent and 26 percent) in total component purchases. As a percentage of vehicle revenue, this dropped to as low as 16 percent in 2004, a year in which both the rand and assembly industry profitability were strong.

Figure 4.9: The Level of Local Content According to Various Definitions



Sources: Unpublished IRCC data, MIDP Customs Account and survey data supplied by Department of Trade and Industry, NAAMSA and NAACAM.

Notes: A. Local component purchases by vehicle producers based on dti survey data.
B. Local component purchases less all import content as % of all component purchases.
C. Local component purchases less all import content as % of vehicle revenue.
D. Average value of production less average forex (from OEM aggregate data).
E. Local content in exported passenger cars determined by Fob export value less forex.

Explaining changes in local content

Under the MIDP, protection of the component sector has been reduced. Local content requirements were abolished and duties have continued to decline, albeit gradually. Conventional trade theory would predict a decline in local content consequent upon tariff liberalisation. Apart from declining protection, there are a number of further considerations. One of the objectives of policy is to increase model volumes. These are now increasing and could be expected to have a positive impact on the level of local content. Changes in local content usually take place when new models are introduced and it would be important, therefore, to be able to measure whether new models have significantly lower levels of local content than the vehicles they are replacing. There has also been significant foreign investment by first tier suppliers and a further key question is the extent to which these firms are engaged in assembly of imported parts or draw on the domestic supply base of second tier firms.

Of major concern in the first few years following the introduction of the MIDP, was the tendency to introduce new models with low local content levels. Table 4.6 indicates both that there was considerable variation in local content levels of new models and that the local content level in some new models introduced was indeed very low, especially as the measurement of local content in this case includes assembly and profit margins apart from actual local content. On this measure, a local content level of under 40 percent is very low in terms of actual local components and translates into less than 25 percent of components fitted being locally sourced. These would comprise mainly peripheral components such as wheels, exhausts, certain trim components, body panels, batteries and glass. Domestic content in exported vehicles has declined from 50 percent in 1997 to less than 40 percent in 2005. Here the decline in recent years partly reflects compressed profit margins resulting from the stronger rand.

Given the fundamental objective of the MIDP, government has been anxious to see higher levels of local content. In the course of interviews conducted in 2002, assemblers voiced their concerns regarding the domestic components industry. They argued that in many cases it did not have the required technology to supply components for the advanced vehicles being exported. A particular problem related to the fact that insufficient investment had occurred to upgrade the technology in this sector.

Table 4.6: Local Content Level of New Models Introduced, 1995 - 1998

New model	Local content (%)
A	61
B	60
C	58
D	51
E	41
F	39
G	37
Average (new models - unweighted)	49.6
Weighted average for the industry	57.5

Source: Department of Trade and Industry, unpublished data.

Note: Local content measured by ex works price less foreign content, corresponding to definition D in Figure 4.9. Some caution should be exercised in the interpretation of the data. The data on new model local content levels are not weighted according to volume. Lower local content models would tend to be lower volume vehicles.

Achieving higher levels of local content is not easy, given the very large investments involved, even model volumes of 40,000-50,000 units per annum do not justify the investments required to raise local content much above a level of approximately 60 percent. [28] One solution would be for component firms, which supply domestic carmakers, to achieve minimum efficient scale by exporting, say, half of their output. The presence in South Africa of the three major German car firms, all with significant vehicle export activities, should be attractive to German component firms. Indeed, the German based carmakers have co-operated to attract investments by first tier suppliers. [29] To some extent they have been successful but

28 As explained above, the definition of local content is problematic. Here I am using the 'official' definition of wholesale value less forex (Measure D in Figure 4.9). This, therefore, includes local assembly. Under narrower definitions (excluding assembly) the local content value would clearly be significantly lower.

29 Interviews

real constraints remain. As an integral part of the global production capacity of the parent companies, South African based assemblers would normally be expected to use exactly the same supplier as the parent company, a practice known as lead sourcing. These suppliers may be different for VW, BMW and DaimlerChrysler. Increasing output by supplementing domestic production with exports in order to reduce unit costs is constrained by the fact that this might make inroads into the established capacity of existing foreign suppliers.

Part of the trend indicated above, reflects changes in the level of local content of components themselves. While there has been investment, mainly by foreign firms (or joint ventures) in high technology, first tier components to supply large volume vehicle projects, in many instances these firms operate as just-in-time sub-assemblers of imported components using technologically advanced assembly jigs and testing equipment. They are not, however, responsible for any materials conversion processes and as such cannot be considered true manufacturers. The advanced materials conversion (and the associated tooling and technology investment) takes place outside of South Africa and local content and local value adding, even on large-scale vehicle export projects, has remained low (Barnes and Black, 2003). The latter characteristic was clearly borne out in the course of interviews with vehicle producers conducted in 2002.[30] It is further supported by recent data drawn from the 70 firms which belong to the South African Automotive Benchmarking Club which show striking differences in the purchasing patterns of local and foreign owned component firms (Figure 4.10).

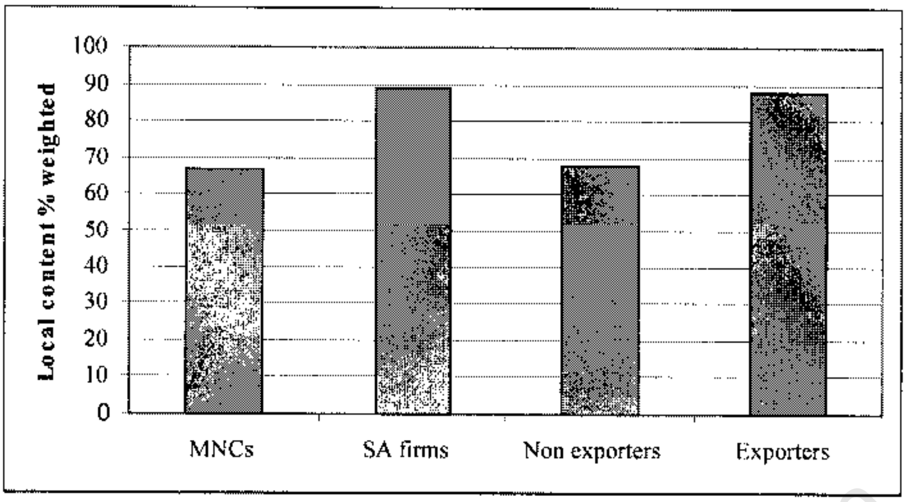
The reliance on foreign inputs partly reflects the assembly or 'system integrator' character of many foreign owned supplier operations and is in part a global trend.[31] This lack of local embeddedness may partly result from the limited time that foreign owned suppliers have been operating in South Africa.[32] But it also reflects the fact that vehicles are being produced in volumes of 50,000 units per annum or less which does not justify heavy investment in component production. This is further demonstrated by the fact that exporters tend to have higher levels of local content than suppliers to the domestic market. Exports are mainly of less complex components and tend to be in high volumes.

30 See Barnes and Black (2003)

31 See, for instance, Humphrey and Salerno (2000)

32 Among Japanese electronics multinationals, Belderbos et al.(2001) find that greenfield investments have lower local content than either joint ventures or acquired firms due to the latters' embeddedness in the local economy.

Figure 4.10: Local Content in Components Produced by Various Categories of Firms



Source: Derived from data supplied by B&M Analysts.

An interesting development noted by certain assemblers and also by a number of component producers, was that some suppliers had become reluctant to supply assemblers even where volumes were fairly large. This was seen to be because of demanding price and quality certification requirements on the one hand and the fact that some component suppliers had access to more lucrative opportunities in international markets, especially the less technologically demanding and price sensitive aftermarket. [33]

On balance, one can conclude that there has been only a slight reduction in local content since the introduction of the MIDP. However, local content levels had previously already declined during Phase VI and are low in absolute terms. The growth in model production volumes has certainly not led to any significant increase in local content but may have stabilised the situation under a regime of falling protection.

5.2 The Supply Response: Exports

The growth of automotive exports has been the most striking feature of the development of the automotive industry over the last decade and a half. Total automotive exports at the start of the Phase VI programme in 1989 were only R443 million but increased more than a hundred fold to R45.6 billion by 2005 (Figure 4.11). A number of factors have accounted for this. The most important has been the import-export complementation arrangements under Phase VI and the MIDP which have powerfully assisted exports.

A second factor has simply been that falling protection and limited domestic market growth, until recently, have forced firms into the export market. Thirdly, the rand was quite weak over

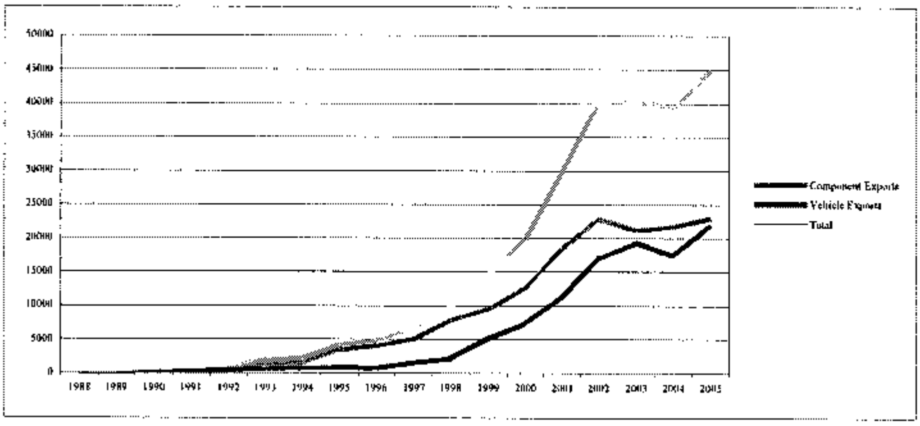
33 Interviews

much of this period. The stronger rand and buoyant domestic market of the last few years have contributed to the levelling off of export expansion since 2003. Fourthly, political change was also an essential factor for South African manufactured exports to gain widespread acceptance internationally and contributed to a sharp increase in manufactured exports during the 1990s (Black and Kahn, 2001).

It is clear that the incentive structure strongly favoured exports. But the very strong supply response to changes in the policy regime is also partly attributable to the nature of the automotive industry value chain. Both Phase VI and the MIDP created incentives for vehicle producers to expand exports. Because they controlled large global networks of assembly operations and linked supplier companies, they were able to rapidly facilitate exports either from their own South African operations or from South African based suppliers to their international operations. Access to cutting edge technology became important for suppliers. This frequently meant that it was essential for domestic firms to acquire a foreign technology partner in order to ease access to foreign markets. This was frequently facilitated by vehicle assemblers.

Given that sector specific policies have played such an important role, it is necessary to examine the process of export expansion to assess questions such as the contribution of exports to structural change, the extent to which economies of scale have reduced the cost base and the sustainability of export expansion. These are key measures by which the welfare impact of import-export complementation may be assessed (Black and Mitchell, 2002). As indicated above, the objective of the MIDP was not simply to expand exports but to facilitate a process by which both vehicle manufacturers and component suppliers were able to achieve economies of scale through a greater level of specialisation. This in turn required expansion into international markets.

Figure 4.11: Automotive Exports, 1988-2005 (R million)



Source: Derived from Department of Trade and Industry (various years), NAAMSA (various years)

These considerations have had a decisive effect on the strategic choices made by vehicle producers. The structure of the MIDP has been such that it has clearly been easier for assemblers to generate exports (of both components and vehicles) than to develop high local content in domestically assembled vehicles. In the early stages of the MIDP, the strategy adopted by vehicle manufacturers was to develop certain types of component exports. These `peripheral' components offered the opportunity of generating large export volumes with limited investment.

From the late 1990s, vehicle exports expanded rapidly. This required much greater investment by vehicle manufacturers and assisted in raising volumes which at least helped component suppliers to become competitive. Exports, initially of components, but later including vehicles were, therefore, the main strategic option adopted to minimise duty payments in the face of increasing imports.

5.2.1 Vehicle Exports

Vehicle exports have grown rapidly off a low base but as Figure 4.11 indicates, the growth in vehicle exports lagged component exports during Phase VI and the early stages of the MIDP. Given the growth in exports of 'peripheral' components in the early years of the MIDP and the relatively slow growth of vehicle exports until the late 1990s, policy makers were concerned that vehicle producers were using the trade complementation arrangements of the MIDP to pursue low volume' as opposed to 'rationalisation' strategies (Table 4.7).

The problem was that vehicle manufacturers initially adopted a strategy of generating import credits by exporting components especially products, which required only light investments. This allowed them to continue to introduce new, low volume models into the domestic market utilising imported components. Adopting this strategy offered an 'easy' route to achieve duty neutrality, certainly much easier than increasing local content in low volume, locally assembled vehicles. It also caused concern among established original equipment component suppliers to the domestic market who found assemblers adopting much more aggressive pricing strategies. But this strategy also left vehicle producers in a vulnerable position. By failing to increase vehicle volumes through exporting, unit production costs would remain high and vehicle manufacturers would become progressively less able to compete as tariff reductions continued.

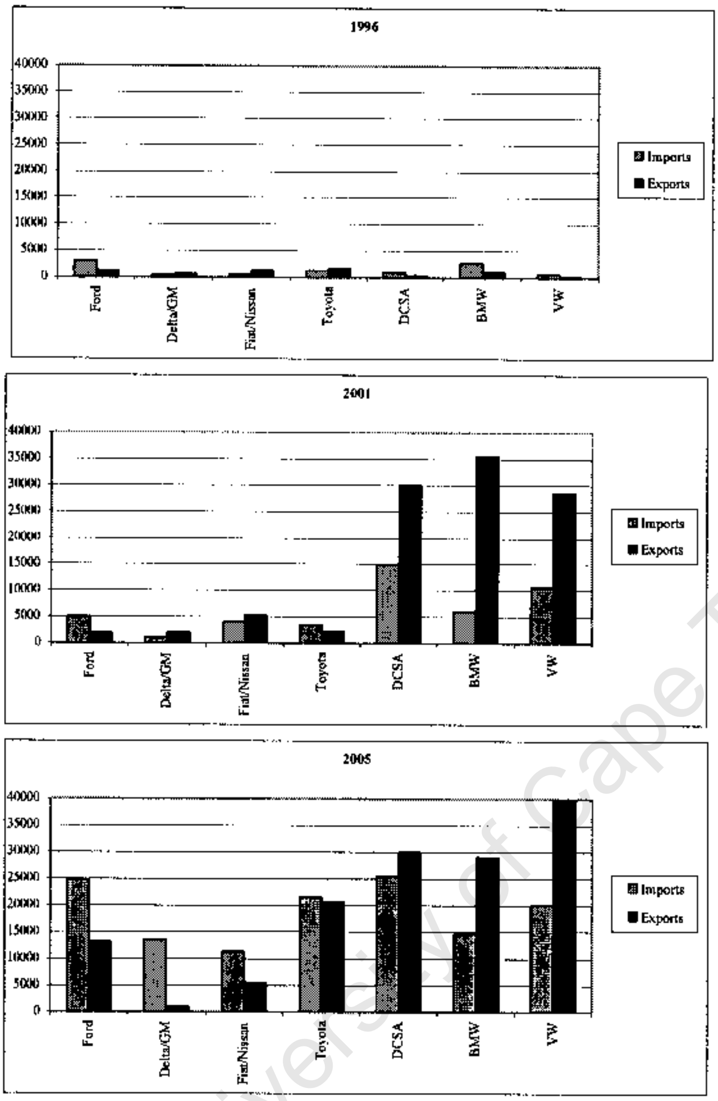
Table 4.7: Strategic Options Facing Vehicle Assemblers

	Low volume strategy	Rationalisation strategy
Strategic choice	Maintain a wide range of locally built models with low local content and offset duties on imported components with component exports.	Rationalise production to one or two models and achieve significant export volumes.
Implications	This option achieves little from the standpoint of industry restructuring. Assemblers do not reduce their cost base. Firstly, by maintaining a wide range of models, in-plant costs are not reduced and may even be increased. This is because model volumes may not rise and firms have to incur all the inefficiencies associated with low volume production. Secondly, component costs are reduced through importation but there is likely to be a shift to lower levels of local content because of the capacity to offset import duties. In the medium to longer term, a low volume strategy is likely to become unviable in an environment of lower import duties because of the failure to achieve economies of scale.	Enables firms to earn credits and thereby rebate duties on imports. This strategic response is in line with one of the key objectives of policy. By increasing model volumes, assemblers are able to reduce their in-plant unit costs associated with labour and tooling. Higher volumes make it economic to raise local content. The incentives to do this are quite strong. Firstly, it enables firms to reduce logistics costs. Secondly, by raising local content, they are able to reduce duties and also earn additional rebates on exported vehicles.

Source: Black (2001)

High volume vehicle exports are not just a function of competitiveness but depend on the global strategy of the parent company including its desire to optimise global production capacity in the context of the policy regime prevailing in each production location. The parent company needs to take the major strategic decision to allocate specific markets to the home country assembler and then follow this up with the required investments. Rising production efficiencies, pressure on local margins as well as clear government policy are necessary to force the hand of the parent company. The result is that exports increase in a non-incremental fashion, dependent on the award of long term contracts (Figure 4.12).

Figure 4.12: Numbers of Vehicles Imported and Exported by Firm, 1996-2005



Sources: Derived from NAAMSA data.

In 1996 no firm exported significant numbers of vehicles and neighbouring SADC countries accounted for the bulk of this small volume. However, since 1999 vehicle exports have grown rapidly with most vehicle manufacturers putting in place significant long-term vehicle export programmes. By 2001, three firms, all German based, had implemented significant vehicle export strategies. This enabled them to make a greater contribution to their respective groups by raising market share in South Africa.

During this phase, other carmakers, such as Ford and Nissan continued to pursue multi-model strategies (in many cases with low local content levels). They were able to do this by generating large scale exports of components which allowed them to offset component imports. This option was not sustainable in the medium to long term and by 2005, both Toyota and Ford had started to implement export programmes with the other assemblers announcing plans as well. High volume vehicle exports allowed vehicle manufacturers to import significant volumes of both vehicles and components duty free. Growing vehicle exports have also enabled assemblers to rapidly increase imports of vehicles relative to the share of independent importers.

Japanese based firms

Historically, Nissan and Toyota were domestically owned and operated under license agreements. During the protectionist phase this was not necessarily a disadvantage. Toyota for instance has been the dominant firm in the domestic market both in cars and passenger vehicles since the 1970s. However, in the early years following the introduction of the MIDP, the strategies of South African operations were constrained by the lack of direct ownership in the South African affiliates. While Toyota and Nissan received access to a wide range of other African markets, these were too small to significantly boost output.

Toyota remained in a relatively strong position given its large domestic market share in both cars and light commercials and its Durban plant continued to produce approximately 80,000 vehicles per year. However, the company found it difficult to generate sufficient export volumes of vehicles or components to offset its component import duties and has frequently been in the position of having to purchase import credits from independent component exporters. Both Nissan and Toyota steadily increased their stakes in the South African operations. These closer ties reflected a strategic response to greater competitive pressure in the South African market. As a result, Toyota South Africa became more firmly integrated into the parent company's global production network. [34] Exports began with the Corolla mainly to Australia and in 2005, Toyota began large scale exports of the Hilux pickup. In interviews conducted in 2002, it was claimed that this would have local content of 70 percent but this has not materialised. The South African plant is one of the hubs of this high volume product, production of which is being sourced completely from outside of Japan. This new project will raise production at the Prospecton plant to 200,000 units per annum and according to Tokuichi Uranishi, executive vice-president of Toyota Motor Corporation (TMC) "this programme marks... the full integration of the South African manufacturing facility into the TMC global supply network". [35] Toyota is clearly moving into the full manufacturing stage of vehicle production (see Table 4.5).

Nissan also faced the problem of limited access to export markets within the worldwide group. However, its share in the domestic market has always been smaller than that of Toyota,

[34] 'Toyota SA invests for global role' *(Automobil*, February, 2002).
[35] See 'Prospecton plant rolling them out' *(Business Day*, 4 August, 2005).

although its share in light commercials remains significant. It has exported small volumes of vehicles and CKD kits to African countries. For many years the plant also produced Fiat Uno vehicles and now undertakes contract assembly for Fiat although this arrangement has recently been terminated due to the Renault investment in Nissan Motor Company.

American based firms

Ford and General Motors established assembly plants in South Africa during the 1920s. During the 1980s both firms disinvested as a result of political pressures. They have now reinvested in South Africa and established closer links with the South African operations but were initially reluctant to source vehicles from South Africa on a significant scale. This was the result of having surplus capacity worldwide as well as already having assembly plants in all significant markets. [36] Ford Motor Company increased its stake to 100 percent in 2002 and immediately announced the possible introduction of a high volume vehicle export programme. [37] Delta initially was in a more difficult position regarding vehicle exports as General Motors did not have a significant stake in its local affiliate. Growing competitive pressures on Delta meant that an export contract became increasingly important and in 2004, GM acquired the 51 percent of Delta, which it did not already own and announced that it was seeking an export contract for built up vehicles. [38] In 2005, GM announced that it was investing $100 million in its two South African plants, mainly to produce the Hummer H3 for markets in the Middle East, Europe and Asia. [39] However, the Hummer is being assembled with low domestic content. Both Ford and GM export a wide range of components such as catalytic converters, leather seating and in the case of Ford, engines

German based firms

The German companies (BMW, VW and Daimler Chrysler) were the first to fully integrate the activities of their subsidiaries into the activities of the parent company. [40] One factor was that the German firms never disinvested from South Africa. The vehicle export strategies of these firms were assisted by the fact that none of them had a wide global distribution of plants. The South African plants, therefore, benefited from the globalisation of German

36 Presentation, Martin Zimmerman, Executive director, Government Relations and Corporate Economics, Ford Motor Company, 1999.

37 See 'High volume export deal is the subject of Ford SA talks' *(Business Report,* 5 July 2002), 'Ford's much-anticipated export programme takes off' *(Automobil,* June, 2003).

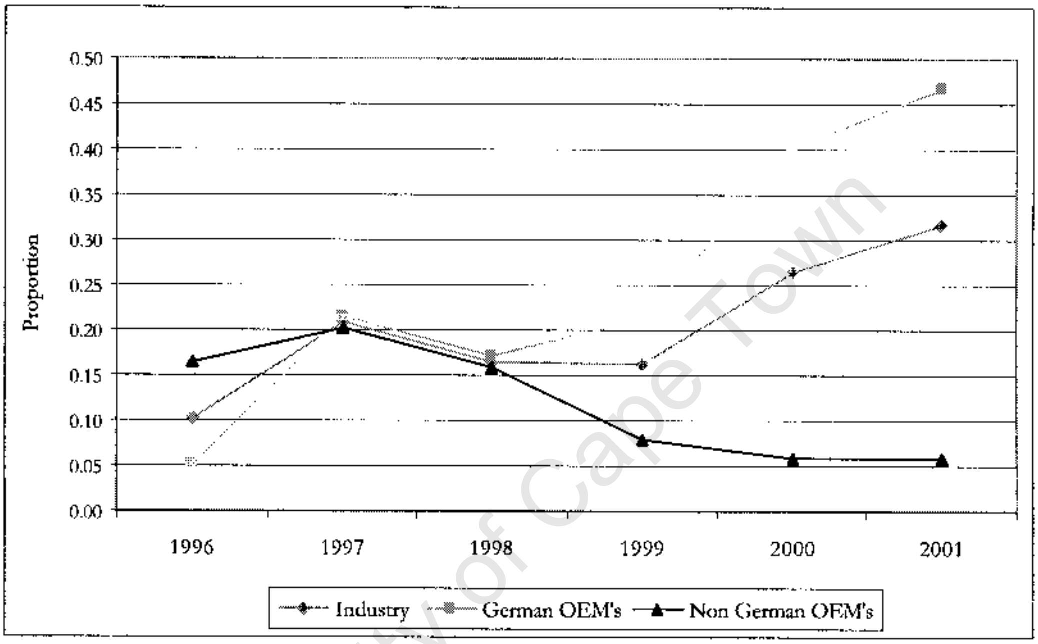
38 'General Motors in talks with Mbeki, Erwin on plan for SA export drive' *(Business Report,* 27 January, 2004).

39 See 'Investment Humdinger: General Motors Hummer is the latest to seek out the benefits of the MIDP' *(Mail and Guardian Business,* 13-19 October, 2006)

40 See Barnes and Morris (2004) for a perspective on the key role of German carmakers in the South African automotive industry.

vehicle manufacturers looking to expand capacity, increase their share of output outside of high cost Germany as well as retain their strategic foothold in the southern African market. This required greater production efficiencies and export capability requiring in turn larger investments and a degree of rationalisation of the product line. By 2001, the German firms were generating nearly 50 percent of their IRCCs from vehicle exports, which also enabled them to rapidly increase vehicle imports (Figure 4.13). [41]

Figure 4.13: Proportion of IRCCs Generated via CBU Exports, 1996-2001



Source: Naumann, 2002

BMW was the first South African assembler to articulate and develop an export strategy. Having dropped production of the 5 and 7 Series vehicles, it produces only the 3 Series in South Africa. Assembly costs are lower than in Germany as a result of lower wages but the company pays a premium for logistics costs given its continuing high import requirements. [42] While local content is being increased, further localisation is complicated by the fact that main 3 Series production continues in Germany supplied by German component plants. Domestic production was close to 50,000 units in 2001 but declined to 43,356 units in 2005 with 67 percent of output being exported to markets such as the UK, US, Australia and Japan. Even though this represents a more than doubling of production volumes over those achieved in 1996, it is still not sufficient to justify very high levels of localisation. However, a number of suppliers have located near the Rosslyn plant. These include Lear Corporation, Faurecia

41 Barnes and Morris (2004) discuss the growing importance of the German carmakers during this period.

42 Interviews.

Interior Systems and ZF subsidiary, Lemforder, which assembles the axle system making use of both imported and local subcomponents.[43]

In the early 1990s, South Africa was not seen as having many advantages as a site for new investment according to the parent company, Volkswagen AG. Mexico was seen as the most cost efficient production site followed by the Czech Republic and Portugal.[44] According to senior management, even assuming that a political settlement was reached, remaining problems included the uncertain policy regime, the high cost of raw materials, the small market in relation to the number of producers, low labour productivity and the high cost of local components. While the South African components industry was regarded as generally uncompetitive, there were some notable exceptions and it was felt that new world class projects could compete effectively. The main potential strengths were seen to be in labour intensive components or where there was high raw material content.

But following political transition and the introduction of the MIDP, the view of the parent company changed. Volkswagen (South Africa) became a major exporter of vehicles having received a large contract to export Golf 4 vehicles to Europe. The South African subsidiary benefited from a temporary shortage of capacity in the global group and this contract gave it the opportunity to rationalise the number of models being locally produced and to prove its capabilities to the parent company. The key to this strategy was the successful localisation of key component capability. Ironically, although the Golf 4 was being produced in volumes exceeding 40,000 units per annum, it initially had extremely low levels of domestic content partly because it was introduced very quickly and also because of exacting technology requirements.[45] VW began exporting the new Golf 5 in 2004 but it was also introduced with relatively low levels of local content.

DaimlerChrysler has extensively modernised and expanded its previously small and outdated East London facility[46] and is exporting C Class Mercedes vehicles mainly to the UK, Australia and smaller markets in Asia. C Class production in 2005 amounted to 42,149 units but the company has found it difficult to secure a more important role in the DaimlerChrysler network, which would enable the achievement of world scale volumes and higher local content.[47]

43 There has also been significant expansion in certain component suppliers. See for example 'August Laepple invests R100m in new press line', *Business Report,* 6 November, 2000.

44 Interview with PJ Weber, Executive Director of Subsidiary Companies and Projects, Volkswagen AG, 1992.

45 Interviews.

46 See 'Daimler Chrysler to invest R900m in SA' *Business Day* (27 November 1998).

47 `SA vies for a bigger slice of DaimlerChrysler pie' *Business Day* (26 May, 2003).

Constraints on competitiveness

The boom in vehicle exports has been driven by the MIDP. Firms do not perceive South Africa as an export platform. Nevertheless, costs are low in some respects and the weak currency up to 2002, low labour and management costs together with cheap land and electricity are important competitive advantages. In 2002, actual assembly costs for local operations such as BMW and DaimlerChrysler were well below in-plant costs in their respective German plants.[48] Where these South African operations incur significant cost disadvantages is in the area of inbound and outbound logistics. This is a function of high transport costs and long distances to foreign markets as well as high levels of imported content. Higher volumes in the region of 100,000 units per annum would facilitate higher local content and the resulting reduction in logistics costs would enable South African plants to compete without any support. But, aside from the fact that they have capacity elsewhere, the major vehicle companies are reluctant to source, say, 100,000 vehicles from South Africa when the local market only accounts for 15,000 units.[49] Assemblers argued that in such an environment, it was risky to allocate substantial export volumes to the domestic operation. International sister plants who could offer their parent companies substantial volume in both the domestic and international markets were thus in a stronger strategic position. In this sense, South Africa competes with other emerging market locations. German firms have invested heavily in central Europe, Japanese firms such as Toyota have huge interests in Europe and the US and among emerging markets have concentrated investment in south east Asia, particularly Thailand. And, of course, car firms from all countries are investing heavily in China. Sustained domestic market growth will increase the demand for imports of both vehicles and components and hence the requirement to generate increased exports to offset import duties.

A number of additional constraints on exports were highlighted by vehicle producers. Concerns were expressed regarding the export of vehicles to the European Union in the longer term because of transport and associated logistics costs. Whilst the existing value of export credits more than compensated for these costs, it was noted by assemblers that the high logistics costs incurred could threaten export programmes due the planned reduction in export complementation values over the next few years.[50] Finally, the availability of capacity in the European Union was noted as a constraining factor, with this likely to be compounded by the recent expansion in low cost capacity in central Europe.

48 Interviews

49 Interviews

50 Interviews, 2002

The destination of South African vehicle exports further illustrates the problem imposed by geographical location (Table 4.8). The regional market is of only minor importance. Exports to SADC have not grown in real terms and amounted to only R890 million in 2005, just 4.2 percent of total vehicle exports. Apart from the small size of these economies, cheap imported used vehicles have undermined their markets for new cars. South Africa's major markets, Japan, Australia and the UK are located at very large distances, although as Holweg and Pil (2004) point out, South Africa has an advantage for German firms wanting to target Japanese and Australian markets. The volatility in sales to major markets illustrates the risk facing the small South African operations. While these exports are significant for South African producers, they are of little importance to the global firms which allocate markets according to their own strategic imperatives. South African firms are essentially 'swing' producers into a wide range of markets depending on fluctuations in global demand. They occupy a peripheral position in the global networks. For example, no South African assembler has yet been allocated sole global responsibility for a single model.

Table 4.8: Major Destinations of Light Vehicle Exports by Value, 1995-2005

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total value (R bn)	0.8	0.7	1.4	1.8	4.8	7.0	10.8	16.3	18.4	17.0	21.4
Country						Percent					
Japan	-	-	-	-	-	11	13	18	35	32	35
Australia	4	11	19	15	10	12	10	11	15	19	24
UK	1	3	2	15	13	9	18	17	16	24	20
USA	-	-	-	-	-	7	18	23	20	14	4
Singapore		-	-	-	1	2	3	1	1	1	2
Spain	-	-	-	-	-	-	-	-	-	-	2
Hong Kong, China	40	-	-	-	-	1	2	2	1	1	2
Belgium	-	-	-	-	-	-	-	-	-	-	2
New Zealand		-	-	-	-	-	1	1	1	1	1
Taiwan	-	-	5	4	3	4	2	1	1	1	1
Germany	-	-	5	25	57	37	19	12	3	1	1
Zimbabwe	27	36	18	8	2	1	3	4	2	1	1
Mozambique	8	9	9	7	4	4	2	2	1	1	1
Zambia	6	7	6	6	2	3	2	2	1	1	1
Malawi	5	9	7	4	2	3	1	1	1	1	-
Kenya	3	9	5	3	-	-	-	-	-	-	-
Other	6	15	23	12	6	6	6	5	2	2	3
EU	-	4	7	41	70	53	38	30	20	25	24
SADC	44	64	46	27	11	12	9	10	6	5	4

Sources: Department of Trade and Industry, various years; NAAMSA Annual Reports (2005, 2006); Automotive Industry Export Council (2007).

In terms of the development stages set out in Table 4.5, the three German based firms are well advanced in the transition stage but have become 'stuck' at this point. Moving to the full manufacturing stage is essential if they are to reduce costs further by increasing local content. However, this would in turn require a larger export allocation by the parent company, which is difficult to justify given that South African costs are fairly high compared to emerging locations in central Europe and Asia.

Toyota, which was initially slow to develop exports, is now the most advanced and is close to entering the full manufacturing category on the basis of total production volumes exceeding 200,000 units with relatively high levels of local content. Ford, Nissan and General Motors are best categorised at being in the early stages of a transition strategy.

5.2.2 Component Exports

As indicated in Figure 4.11, component exports have expanded dramatically. From a low base in 1989 when Phase VI was introduced, component exports had increased more than a hundred fold in nominal terms by 2005. The breakdown in component exports is shown in Table 4.9.

A key objective of the import-export complementation scheme is to assist component suppliers to generate high volumes which would make them more efficient, and able to compete in the domestic market against imports. A linked objective is that reduced production costs would have the added benefit of providing lower cost inputs into the assembly industry. The objective of higher component volumes has certainly been achieved at least in the sense that export development has usually been accompanied by higher volumes and specialisation. For instance, on its return to South Africa through the purchase of a controlling stake in the Consol subsidiary, Contred, Goodyear announced that it would rationalise its product list from 260 types of tyre to 40. [51]

However, the nature of export expansion has raised a number of concerns. Firstly, there is the issue of the implications for the overall integration of the industry particularly given the profile of products, which are being exported. Secondly, there is the question of the sustainability of the rapid export expansion that has taken place and, thirdly, the rapid increase in duty free importation, which has potential dangers for the component sector. These actual and potential difficulties are discussed below.

The profile of component exports and implications for industry integration

While export expansion has taken place across a wide range of components, a striking feature is the large share of total exports taken up by a few component categories especially catalytic converters and automotive leather (Table 4.9). These components and also some other major component exports such as wheels and tyres could be described as 'peripheral' in the sense of being relatively minor components, which have high raw material content and are not particularly complex in terms of incorporating large numbers of sub-components. [52]

51 'Consol seals Goodyear's return to SA' *Business Day* (19 November 1996).

52 The visiting chief executive of a major carmaker referred disparagingly to them as "salami".

Table 4.9: Exports of Components, 1995-2005 (R million)

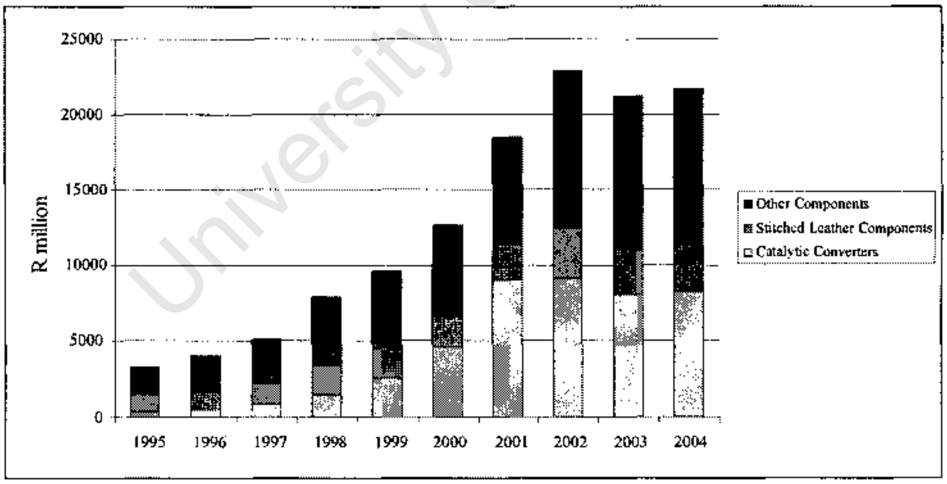
	1995	1996	1997	1998	1999	% of 1999 total	2000	2001	2002	2003	2004	2005	% of 2005 total
Catalytic converters	388	485	835	1520	2 569	26.6	4683	8989	9204	8104	8289	9935	43.2
Stitched leather covers	1019	1259	1408	1854	1 888	19.5	1926	2391	3184	2899	3113	2693	11.7
Tyres	219	296	342	498	639	6.6	682	781	1379	1278	1285	1183	5.1
Engine parts	112	137	285	390	383	4.0	409	520	771	843	894	1000	4.3
Engines	9	86	192	233	53	0.5	76	88	623	564	701	781	3.4
Road wheels/parts	175	227	325	446	518	5.4	551	725	955	809	753	738	3.2
Transmission shafts, cranks	29	38	7	62	85	0.9	127	149	236	263	332	553	2.4
Silencers/exhaust pipes	76	170	151	493	598	6.2	377	282	340	327	407	492	2.1
Automotive glass	49	71	105	112	147	1.5	171	241	328	307	311	359	1.6
Automotive tooling	259	279	309	256	264	2.7	362	441	363	529	383	332	1.4
Car radios	7	4	29	47	73	0.7	89	115	171	332	257	268	1.2
Wiring harnesses	41	92	136	207	304	3.1	319	391	457	427	359	258	1.1
Radiators	77	107	93	108	111	1.1	72	70	199	191	162	220	1.0
Axles	3	3	7	26	34	0.4	63	81	129	119	140	201	0.9
Ignition/starting equipment	4	16	30	47	94	1.0	128	195	231	270	230	185	0.8
Filters	13	42	55	72	85	0.9	118	114	184	142	164	174	0.8
Gauges/instruments/parts	18	28	29	30	59	0.6	64	77	119	128	142	161	0.7
Brake parts	23	29	39	76	79	0.8	95	118	215	198	146	120	0.5
Other components	797	682	738	1418	1691	17.4	2328	2818	3795	3539	3665	3347	14.6
TOTAL	3318	4051	5115	7895	9674	100	12640	18586	22883	21269	21733	23000	100.0

Sources: dti/TISA (various years), NAAMSA (various years)

Catalytic converters exports alone amounted to R9.9 billion or 43.2 percent of total component exports in 2005. The industry supplying leather seat covers amounted to 19.5 percent of total component exports in 1999 but this declined to 11.7 percent in 2005 (Figure 4. 14). Catalytic converters have only recently become a legal requirement on South African roads but since the mid 1990s have been the product of choice, together with automotive leather, for carmakers wanting to generate import credits. From the perspective of multinational carmakers wanting to rapidly generate exports, catalytic converters have a number of advantages. Global demand for catalytic converters was expanding rapidly due to environmental legislation and due to their platinum content, catalytic converters are high value products. South Africa supplies the bulk of BMW's global automotive leather requirements and is an important supplier to a number of other foreign vehicle manufacturers. Interestingly, at the time of the Mid Term Review in 1997-98, automotive leather was regarded as the sector which was dominating component exports enabling assemblers to rebate duties on high volumes of imports, but exports in this category have been constrained partly due to a shortage of local leather. [53]

The bulk of export expansion has, therefore, not been by 'traditional' component suppliers but by a rapidly emerging new group of mainly foreign owned firms frequently with links to vehicle manufacturers. [54] Relatively light investments with a low level of integration into the domestic industry, either in terms of supply to domestic vehicles or in terms of the use of sub-components, have been one outcome. Because exports account for the vast share of output in most of these cases, domestic consumers (either assemblers, first tier suppliers or the aftermarket) do not receive the benefit of reduced costs due to economies of scale. This is one of the criteria affecting the welfare outcome of the import-export complementation policy (Black and Mitchell, 2002). It could be argued, therefore, that local assemblers in conjunction with their multinational parents have developed large component export businesses, which do not contribute much towards the more integrated development of the automotive industry. Thus, if multinational vehicle manufacturers select the strategy of developing large scale exports of 'peripheral' components (the `low volume strategy' in Table 4.5) instead of reducing their cost base by expanding vehicle exports and localising major components, their viability would be threatened in the long run.

Figure 4.14: Exports of Catalytic Converters, Automotive Leather and Other Components, 1995-2004



Source: Compiled from Department of Trade and Industry data.

However, the argument that the profile of component exports is dominated by two categories needs to be qualified. Firstly, if the growing volume of vehicle exports is included in the

53 Footwear producers have complained about the impact on leather supply resulting from the MIDP. See Ballard (2001).

54 Similar trends have been observed in other countries experiencing rapid international integration and export expansion such as Brazil (Posthuma, 1995) and Argentina (Miozzo, 2000).

export profile, the picture looks very different. Vehicle exports averaged only 18.3 percent of total exports for the years 1995-96 but increased to 46.9 percent of the total for the years 2004-5. Vehicles are high value added products and include a wide range of locally produced components.

Secondly, while a substantial shift in the profile of exports has taken place over the last few years and the proportion of total exports accounted for by a small number of products has increased, it is not clear that this has all been in the direction of low value added components. Most notable among the growth of high value added, complex components is the expansion of engine exports by Ford and more recently VW. By 2005, engines and engine parts accounted for 7.7 percent of component exports and are increasing in importance. The production of engines is highly capital and scale intensive. Minimum efficient scale for an engine plant is in excess of 200,000 units per annum for a single basic make of engine. This illustrates the problem encountered in raising local content in South Africa where the highest model volume is approximately 50,000 units. It also illustrates the advantage of specialisation. The Ford engine which is being exported in volumes of over 200,000 per annum with a local content level of over 80 percent has attracted new investment in a range of local and foreign suppliers.[55] These firms together with the engine plant itself produce the bulk of component requirements including engine blocks, cylinder heads, con-rods, flywheels, exhaust manifolds, valves, rocker covers, fuel charge assemblies and coolant flow control modules.[56] VW started large scale engine exports in 2004. Volumes and local content are not as high as in the case of Ford but suppliers include a number of Eastern Cape based firms such as Alucast, Luk Africa, Sentech, First Pro and Zealous.[57]

Sustainability

A second key question concerns the sustainability of the large fixed investments and export volumes that have been established. Firms are quick to argue that they will pack up and leave if benefits are seriously reduced. Even though the catalytic converter industry is capital intensive, this is in part due to high working capital requirements as a result of the high value of platinum group metals (PGMs) which are integral to the production process. Early investments in the sector gave the impression of being somewhat footloose. Only limited

55 These include AE Goetze, Visteon, Murray and Roberts Foundries, Atlantis Forge, Kolbenco, Bell Essex and Smiths Industries. See 'AE Goetze pistons for Escort Motor' *(Automobil,* April 1997); 'Ford's engine plant revs up to generate forex of RI .5bn' *(Business Report,* 19 July, 2002).

56 See for instance Ford gives a RI bn deal to Murray and Roberts, *(Business Report,* 6 September 2000); Visteon pours R116m into Port Elizabeth motor components factory' *(Business Report,* 8 March, 2002); 'Ford's RI bn engine investment powers jobs' *(Business Report,* 23 April, 2002).

57 See 'Volkswagen wins R12bn export deal' *(Business Report,* 31 March, 2004).

segments of the total production process were carried out in South Africa. Initial investment involved the establishment of plants, which undertook the coating and canning of the imported ceramic substrate. Coaters established in South Africa include Engelhard and Johnson Mathey. Canners include Arvin, Bosal, Magnetti Marelli and Tenneco. The pace of expansion increased following the signing of a number of very large contracts in 1999 and 2000[58] and by 2005 South Africa was producing approximately 14 percent of total world supply. The industry has reached sufficient critical mass to justify backward integration beyond the relatively simple coating and canning processes. For instance, the two world leaders in ceramic substrates, Corning and NGK Insulators, have established plants in South Africa that undertake the cutting and baking of the substrate.[59] However, they have not made the very large investments required for substrate production. In addition, there has been investment in ancillary industries such as flex connections, matt manufacture and manifold, exhaust system and silencer assemblies.

Automotive leather is a very labour intensive process and shares some of the attributes of the notoriously footloose garment industry. However, in this sector too, the value chain has become increasingly embedded with the development of world class capabilities ranging from tanning of high quality leathers to JIT logistics.

Sustainability under a regime of falling assistance, is a function of cost factors such as labour, materials and logistics but also depends on more dynamic attributes such as scale of production (in relation to minimum efficient scale) and the rate of productivity improvement over time. Also important are levels of sunk investments including not just fixed capital but a trained labour force and other infrastructure specific to the enterprise as well as the level of local integration in terms of a local supply network and market. All these factors can contribute to the value chain becoming more deeply embedded in the particular location.

The apparently exceptionally rapid export growth in certain components has, in fact, not been all that unusual. Comparing dollar levels of exports into the EU from South Africa and a range of countries on the EU periphery, it is evident that growth rates from countries such as Hungary, Poland and Turkey in major component export categories such as leather, road wheels, tyres, exhausts and wiring harnesses have significantly exceeded the growth rate from South Africa. Catalytic converters are the one exception (Barnes, 2002).

58 A number of large contracts were announced in 1999-2000. See for instance "Bosal signs R810m converter deal" *(Business Times,* 8 August 1999), "Delta, Tenneco clean up with R2.3bn catalytic converter deal" *(Business Report,* 13 September 2000), "Renault seals RI I billion export deal for catalytic converters" *(Business Report,* 28 November 2000).

59 For further detail on the NGK investment see Chapter Six.

Displacement of existing component suppliers and employment

Burgeoning component exports have enabled assemblers to offset duties on component imports leading to much greater competition for domestic suppliers. This is the reason that some of the new growth industries have been much criticised by the component producer's federation, NAACAM. The vocal opposition by the NAACAM executive to this development led to catalytic converter producers forming their own industry grouping, the Catalytic Converter Interest Group (CCIG). They also worked closely with NAAMSA, most of whose members had played a direct role in expanding the sector. More recently, complaints from the 'traditional' component industry have grown softer as vehicle exports have created new, high volume opportunities for suppliers.

Another concern expressed concerned the capital intensity of certain export sectors. For instance, the catalytic converter industry is highly capital intensive with relatively few jobs created for the huge values of exports being generated. But other major component exports such as automotive leather and wiring harnesses are, in fact, very labour intensive and this was a factor in encouraging the location of these sub-sectors in South Africa.

5.3 Welfare Analysis: Exports, Import Credits and Economies of Scale in Components

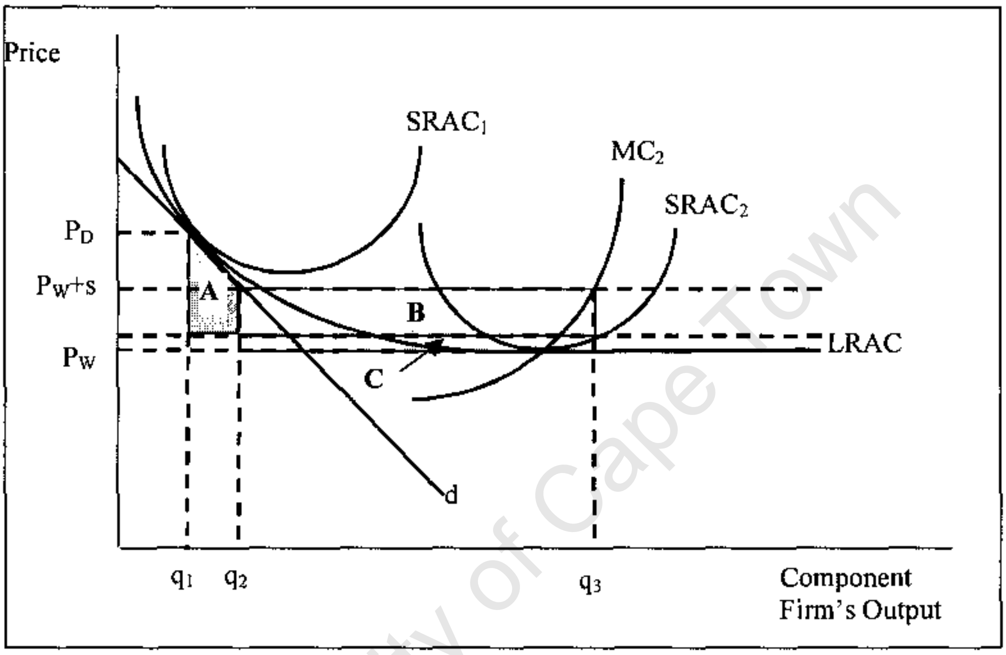
The importance of the profile of exports can be demonstrated using conventional welfare analysis.[60] Figure 4.15 shows the situation of a component manufacturing firm for which exporting is an economic activity, albeit unexplored in the absence of import credits. The firm faces economies of scale followed by constant returns to scale over the relevant range of output. The world price of similar components (P_w) is assumed in this case to be equal to this firm's lowest LRAC. The curve d represents domestic demand for this component by domestic assembly firms. Prior to the import credit policy, this firm used plant size 1 with $SRAC_1$ to produce q_1 units that it sold domestically at **PD.**

The availability of import credits under the MIDP induced it to export. It scaled up its operations to plant size 2 with $SRAC_2$. It sells its exports at the world price. Each unit exported also generates an import credit with a positive market value. For the time being, assume that the component firms can sell credits for their full value, s. Then the firm faces a perfectly elastic demand for its output at price P_w+s and produces q_3. The quantity demanded domestically is q_2 and q3 - q2 is exported. Higher volumes generated from exporting allow

60 This section is based on Black and Mitchell (2002)

firms to better take advantage of scale economies, and the welfare benefits of this effect can be seen by trapezoid A. The upper triangle of A represents additional consumer surplus (to domestic car assemblers) arising from increased consumption at lower prices and the lower rectangle represents rents accruing to the component producer owing to cost savings. A thus represents the benefits of economies of scale to domestic assemblers and the component producer.

Figure 4.15: Export Complementation in the Case when Exports are Economic



Source: Black and Mitchell (2002).

Rectangle B shows rents earned by the component producers stemming from their ability to extract rents from the downstream motor vehicle assemblers. This is ultimately borne by South African consumers. Note that these components are being exported at price P_w, which is less than the average cost of production. This loss is shown by rectangle C. The firm is willing to accept this loss because it can sell its export credits for B + C. But while B is a transfer from carmakers to component makers, C is a deadweight loss to the economy. To see net welfare gains or losses we must compare the efficiency gains of A against the deadweight loss C. While these appear to roughly balance as drawn in Figure 4.15 this is merely a coincidence, and in practice there might be large net welfare gains or losses.

The analysis so far has assumed that components firms are able to extract the highest possible price from assemblers. In reality component producers do not receive the full 'price' for their credits, in part this reflects the bargaining power of multinational assemblers, who are likely to be key customers. There are also instances where 'payment' may take the form of facilitating access into the international networks of the domestic assembler's parent company.

How does bargaining power affect the welfare analysis? Suppose, for the sake of example, that the components firms are only able to negotiate a price for their components that extracts half of the downstream firms' cost savings. Figure 4.15 shows that the changes are more than simply distributional. First, the implicit subsidy per unit produced, s, will be lower, and the domestic price of components will fall. This will increase the welfare gains to consumers of components (who are vehicle manufacturers), A, and reduce the deadweight losses, C, making it more likely that there will be net welfare benefits from the export credit programme.

The analysis began with the notion that this is an example of "economic" exports, but indicates that these exports are occurring below average cost. This discrepancy can be reconciled by noting that once the policy has introduced components producers to foreign markets, then the export credit policy could be discontinued. Firms would then face a perfectly elastic demand for their output at P_w and they could continue to export at that price since it covers their average costs. The welfare benefits of increasing the scale of production (shown as A) would continue and be larger whereas the welfare losses (shown as C) would disappear.[61] This is in accordance with the objective of the programme — to give experience in exporting and to increase the scale of operations.

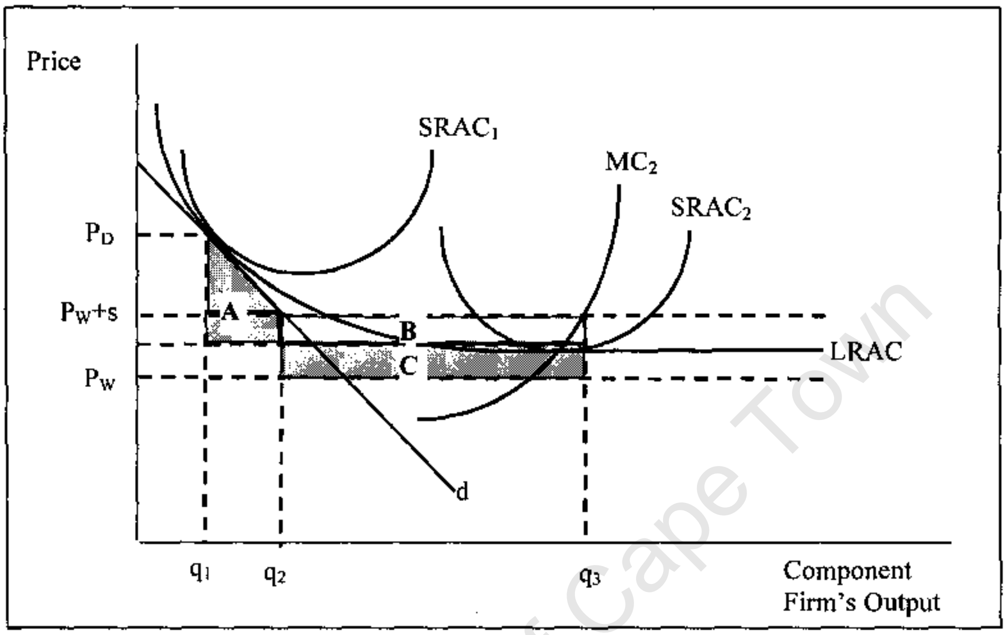
As mentioned above, many of the components exports initiated under the MIDP consist of new firms that produce entirely for the export market. For this type of exporter, there is no domestic demand curve and, therefore, there are none of the gains of A. In this instance, then, the export credit results in exports below average cost, causing welfare loss C, which comes at the expense of South African vehicle consumers and taxpayers. When there are no domestic consumers of the components it is especially important that export complementation be used to initiate economic exports but be discontinued without delay, since these exports are made at a net welfare loss.

This raises the issue of uneconomic exports, shown in Figure 4.16. The key difference between this case and the previous one is that the world price of components is shown to be below the lowest achievable average cost for South African components. No matter how much output might expand, South African firms would not be competitive. Area A again represents gains achieved by expanding output, B continues to represent rents captured by

61 The area of A would be larger. With firms facing a lower marginal revenue curve they would cut back production to the point where MC crosses LRAC. The firm will price at marginal cost (equal to LRAC). Domestic consumers thus move down their demand curve to Pw, and A will be a triangle lying under the demand curve between PD and Pw.

components producers and C is still the welfare cost of exporting below the opportunity cost of production. The net welfare impact still depends on the relative size of the gains of A as compared to the losses of C. However, in this case the exports are driven entirely by the export credit policy. Exports would cease if the credits ended.

Figure 4.16: Export Complementation in the Case when Exports are Uneconomic



Source: Black and Mitchell (2002.

A key question, then, is whether higher volumes will enable exporters to reduce average costs at least as low as the world price, although it is important to note that welfare gains can be realised even when short run average costs are above world prices provided domestic assemblers receive reduced prices for domestic components (as when A > C in Figure 4.16). As explained above, export expansion under Phase VI and the MIDP has been very rapid but the bulk of the export expansion has not been by 'traditional suppliers', who developed under the earlier local content programmes, but by a rapidly emerging new group of mainly foreign owned firms. In the case of the major component exports such as catalytic converters and automotive leather, the domestic market is negligible thus nullifying the gains in consumer surplus evident in Figure 4.15 and Figure 4.16.

Protection clearly imposed important costs directly on consumers but in a scale intensive sector such as the automotive industry these costs can be greatly compounded by the emergence of a low volume, high cost industrial structure, which has frequently characterised the protected automotive industry in developing economies. The introduction of Phase VI and later the MIDP led to a radical realignment of the incentive structure. Apart from the tariff reductions that have taken place, allowing exports to offset import duties has led to a much more export oriented industry.

While the expansion of exports has been dramatic, the welfare implications of this are less clear. This analysis shows that under certain assumptions, the cost reductions resulting from higher volume production can be welfare enhancing even where costs remain above world prices. But outcomes depend crucially on the extent to which exports are economic or become economic over time. There are a number of key considerations here. Firstly, the extent to which exports lead to greater economies of scale and hence lower costs are an important factor. A second determinant is the extent to which learning effects and the development of ancillary industries, or what could be termed agglomeration effects, reduce costs over time. Thirdly, the expansion of exports of assembled products (most obviously vehicles but also complex components such as engines) creates high volume demand for sub-components, which may then be produced competitively by domestic suppliers. So, to the extent to which this occurs, export assistance may carry positive externality effects. More intangibly, the MIDP has encouraged international firms to incorporate South African subsidiaries and licensees into the global networks that determine the vast majority of trade flows in this sector.

6. INVESTMENT

The supply response to the realignment of domestic and international prices is the key variable, which determines the impact of liberalisation and this in turn hinges on investments made by firms. Historically, in South Africa, protection led to the expansion of production capacity in vehicles and a wide range of components. However, this was initially aimed at low volume production capability, ill suited to high volumes and efficiencies necessary for international competitiveness. In the assembly industry, for example, much of the investment was in model specific tooling for bringing new products to the market and the industry was characterised by limited automation and low productivity.

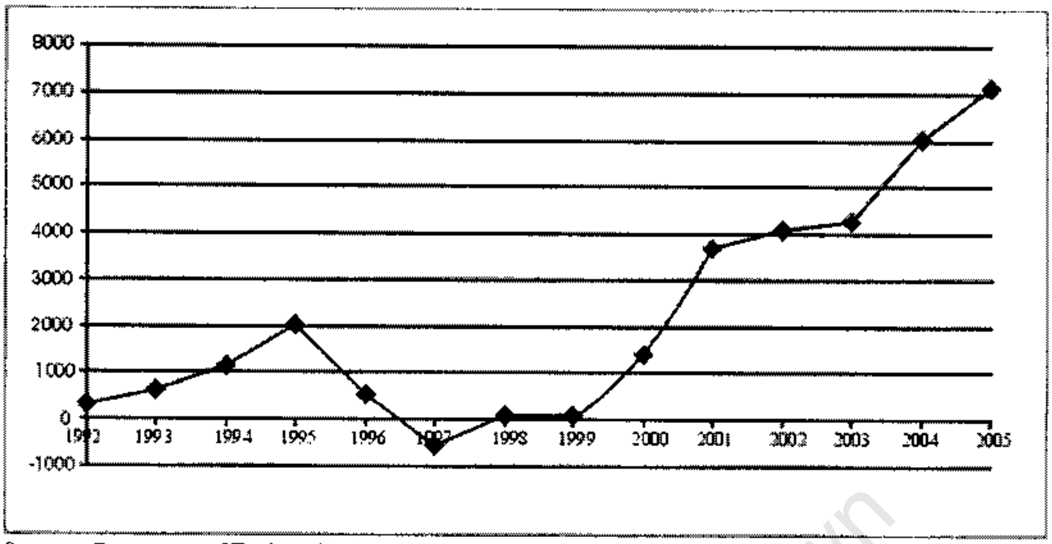
When imports are liberalised, it is possible that profit margins will fall in the short term and this could impact negatively on both the motivation and capacity to invest in the industry. While profits are declining in a more competitive market, there is clearly the risk of investment being reduced and gradual attrition taking place leading eventually to plant closure. However, the investment behaviour of the assemblers has been influenced by a number of industry specific factors. The importance of economies of scale means that the increased competitive temperature places some pressure on firms to increase production as a way of reducing unit costs. This in turn may require that the parent company creates export opportunities for the South African subsidiary and invests accordingly. Investments have to be enlarged or firms face the prospect of losing market position and eventually becoming unviable. Thus the situation that faced the local assemblers and their parent companies in the mid to late 1990s was akin to a game of poker - to stay in the game the stakes had to be increased.[62] Given that the key investment decisions are made outside South Africa by the global parent, short term profitability in a minor South African subsidiary has been a lesser consideration than medium term market prospects and strategic concerns related to market share and the requirements of global production networks.

But the concern here is not just with the aggregate level of investment but with the types of investments being made. For instance, given the problem of low volume output the scale of investments, particularly in assembly, is a key criterion. Given the importance of developing an integrated domestic supply chain to reduce logistics costs, the type of component investments are also important. Section five emphasised the rapid expansion in exports of `peripheral' components such as catalytic converters and automotive leather. Another feature has been the growth of first or '0.5 tier' component investments, which involve assembly rather than manufacture. Scale is important here, as well, if second tier components are to be locally sourced.

Net profits before tax of the seven light vehicle manufacturers increased off a low base from R328 million in 1992 to a then record level of 82,032 million in 1995 on the back of booming sales (Department of Trade and Industry, 2000). Profits then dipped precipitously and the industry incurred an aggregate loss in 1997 as the entry of imported vehicles in significant volumes led to much greater price competition and lower margins which added to the pressures of stagnating sales. This was followed by a rapid recovery over the period 2000-2005 (Figure 4.17). Since 2003, the recovery of the rand and booming domestic sales have enabled domestic assemblers to benefit from high capacity utilisation and lower rand prices on imported components and vehicles. In 2005, capacity utilisation in the production of cars (79.7 percent), light commercials (79.9 percent), medium commercials (84.4 percent) and heavy commercials (95.9 percent) was at its highest level since the introduction of the MIDP in 1995 (NAAMSA, 2006: 15).

[62] At the time of TMC's purchase of a 27.8 percent stake in Toyota (South Africa), Shinji Sakai a senior managing director of Toyota Motor Company stated that "since the freeing of South Africa's economic system we are seeing more competition and we need to enhance our strength". See 'Toyota Japan to buy chunk of its local carmaker in a move to boost output' *(Sunday Independent,* 13 October, 1999).

Figure 4.17: Aggregate Profit Performance of Vehicle Manufacturers, 1992-2005 (Rm)



Source: Department of Trade and Industry, various years; NAAMSA (2006).
Note: Car and light commercial vehicle producers only.

Data for the component sector is sketchier but profitability has followed a similar trend. A survey conducted by the Department of Trade and Industry in 1997 indicated that for a sample of 23 firms, profits fell by 75 percent in 1996 from the record levels of 1995 (Department of Trade and Industry, 1997:10). The key factor here was falling margins largely resulting from price pressure applied by vehicle manufacturers. Firms more oriented to the export market continued to do well. However, a survey of 35 component firms conducted by Barnes (1998) indicated that the decline in profitability was levelling out with an increasing number of firms showing increased profits from 1996-97 compared to 1995-96. [63] DTI data, again based on a relatively small sample of firms showed significant improvement in profit levels from 1998 to 1999 (Department of Trade and Industry, 2000). During this phase there was a clear division in the fortunes of component suppliers. Exporters did well while those restricted to the domestic market for reasons of size, licensing restrictions or the lack of a link to a foreign company came under growing pressure. From 2000 to 2002, profitability increased sharply with growing export volumes and an increased contribution from supplying vehicle exports. Profits dipped in 2003 as the stronger rand reduced margins in both the domestic and export markets (Department of Trade and Industry, 2003, 2004).

While inflows of foreign direct investment into the South African economy totalled a moderate R27.3 billion for the first few years following the introduction of the MIDP (1995-97), the automotive sector was the third largest recipient (after telecommunications, food and beverages) which is particularly significant given adverse domestic market conditions and the

[63] See also Valodia (1997)

fact that the industry faced declining protection. But much of this FDI involved the purchase of majority or minority stakes by Ford (in Samcor), Toyota Motor Corp. (in Toyota SA), Nissan Motor Corp. (in Nissan SA) and General Motors (in Delta). At least one of the factors driving the takeover of domestically owned plants by licensees was the need to upgrade the South African plants in the face of growing competition and the key question is the level of investment in fixed plant.[64]

Investment by vehicle manufacturers has increased since 1990 and the trend has been steadily upward since the trough of the mid-1990s, when political and policy uncertainty together with a weak domestic market led to a serious slump in new capital expenditure (Figure 4.18). In 1996, Delta Motor Corporation opened the first new assembly plant to be built in South Africa for over a decade. It was, however, a fairly small CKD plant with low levels of automation. Global strategic considerations were important in the early decision by both BMW and DaimlerChrysler to invest heavily to upgrade their plants in order to be able to achieve significant export capability. [65] In 1998, BMW completed a R1 billion upgrade of its Rosslyn plant and DaimlerChrysler announced that it was to invest R900 million in a new paint shop and body shop at its East London facility (Department of Trade and Industry, 1998). This has attracted some further investments by suppliers as well.[66] Further expansion took place from 2001 as vehicle export programmes were ramped up with VW, DaimlerChrysler and BMW all announcing large expansion plans.

With the boom in domestic sales that started in 2003, investment has received a further boost and Toyota's R1.2 billion new paint shop investment can accommodate a planned increase in production to 200,000 vehicles per annum which is equivalent to world scale. DaimlerChrysler has invested heavily reportedly to expand production to 100,000 units per annum[67] and Ford also announced plans to double production from 40,000 to 80,000 vehicles with the launch of the Ford Focus export programme. [68]

General Motors which was the last multinational to take full control of the South African operation has also announced plans to develop exports and improve market share. [69] Volkswagen has also recently undertaken a R750 million investment in a new paint shop." In

64 See 'Competition forces car manufacturers to invest' *(Business Day*, 19 January 1998).

65 See 'BMW injection shows confidence in SA' *(Business Report,* 24 January, 1996); 'German carmakers bank on SA results' *(Business Day*, 26 November, 1998).

66 See 'BMW to attract extra RI bn into component plants' *(Business Day*, 22 April, 1997).

67 `Car-makers spend billions, boost jobs' *Business Times* (19 February, 2006).

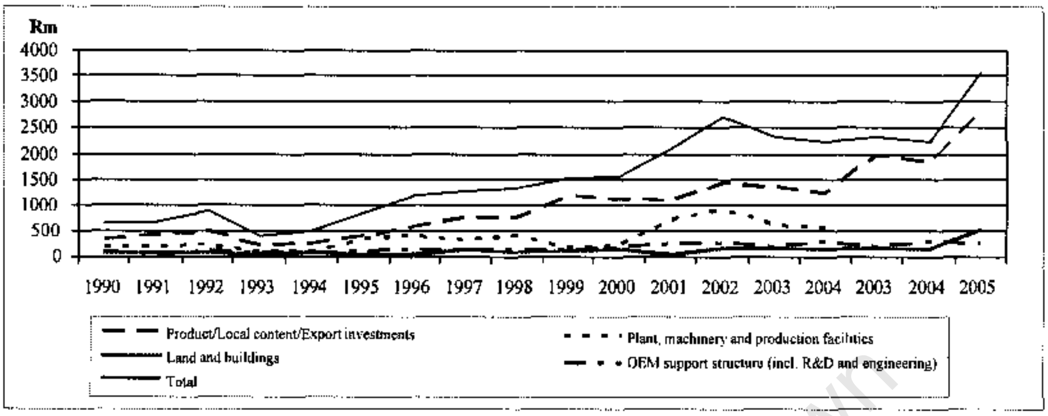
68 'Ford plans to rev up production' *Business Report* (14 February, 2005).

69 See 'Ford and GMs local operations speed on' *(Sunday Times,* 24 September, 2006).

70 `VVVSA raises the roof *(Automobil,* June, 2006).

2005, capital expenditure by vehicle producers reached a record level of R3.6 billion on the back of booming production and very high levels of capacity utilisation.

Figure 4.18: Investment Expenditure by Vehicle Manufacturers, 1990-2005



Source: NAAMSA Annual Reports, various years

But large scale projects announced by carmakers frequently take longer to materialise and turn out to be on a smaller scale than initially indicated. The investments made in plants have continued to lag, both in a quantitative and qualitative sense, behind the massive investments that have been made in booming emerging market industries in Brazil, Thailand, China, India and central Europe over the last 15 years (see Table 4.10). So while the BMW and DaimlerChrysler investments in South Africa were qualitatively different to assembly plant investments up to that time, they were by no means world scale. And small scale CKD assembly investments have continued — for example, in early 1998 Fiat announced it was to spend R250 million to produce new models out of the Automakers plant. [71] The amount being invested and the projected annual volumes of 25,000 units, which were never reached, were well below the level of investments being undertaken in larger emerging markets. They represented a holding strategy, with the firm unwilling to commit itself to large investments but reluctant to withdraw from production in South Africa. More recently there have been reports that the KwaZulu-Natal investment agency, TIKZN, would be assisting with a R450 million car assembly investment[72] and two Indian conglomerates, Mahindra and Tata, have announced that they are considering CKD assembly in South Africa. [73] Honda on the other hand has recently stated that an assembly plant in South Africa was not on the cards. [74]

71 See 'Fiat Auto to invest R250m to produce new cars in SA' *(Business Report*, 26 January 1998).

72 'Another R5.6bn en route to KwaZulu-Natal' *(Business Report,* 26 October, 2006).

73 See `Mahindra assesses SA car assembly plant start-up' *(Business Report, 1* September, 2006), 'Tata may use Nissan assembly site to start local car assembly' *(Business Report,* 15 August, 2006)

74 Until 2000 Honda vehicles were assembled in the DaimlerChrysler's East London plant. See 'Honda Motor says an SA manufacturing plant is not feasible' *(Business Report,* 26 October, 2006)

Table 4.10: Investment in Vehicle Production in Developing Countries, 2004

	Investments (€ million)
Brazil	1141
China	5330
Czech Republic	663
India	1014
Malaysia	1263
Poland	893
Slovakia	1056
South Africa	*277*
Thailand	443

Source: OICA (2007)
Note: 2004 or latest available figures. Investment levels fluctuate widely from year to year so these figures should be seen as indicative.

There has also been an expansion in investment in the component sector but in the late 1990s, the investment in first tier components with high local content was quite limited. Foreign investment has played an increasingly important role. This has involved a number of greenfield investments but the takeover of existing firms has accounted for a large share of FDI as has been the case in other sectors (Gelb and Black, 2004a). Much of the foreign investment was in the export sector in products such as catalytic converters, automotive leather and wiring harnesses (Table 4.11). Since 2000, growing investment has taken place in first tier suppliers locating close to assembly plants with export projects, but many of these involve assembly type operations with limited local content. There have been some important exceptions to the above, an example being the Samcor engine project, which has created large scale spin-offs for local component suppliers due to its high level of local content. [75]

The growing profile of the industry has also served to attract growing governmental support for what was increasingly seen as a high growth sector. Part of this has taken the form of dedicated infrastructure support such as supplier parks and specialised port facilities. In 2002, the Gauteng Provincial Government announced a contribution of R200 million to the establishment of a supplier park in Rosslyn and provincial and metropolitan authorities have followed suit in KwaZulu-Natal and the Eastern Cape.

[75] `Samcor to put R146m into new engine project' *(Business Day,* 2 June, 1998).

Table 4.11: Foreign Investments in the Component Sector

Multinational	Nature of investment	Product(s)	Date of investment
Cooper Industries (US)	Reinvestment to establish Cooper Automotive of South Africa	Spark plugs	1995
Bridgestone-Firestone (Japan)	Purchase of Firestone from Murray and Roberts	Tyres	1996
Goodyear (US)	60% stake in Consol's Contred Group for R567m	Tyres	1996
Behr AG (Germany)	Purchased T&N Holdings heat transfer division	Heat transfer (evaporators, condensors, radiators)	Late 1990s
Era (Germany)	Purchased equity in Beier	Automotive textiles	Late 1990s
Aunde (Germany)	Greenfield	Automotive leather	Late 1990s
Aunde (Germany)	Purchased equity in CTAP	Automotive textiles	Late 1990s
Lemforder (Germany)	Purchased an Auto Industrial plant	Axles	Late 1990s
August Laepple (Germany)	Greenfield	Body panels	Late 1990s
Zeuna-Starke (Germany)	Greenfield	Catalytic converters/exhaust systems	Late 1990s (Plant closed 2006)
Leoni (Germany)	Greenfield	Wiring harnesses, interior accessories	Late 1990s (Plant closed 2006)
Degussa (Germany)	Joint venture with the IDC	Catalytic converters	Late 1990s
Eberspecher (Germany)	Purchased full equity from joint venture partner	Catalytic converters/exhaust systems	Late 1990s
Drexel Meyer (Germany)	Joint venture with Beltronix	Wiring harnesses	Late 1990s
Delphi (US)	Greenfield	Catalytic converters	Late 1990s
Faurecia (Fench)	Greenfield	Catalytic converters	Late 1990s
Faurecia (French)	Purchased Autoplastics	Interior trim components & sub-assemblies	Late 1990s
Borbette (French)	Purchased M&R's aluminium wheels plant	Aluminium wheels	Late 1990s
Engelhard (US)	Greenfield	PGM coatings for catalytic converters	Late 1990s
NGK (Japan)	Greenfield	Ceramic monoliths	Late 1990s
Senior Automotive (UK)	Greenfield	Flexible Couplings	Late 1990s
Visteon (USA)	Greenfield	Air fuel manifolds	2001
Magnetti Marelli (Italy)	Greenfield	Catalytic converters	Late 1990s
Mario Levy (Italy)	Greenfield	Sewing plant for stitched leather seats	Late 1990s

Table 4.11: Foreign Investments in the Component Sector (Continued)

Multinational	Nature of investment	Product(s)	Date of investment
Almec Spa (Italy)	Greenfield	High pressure aluminium castings	Early 2000s
AMD Group (USA)	Greenfield	Exhaust vibrator balancer	Early 2000s
Saffil Ltd (UK)	Greenfield	Mats for catalytic converters	Early 2000s
Fehrer	Feltex Fehrer Purchase of 26% of Feltex's foam moulding division.	Interior trim	2002
Cataler (Japan)	Greenfield	Catalytic converters	Early 2000s
Toyota Bushuku (Japan)	Purchased Toyota SA' seat manufacturing plant	Seating systems	Early 2000s
Toyota Tsusho (Japan)	Greenfield	Tyre assemblies	Early 2000s
Faurecia/Siemens Automotive Systems (French/German)	Greenfield	Front end modules	Early 2000s
Otto Fuchs	Greenfield. R112m Joint venture with BEE firm Foxtec- Ikhwezi		Announced 2005
Denso (Japan)	Purchased 25% of Smiths Manufacturing from Metair	HVAC systems, radiators, evaporators & condensers	2005/6
Yazaki (Japan)	Purchased 25% of Hesto Harnesses from Metair	Harnesses	2006
Apollo Tyres (India)	Purchase of Dunlop for $62 million	Tyres	2006

Sources: Department of Trade and Industry (various years); Barnes and Morris (2004); Media reports; Personal communication, Justin Barnes.

7. PRODUCTIVITY AND EMPLOYMENT

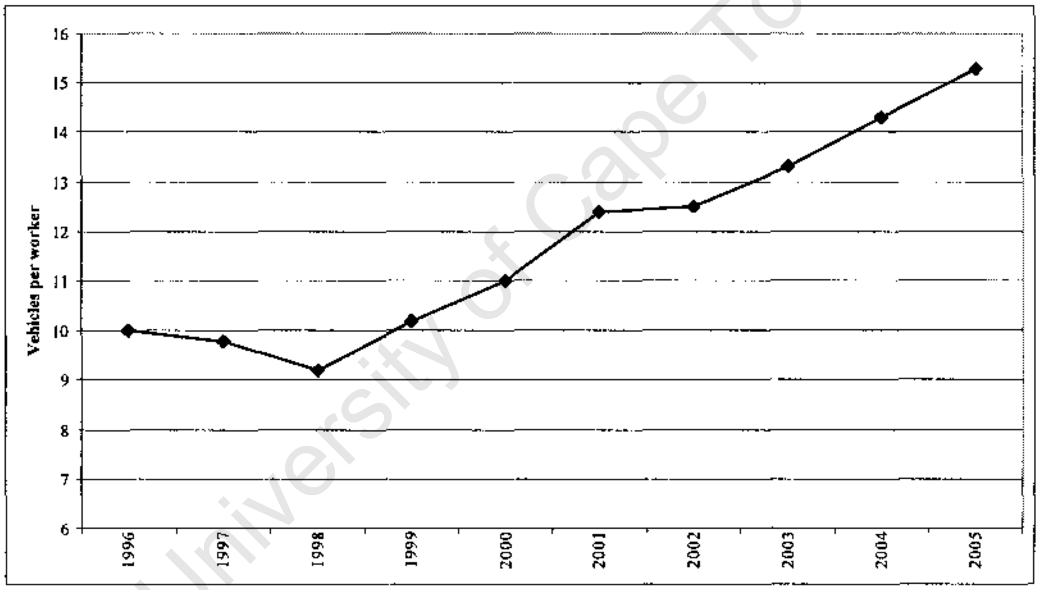
Automotive industry productivity in the early 1990s was very low in South Africa but has improved rapidly. Aggregate productivity data show that the automotive industry has outstripped manufacturing as a whole since the introduction of the MIDP in 1995.

Data collected by the International Motor Vehicle Programme based on detailed assembly plant surveys conducted in 1994 and 1996 showed that the average South African assembly plant compared poorly with assembly plants in other countries.[76] The main reasons for this can be ascribed to low levels of automation and the complexity of most assembly plants, which produced a range of models in relatively low volumes. However, the rate of improvement was rapid with direct labour hours per vehicle being reduced by 32 percent between 1994 and 1996. A crude measure of assembly plant productivity is to measure

[76] Unpublished data, International Motor Vehicle Program.

vehicle output per employee. This fluctuates according to domestic market conditions but increased by 68 percent over the period 1990-2005 (Figure 4.19). An important factor impacting on assembly plant productivity has been the reduction in the number of models produced and to some extent higher levels of automation. Improved operational competitiveness drawing on lean production principles has also played a role (Black and Barnes, 2003). But it is important to remember that model volumes remain fairly low as do levels of automation. Quality has been much improved. In 2002, for instance, the Pretoria BMW plant at Rosslyn, outside Pretoria, received the highest quality rating of any German manufacturer supplying vehicles to the US. More recently the Mercedes plant in East London won plaudits for quality in relation to DaimlerChrysler's other global production sites. JD Power's 2005 survey showed that South African produced vehicles had 23 percent more defects than imports. This was a large improvement on the previous year (43 percent more). [77]

Figure 4.19: Vehicle Output per Number of Employees, 1990-2005



Source: NAAMSA Annual Reports (various years).
Notes: These data are based on total assembly industry employment including administrative staff.

Similarly, rapid improvements have been made in the component sector. Surveys of component firms in KwaZulu-Natal province, undertaken by Barnes (1998), show significant improvements over the period 1994-97 in inventory levels, quality and indicators of external and internal flexibility. [78] Further gains were made over the period 1998-2001 (Table 4.12) although firms remained significantly behind the global frontier. Performance of the South African component firms tended to be better on internal benchmarks than where external

[77] 'SA vehicles have 23 percent more flaws than imports' *(Business Report,* 1 November, 2005).
[78] See also Kaplinsky and Morris (1999)

factors played a role, for example in raw material inventories and supplier performance (Barnes, Kaplinsky and Morris, 2004).

Table 4.12: Operational Improvements in the Automotive Components Sector

	South African firms				Comparator firms	
	n	1998	2001	Improvement 1998/99-01 (%)	W. Europe n=14	Emerging economy n=12
Total inventory (days)	32	62.6	42.0	32.8	31.2	38.6
Customer return rate (ppm.)	23	3270	1240	62.0	549	624
On time and in full delivery to customers	25	92.2	92.7	0.6	96.1	93.5

Source: Derived from Barnes, Kaplinsky and Morris (2004: 162)

One objective of the MIDP was to maintain employment during the process of restructuring and this has indeed occurred. Total employment in the vehicle manufacturing industry (assembly and components) declined from 106,845 in 1990 to 104,100 in 1995. Since then it has increased quite strongly to 112,300 in 2005 (Table 4.13). Employment in automotive production has increased as a share of manufacturing employment since 1995. Disaggregating the effect of trade liberalisation from the impact of market conditions is complicated by the impact on market growth resulting from the reduced price of vehicles in real terms, which in turn is partly the result of liberalisation. While cyclical factors have an important effect on employment levels, assembly plant employment has declined slightly since 1995. A degree of rationalisation as well as outsourcing of certain activities previously performed in house account for this. Strong increases in production since 2002 have been accompanied by increasing employment.

There has also been significant rationalisation of sections of the component sector. Greater specialisation within firms in many cases led to job losses. A typical scenario would be the replacement of multiple lines using labour intensive methods with more automated and specialised production of a lower number of products. However, South African component suppliers have in many cases retained their flexible, low volume capacity in aftermarket production. In the component sector where there have been declines in employment in `traditional' suppliers, the rapid growth of exports has had an impact especially in labour intensive areas such as automotive leather and wiring harnesses.

Table 4.13: Employment in the Automotive Sector, 1990-2005.

	Assembly	Component	Tyre	Motor trade	Total
1990	37,845	69,000	na	160,000	
1991	36,895	65,000	na	155,000	
1992	38,731	na	na	178,000	
1993	37,160	na	na	171,000	
1994	37,600	na	na	175,000	
1995	38,600	65,500	11,000	178,000	293,100
1996	38,600	65,500	10,000	180,000	294,100
1997	37,100	69,100	9,500	180,000	295,700
1998	33,700	69,700	9,100	170,000	282,500
1999	32,000	67,200	6,670	175,000	280,870
2000	32,300	69,500	6,575	180,000	288,375
2001	32,700	72,100	6,300	182,000	293,100
2002	32,370	74,100	6,000	185,000	297,470
2003	31,700	75,000	7,200	191,000	304,900
2004	31,800	74,500	7,200	194,000	307,500
2005	34,300	78,000	6,800	198,000	317,100

Sources: NAAMSA (various years); Department of Trade and Industry (various years).

8. CONCLUSION

In the early 1990s, the South African automotive sector was widely regarded as inefficient and uncompetitive, dependent on heavy protection for its existence. South Africa was far from major markets and the small domestic market showed little sign of growth. Indeed, it was not until 2004 that domestic sales exceeded the previous record set as far back as 1982. In the face of the prospect of globalisation, the prognosis for the industry was poor.

The period 1990-2005 has been a phase of rapid change. This has mainly been the result of significant liberalisation of the domestic market as a result, firstly of Phase VI (introduced in 1989), and then more importantly, the introduction of the MIDP in 1995. Phase VI and the MIDP have gradually reduced protection of the automotive sector and encouraged firms to specialise by means of exporting. One of the key objectives of this policy of 'guided integration' [79] has been to encourage a phased transition from CKD assembly to full manufacturing with the attendant benefits of higher volumes and increasing localisation of components. However, the liberalisation process has been a partial one and policy continues to assist the industry although to a much lesser degree than was the case previously.

79 This is a term used initially in a somewhat different context to describe the strategy used by Mexico especially in regard to its integration into the US production system (Womack, 1989).

This chapter has sought to assess how policy has impacted on industry structure and how this process has been mediated by the supply response of firms and the strategic decision making of international firms. It is argued below that while the industry is in many important measures in a stronger position, in some important respects development has been 'limited.'

As was stated in the introduction to this chapter, the MIDP has received extensive positive publicity and the long term performance indicators summarised in Table 4.14 present a fairly positive picture of developments especially given the fact that they have taken place in what has, until recently, been a low growth economy. To date the costs of liberalisation have been quite low. The share of imports has grown sharply but there has been a very rapid increase in exports of both vehicles and components. Investment, including foreign investment has increased. Significant rationalisation has reduced the extreme proliferation of makes and models being assembled in very small, uneconomic volumes. While there has been little gain in employment, the sector has fared better than manufacturing as a whole. Vehicle prices have also declined in real terms although they remain significantly higher than in most first world markets. Quality and productivity have improved significantly. So although the sector remains assisted, its structure is more robust, more competitive and more oriented to global markets.

Table 4.14: Key automotive industry indicators, 1990 and 2005

	1990	2005
Tariffs – CBU	115%*	34%
Tariffs – CKD	50% local content requirement (Phase VI)	27%
Domestic sales of light vehicles (units)	322,124	590,000
Production of light vehicles (units)	330,000	497,073
Average local content in light vehicles (vehicle ex factory price less imported content)	57%**	58%
Imports as a share of light vehicle market	<1%	39.3%
Exports as share of production (light vehicles)	<3%	28.1%
Component exports	R287 million	R22,709 million
CBU exports	R381 million	R22,846 million
Automotive imports	R6400 million	R73,301 million
Ownership	Mainly local	Mainly foreign
Number of light vehicle models produced	30+	23
Number of manufacturers	7	7
Employment (assembly)	37,845	34,300
Employment (components)	69,000	78,000
Productivity (vehicles produced per employee)	9.1	15.3
Vehicle output as share of world output	0.70	0.79%
SA automotive exports as share of global exports	0.1%	0.5%
SA automotive imports as share of global imports	0.4%	1.0%

Sources: NAAMSA (published and unpublished data), dti (published and unpublished data), WTO.
Notes: * 105 percent duty and 10 percent surcharge ** 1996

These changes have occurred in an economic environment, which has not been particularly favourable. The early 1990s and the political transition were difficult economically. The new ANC government had to grapple with a weak economy burdened by debt and massive social backlogs. While the world applauded the peaceful transition, investors adopted a wait and see attitude. The economic situation was gradually stabilised but it was only after 2002 that a higher platform of growth was established.

However, policy has also produced distortions, encouraged uneconomic investments and led to unforeseen side effects. These impacts limit the gains that have been made and are likely to cause complications in the future.

One of the most striking changes has been the rapid growth in exports and imports. The level of export assistance has been far too high, especially at the start of the programme. The orientation of the industry has changed fundamentally away from its focus on the small domestic market. In fact it has become 'ultra export oriented.' [80] Growing exports have facilitated specialisation and the achievement of economies of scale. But as yet this has had only a limited effect in terms of increasing 'economic' local content. More evident, especially in the early stages, was the expansion in exports of 'peripheral' components such as catalytic converters and automotive leather. The result was the growth of a large component export sector, which was not integrated with the low volume, low local content assembly industry supplying the domestic market. Another important effect of rapid export expansion was the increasing ability to rebate import duties which added significantly to import pressure on the industry.

Greater international integration has led to growing foreign investment and ownership. The assembly sector is now virtually completely foreign owned as is a large portion of the component sector, especially the major exporting sub-sectors. Foreign ownership has facilitated access to global networks. With few exceptions, domestically owned component firms neither possessed the technological capability to become independent first tier suppliers nor had ambitions in this direction. [81] Many have been forced to reposition themselves as second tier suppliers, but may have gained from being reintegrated into the supply chain but with much higher volumes. [82]

[80] This is a relative term. Many countries export a greater share of their automotive production. This refers to the orientation of the trade regime. As a result of the high level of export support, South Africa does export a high share of output given its remote location.

[81] This is not to say that these firms were necessarily technologically un-dynamic (see Chapter Six).

[82] An example is Murray and Roberts, which produces castings and engine components and is a key supplier to the Ford Engine plant in Port Elizabeth.

The investments now being undertaken are on a larger scale than was the case previously and the industry is in a stronger position as tariffs continue to decline. Nevertheless, investments have in fact been quite modest in relation to most other major developing country vehicle producers. Even the vehicle assemblers undertaking major export projects have found it difficult to encourage multinational suppliers to invest in South Africa. Many of the first tier suppliers, who have established operations in South Africa, use little local content. It is clear that there has been a substantial hedging of bets, for example, in the initial reluctance to make major investments in the assembly sector. It is apparent too, in the somewhat footloose nature of investments in key component export sectors such as automotive leather and catalytic converters.

The industry has made substantial progress in moving towards the transition phase (see Table 4.5). To take the next step requires large investments which may be difficult to justify for some assemblers which produce volumes of under 30,000 units for the domestic market. There is a risk of certain vehicle producers being 'stuck' in the transition phase, unwilling to take the final step towards full manufacturing. This means that they are unlikely to achieve high levels of local content and the high resulting logistical costs are a major constraint on competitiveness. This creates a problem for policymakers, because such firms will remain reliant on continuing state support. Toyota is the one firm, which is moving clearly in the direction of full manufacturing with the move facilitated by its dominant share in the domestic market. The component export sector has in many instances achieved high volumes and as a result been able to reduce costs. As support is phased down, the exchange rate will be an increasingly important determinant of the viability of this sector.

The MIDP has achieved some real successes. There is no doubt that the industry is more efficiently structured then was previously the case. Volumes in the vehicle and component sector have risen enormously and firms have also improved in-plant productivity and manufacturing benchmarks. New investment including foreign investment has upgraded technology and quality. But vulnerabilities and questions over sustainability remain and the `limited' development of the sector remains a central problem. A large export industry has been developed. Without continuing assistance it will shrink. The supply chain remains underdeveloped and heavily reliant on imports. Investment in assembly and many first tier components remains well below world scale in most cases.

Essentially, there is little indication that South Africa is en route to becoming a major new location for the global automotive industry. But a major positive feature is the growth in the domestic market. If policy is appropriately managed with an incentive structure which is appropriately balanced between production for exports and the domestic market, there are considerable opportunities for growth.

CHAPTER FIVE

PROTECTION, ECONOMIES OF SCALE AND INDUSTRIAL POLICY

1. INTRODUCTION

In nearly all developing countries that have sought to develop an automotive industry this has been done through protection. While there has been a measure of success high tariffs and, more specifically, high effective rates of protection on assembly has led both to excessive entry of assembler firms and an excessive proliferation of models being produced within individual plants. The result in countries ranging from Brazil and Argentina to Malaysia and Indonesia has been low volume production which has, of course, been exacerbated by the relatively small size of most developing country vehicle markets.

This presents a problem for policy makers because in spite of the introduction of new technology and new forms of production organisation, the automotive industry remains characterised by significant economies of scale both in vehicle assembly and in component manufacture. Producing in low volumes raises costs, in turn making it difficult for the industry to compete in a globalising environment.

As we have seen in Chapter Three, in the early 1990s, South Africa had seven vehicle producers, some of which produced more than one make as well as several models in a single plant. This was clearly a very high degree of fragmentation for an industry, which at the time produced approximately 300,000 vehicles annually. This fragmented production structure also made it difficult for component producers to achieve volumes approaching minimum efficient scale. So for both firms and the state, the question of how to deal with this major structural problem assumed great importance especially as government moved to liberalise trade, partly in response to WTO pressures.

Excessive entry by vehicle producers and the proliferation of low volume models raises a number of questions for the vexed issue of industrial policy. The broader context is the role of government in driving more rapid industrial expansion. Here the debate has been between those arguing the case for government to address pervasive market failure and those who emphasise the more likely prospect of government failure. Amsden (1992; 1994), Amsden and Chu (2003), Chang (1996, 2002), La11 (1994) and Wade (1988) have been strong proponents of the potential effectiveness of industrial policy and draw heavily on the east Asian growth experience. The orthodox neoclassical case against industrial policy has been equally strongly stated by Lal (1983) and Krueger (1990), who emphasise the limitations of governmental capacity. Stiglitz (1996), Rodrik (2004; 2006) and Hausmann and Rodrik (2004) provide more nuanced support for industrial policy. Pack (2000) and Pack and Saggi (2006) argue that while clear market failures exist, the empirical support for industry policy is limited.

The objective of this chapter is, therefore, to assess the importance of scale as a structural problem in the South African industry and to illustrate the complexities of formulating and implementing policy to deal with it. Section two considers the question of scale in the automotive industry internationally. Section three examines the problem of scale in the South African automotive industry by illustrating the extent of proliferation of makes and models being domestically produced and the implications for competitiveness. The question of scale was central in the policy debate which led up to the introduction of the Motor Industry Development Programme (MIDP) in 1995 and in later policy developments. This is examined in section four, which illustrates the complexity associated with trade and industrial policies, which seek to achieve greater economies of scale. Section five examines the impact of the MIDP on the rationalisation of South Africa's automotive industry. Section six concludes the chapter.

2. ECONOMIES OF SCALE

Economies of scale occur when total costs rise less than proportionately to output. The term minimum efficient scale refers to the scale of production at which available scale economies have been exhausted. All manufacturing sectors contain processes, which could be described as scale intensive. However, economies of scale are particularly important in sectors such as the automotive and chemical industries.

Alcorta (1998) identifies three main sources of scale economies: specialisation, indivisibilities and dimensional effects. Static specialisation effects arise out of the separation of tasks as in the case of Adam Smith's famous example of pin manufacture. Specialisation can also result in dynamic gains through learning by doing in long production runs or the output of cumulatively large volumes over time. Indivisibilities occur, for example, with capital equipment where the minimum capacity of a machine at one stage determines the minimum capacity of the others (Alcorta, 1998). Dimensional effects are particularly important in flow type industries such as chemicals and refer to the geometrical volume to surface area relationship of capital equipment such as containers and pipelines. Because the volume of a sphere rises at the two thirds power of the surface area, the cost of construction of this type of equipment rises less than proportionately to capacity giving rise to the '0.6' rule commonly used in engineering.

Scale economies can also be analysed according to product, plant or firm size (Alcorta, 1998). Product scale economies are determined by production runs or lot sizes and are determined by tooling costs and the cost of machine changeovers including set up times. Machine changeovers are, accordingly, a major cost-raising factor in production. Ceteris paribus, the higher the set up costs, the higher will be the optimal scale of production.

Plant scale is of particular importance in continuous flow processes such as in the chemicals industry where dimensional effects loom large and substantial savings can be achieved through large plant size. But plant scale is also important in the production of discrete goods such as in the automotive industry where economies of scale can arise from specialisation of labour and machinery and improvements in production organisation (Alcorta, 1998; D'Costa, 2004).

Firm scale is especially important in sectors where large investments in R&D are required. Internationally the costs of developing new vehicles are immense and entail a major risk for smaller automotive firms. This consideration has been a major driving force in the spate of mergers and takeovers in the industry as well as the formation of strategic alliances that have occurred over the last decade. Scale may be important also in the area of marketing and distribution where fixed costs rise less than proportionately to output — in advertising, for example.

2.1 Economies of Scope

Most plants manufacture a range of products and may achieve economies of scope which occur when the cost (C) of making products (q1,q2) together is less than the cost of producing them separately defined as follows (Alcorta, 1998):

$$C(q1,q2)<C(q1,0)+C(0,q2)$$

The existence of multiple products within firms complicates the defining of average unit cost. This would then depend on the proportion of the commodities being produced and their respective product specific economies of scale. Accordingly in a two-good environment, multi-product scale economies are equal to total costs divided by the weighted sum of marginal costs. The weights represent the various levels of output of the two goods (Alcorta, 1998). The existence of strong economies of scope could therefore lead to multi-product or plant economies of scale even in cases where there are not economies of scale in individual products.

In scale intensive industries, tariff protection in a small domestic market frequently leads to the establishment of plants operating at below minimum efficient scale with resulting significant cost penalties. A further problem is likely to be a lack of specialisation within product sectors. Apart from raising costs within the production process concerned, low volume production can result in pecuniary diseconomies through a failure to achieve lower costs from suppliers that would be possible if volumes were higher. This would arise particularly in a protected economy. Low volumes also impose external costs on suppliers through generating insufficient volumes of end product to justify investment in components or other intermediates. This problem is of great importance in the automotive industry in many developing countries, where low volume vehicle plants mean that investment in component production is uneconomic beyond a low level of local content. It is also typical in sectors such as electronics assembly in many developing countries. Low volume component production in cases where the sector is protected, means that input costs are high for assemblers. The issue is somewhat less clear in sectors where the penalties for low volumes are borne mainly by the large scale, upstream producers themselves. While this may provide them with a greater incentive to produce in high volume, it may also increase their market power in the domestic market especially if the market concerned is relatively small and subject to tariff protection. This has been apparent, for example, in the basic chemicals and metal processing sectors in South Africa.

2.2 Economies of Scale and Low Volume Production in the Automotive Industry

In the context of the automotive industry in South Africa and other developing countries, key questions are the issues of minimum efficient scale in assembly and components production and the extent of cost penalties incurred if these are not achieved.

Scale economies in the automotive industry arise in a number of ways. Firstly, more efficient methods and advanced machinery have been developed for large-scale production. A high degree of automation will only be appropriate if total output is large. Secondly, unit costs are reduced through spreading the high cost of product design and development over large production volumes. Thirdly, high production volumes facilitate greater specialisation of labour and management functions. This can both lower costs and also increase productivity.

Of great importance in the automotive industry is product scale. This takes into account batch or lot size, in other words the length of the production run. Longer runs minimise machine changes and costs can be reduced by minimising down time (Alcorta, 1998). Changing to a new model or component may also require expensive investment in tooling. Important savings can also be made from higher levels of capacity utilisation in existing facilities but this should not be confused with economies of scale.

The measurement of minimum efficient scale and the cost implications of producing at below these levels are beset with problems. Firms have difficulty in dealing with the concept and it is certainly easy for respondents in firms to confuse scale, length of product run and capacity utilisation.

There has been an important debate about whether new flexible technologies and related changes in production organisation have led to a decline in the optimal size of manufacturing plants and firms. Proponents of this view include Acs and Audretsch (1990), Best (1990) and Womack et al. (1990). If this were the case, it would clearly have positive implications for low volume producers in developing countries as it would reduce the relative locational disadvantage of these countries which tend to have smaller domestic markets. However, there appears to be limited empirical support for the more optimistic proponents of the 'descaling ' argument. A major study of engineering firms in a number of developing countries found that new technologies have not significantly reduced minimum scale.[1] But greater flexibility enables low volume producers to reduce the vulnerability to fluctuations in demand impacting negatively on capacity utilisation (Bureau for Industry Economics, 1988).

Jones and Womack (1985) have argued that while the spread of 'lean' Japanese manufacturing techniques may reduce optimal scale, the impact was generally disadvantageous to developing countries because of the importance of suppliers being located close to assemblers in order to be able to supply on a JIT basis. In the Indian automotive industry, D'Costa (2004) found that flexible practices were key to successful expansion but that attaining economies of scale in turn facilitated the introduction of these practices.

2.2.1 Economies of Scale in Vehicle Assembly

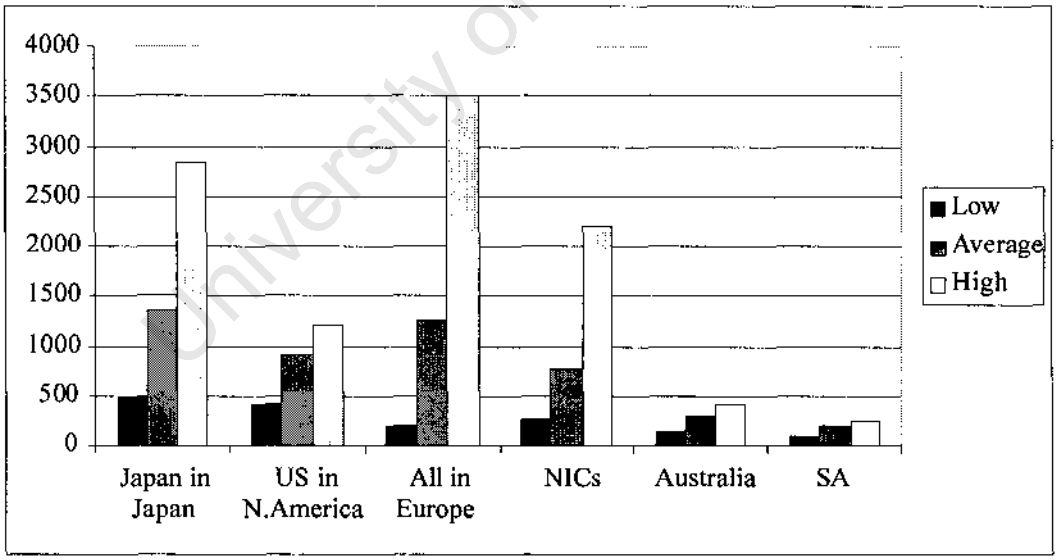
There is some dispute as to the level of minimum efficient scale in vehicle assembly and also about the extent to which this may have changed with the introduction of new forms of production organisation. Earlier estimates put minimum efficient scale in assembly at

1 See Alcorta (1998) and case studies of the engineering industry in Mexico (Dominguez and Brown, 1998) and Thailand (Brimble, 1998).

200,000-300,000 units per annum (Owen, 1983; Lucke, 1988; Bureau of Industry Economics, 1988) usually spread over no more than two basic models.[2] Submissions to Australia's Industry Commission (1990:198) supported data collected in the late 1980s by MIT's International Motor Vehicle Program (IMVP)[3] which suggested that scale economies in final assembly are exhausted at between 200,000 and 250,000 units per annum. However, the IMVP found this could decline to approximately 150,000 due to product mix as in the case of more upmarket vehicles or as result of changes in technology and production processes.

State of the art assembly plants such as those established by Japanese producers in the United States in the early 1990s had a capacity of 150,000-300,000 units per annum. As Figure 5.1 indicates, there was a large range in daily production rates between large and smaller plants at this time. The data presented in Figure 5.1 includes very large scale operations such as Volkswagen's Golf assembly plant as well as small scale specialist producers. While caution should be exercised in using the capacity of actual plants to represent optimal scale, in large, open economies they probably provide a reasonable proxy. Plants in the newly industrialised countries (NICs) tended to have lower daily output levels but these were operating at well below optimal levels in protected domestic markets.

Figure 5.1: Scale of operation of international assembly plants (daily vehicle production rates) in the late 1980s



Sources: Derived from Industry Commission (1990: 198), NAAMSA (1989), dti (unpublished data).

It has been argued that there has been a decline in minimum efficient scale since the early 1990s to around 150,000 units as a result of changes in technology, production processes and

2 See Lucke (1988) for intemational comparisons of production volumes by firm and model.

3 Cited in Industry Commission (1990).

product mix. Certainly, new forms of technology and production organisation, for instance using space frame construction in which body panels are riveted onto the frame with modules made by outside parts suppliers, can reduce optimal volumes. But these methods remain limited and the bulk of vehicle assembly continues to use conventional techniques. The optimal scale of production does tend to be lower in speciality or luxury cars (Alcorta, 1998). For example, the BMW plant established in the US in the mid 1990s has a capacity of 80,000 units per year. More recent estimates by Rhys (2004) are that there has been no significant change in economies of scale in vehicle assembly which are achieved at 250,000 units per year.[4]

Flexible machinery and production organisation has had more of an impact on the variety of models and derivatives that can be efficiently produced in one plant and the trend in the US, Japan and to a lesser extent Europe has been towards a gradual decline in average annual production volumes per model. Thus an important change in some assembly plants built since the early 1990s, has been their capability to make a range of models rather than a sharp reduction in total capacity. An early example was the Mazda plant built at Hofu, near Hiroshima, which was designed to make up to 18 different body types.[5] A more recent example is GM's Opel plant in Poland which produces three models on a single assembly line.[6] This kind of flexibility is made possible by sophisticated scheduling of component supply to the assembly line.

Based on their global database assembled in 1998, Sturgeon and Florida (1999:51) found that the average plant producing in the carmaker's home country had a capacity of 230,000 vehicles per year while transplants operating in other developed markets had an average capacity of 188,000 vehicles per year. Plants in developing countries were significantly smaller although those classified as PLEMA[7] plants had an average capacity of 159,000 units per annum. These are plants, which were established as low cost supply sources to large adjacent markets, and clearly needed to operate at close to optimal scale. The bulk of plants in developing countries serve the domestic market and their average capacity was only 44,000 units per annum (Sturgeon and Florida, 1999).

Assembly plants in developing countries have not only tended to be smaller than their counterparts in developed countries but also frequently produce a wide range of models. The

4 See also 'A survey of the car industry' *(The Economist,* 4 — 10 September, 2004).

5 See 'The Car Industry' *(The Economist, 17* October 1993).

6 Plant tour, February, 2007

7 Sturgeon and Florida (1999) use the category 'peripheries of large existing market areas' (PLEMAs) for locations such as Mexico, Spain and eastern Europe. See Chapter Two.

result has been that these plants have typically operated at very low levels of output per model. This reflects the existence of protected domestic markets rather than lower optimal scale in developing countries. Plants in developing countries of course are less automated and to the extent that this reflects lower labour costs it would somewhat reduce minimum efficient scale. To a large extent, however, low levels of automation are an adaptation to low volume production as is the fact that these plants tend to build a lower percentage of the vehicle than is the case in a large scale, integrated plant. Indeed, the small size of many developing country markets has meant that international carmakers have developed a series of strategies to minimise the negative impacts of producing at below 'optimal' scale. These include:

> *"starting with small, flexible and expandable "completely knock down" (CKD) assembly plants; sharing large capital expenditures (e.g. paint shops) with other automakers; increasing reliance on suppliers; and moving to modular vehicle designs to simplify, the final assembly process and reduce initial investment requirements" (Sturgeon and Florida, 1999: 2).*

Holweg and Pil (2004) argue that having smaller scale operations in conjunction with large scale facilities gives a firm the "flexibility to be creative" (2004: 195). They cite the case of German manufacturers in South Africa who have been able to reduce shipping distances to Japanese customers by using their small scale South African facilities. These small scale operations also have the advantage of being excellent locations to seek out and develop top managerial talent and can be established in a wider range of locations because of their smaller labour requirements (Holweg and Pil, 2004). The existence of such smaller plants also gives greater volume flexibility within the larger group. While achieving economies of scale in a larger volume plant is fine in theory, the volatility in demand for vehicles raises the constant and costly problem of capacity underutilisation. Fixed costs are high and the cost of running an assembly plant over one year at 50 percent capacity is 76 percent of full capacity total operating costs. The average cost of running a plant at 50 percent capacity over one week is nearly 80 percent of full capacity costs (Holweg and Pil, 2004: 192).

There is little consensus on the cost penalties resulting from low volume assembly. The Bureau of Industry Economics (1988: ix) cites a study by Toder, which found that increasing the scale factor from 100,000 to 250,000 units would reduce unit costs in the assembly process by 24.3 percent for small vehicles and 13.4 percent for large vehicles. An Australian Industry Commission report cited a study by Mitsubishi which indicated that increasing production from 50,000 to 100,000 units per annum by introducing double shifting and greater levels of automation would reduce total assembly costs by 7.5 percent per vehicle, equivalent to just over one percent of the total cost of the car. This small cost saving results from the premium applying to second shift wages and illustrates the fact that assembly costs represent only approximately 20 percent of total vehicle costs (Industry Commission, 1991: 2000).

A 1993 World Bank study cited in Francois and Spinanger (2004: 96) argued that China had a cost disadvantage of at least 20-30 percent because it operated very significantly below minimum efficient scale. A more recent Chinese study by Wu (cited in Huang, 2002) found that the construction costs of a greenfield plant increase by only 40 percent when production capacity is doubled from 100,000 to 200,000 units.

2.2.2 Economies of Scale in Component Manufacture

Although estimates vary regarding minimum efficient scale in the production of major components, it is clear that this is only reached at very high volumes, significantly higher than apply to vehicle assembly. Minimum efficient scale varies according to the type of component (Table 5.1). Generally, capital intensive plants and processes where fixed costs are high lead to higher optimal scale. The stamping of body panels, for instance, is highly capital intensive and efficient scale can be in excess of one million units per annum and is dependent to a large extent on the life of the dies.

Economies of scale are also extensive in engine production but tend to be lower in the assembly of engines than in the casting and machining of major sub-components (e.g. engine blocks). The existence of minimum efficient scale in 'assembly' as opposed to `manufacturing' processes also applies to other major components. The production of steel or alloy wheels is also scale intensive but for plastic components, which tend to be highly differentiated, minimum efficient scale is reached at somewhat lower volumes according to studies conducted in the Australian industry (Bureau for Industry Economics, 1988: 26)

There is little evidence that minimum efficient scale has declined over time as a result of new technology or changes in production organisation. According to the data presented in Table 5.1, there has been no decline and minimum efficient scale may even have increased. The estimates in Table 5.1 refer to annual plant output rather than production runs for a single component so do not take into account of the variety of products produced which has been a major issue in developing country markets including South Africa. As in assembly, it has however become possible for a single plant to efficiently produce a larger range of parts (Alcorta, 1998). Also, according to a number of studies (Bureau of Industry Economics, 1988;

Rhys, 2004) there may have been a flattening in the shape of the long run average cost curve with lower cost penalties at sub-optimal scale. Advanced, flexible robotics of the sort being pioneered by Denso in Japan, may reduce product scale but the huge initial investment effectively increases optimal plant scale (Miyake, 2006).

Table 5.1: Estimates of Minimum Efficient Scale in Components Production

	Minimum Efficient Scale/Output per annum	
Component/Process	Bureau of Industry Economics (1988)	Rhys (2004)
Engine block castings	260,000-1m	1,000,000
Engine block machining	150,000-600,000	600,000
Engine assembly	100,000-500,000	
Casting of various other parts		100,000-750,000
Axle machining and assembly		500,000
Transmissions /gearboxes	260,000-500,000	
Stampings	100,000-several millions	1-2,000,000
Body unit	200,000-400,000	
Frame	200,000-206,000	

Sources: Derived from Bureau of Industry Economics, (1988); Rhys (2004).
Notes: The BIE data above are summarised estimates of a large number of studies.

Cost penalties are also difficult to determine but are generally higher than in assembly. This is due to component production usually being more capital intensive with fixed costs constituting a higher proportion of total cost. An early study of the Australian component industry by Stubbs[8] found that a doubling of output could bring costs down by as much as 15-20 percent. Other studies, also in Australia, indicated that significant scale economies could be achieved by higher volume output (Industry Commission, 1990). For instance, doubling output of engines could result in cost reductions per unit of 11-12.5 percent. In the case of body panels, where economies of scale are extremely important, doubling output was estimated to reduce unit costs by as much as 20 percent in the case of small cars and 21 percent in the case of medium cars. For plastic components, cost reductions of 5.5 percent for small cars and 12.5 percent for large cars could be achieved by doubling output (Industry Commission, 1990: 200).

Our main concern here has been scale at plant or product level. Firm scale has increased for first tier suppliers, mainly as a result of the growing importance of R&D capability as assemblers have delegated responsibility to a smaller group of major suppliers (Alcorta,

Cited in Bureau of Industry Economics; 1988: 20

1998). Both the increase in minimum efficient scale and the high level of required technology have made it difficult for suppliers based in developing countries to remain in the first tier.

3. LOW VOLUME PRODUCTION IN THE SOUTH AFRICAN AUTOMOTIVE INDUSTRY

South Africa's automotive industry has suffered from an extreme degree of proliferation according to any measure. As Figure 5.1 indicated, daily production levels in South African plants in 1990 were extremely low compared not only to advanced country plants but also to the newly industrialising countries. The problem of small scale plants was compounded by the fact that in 1990 there were seven passenger vehicle manufacturers in South Africa producing no less than 11 different makes with over 30 different basic models.[9] Production in 1990 (for the domestic market and export) was just over 200,000 units so that average production per model was approximately 7,000 units, exceptionally low in international terms.

When the MIDP was introduced in 1995, the situation in South Africa had not changed much. While low model volumes have been characteristic of protected industries in developing countries, volumes were growing rapidly in the new emerging group of vehicle producers such as Mexico, Brazil and Thailand. As Table 5.2 indicates, Brazil produced five models in volumes of over 100,000 units per annum and Mexico three. Thailand had established a reasonably high level of volume production in pickups which constituted the bulk of the domestic market. In terms of model proliferation, the structure of production in South Africa was more akin to that of minor automotive industries such as those in Indonesia and Malaysia.

The proliferation of makes and models being domestically produced raises costs in assembly but as indicated in the previous section, these premiums are not very large in relation to the total cost of producing a vehicle. In a market with high effective rates of protection for vehicle assembly, it is clearly economic for producers to build a wide range of models even in low volumes in order to be able to supply a full model range.

However, the implications of model proliferation for the component sector are more adverse. The cost premium incurred by component makers for producing a wide range of products at low volume is considerable. Given that materials and components account for up to 80 percent of total cost and that economies of scale are more significant in component production, it is clear that the decision taken by assemblers to operate low volume plants,

9 The number depends on definition. Basic models are defined as being, for example, the Toyota Corolla and Camry or the BMW 3 Series and 5 Series. Each of these models has a number of different derivatives (engine size, number of doors etc).

perhaps also producing many models within these plants, generates greater diseconomies external to the assembly process than internally. So suppliers are severely disadvantaged by the decision of assemblers to introduce a proliferation of new models.

Table 5.2: Production Volumes for Models at a Single Plant

		Production volumes (000s)				
Country	Vehicle type	>100	50-100	20-50	<20[a]	Year
China	Cars	1	1	2	7	1995
China	Pickups, utility vehicles, vans	0	1	8	19	1995
India	Cars	1	1	1	9	1995
Malaysia	Cars	1	1	1	14	1995[b]
Malaysia	Vans	0	0	0	5	1995
Mexico	Cars	3	3	5	1	1997
Mexico	Pickups, utility vehicles	2	2	1	1	1997
Argentina	Cars	0	1	6	4	1997
Brazil	Cars	5	3	4	3	1997
Indonesia	Cars	0	0	1	13	1995
Indonesia	Vans, utility vehicles	0	1	2	10	1995
Thailand	Cars	0	1	3	7	1995
Thailand	Pickups	0	4	1	1	1995
S. Africa	Cars	0	0	4	17	1995
S. Africa	Pickups	0	0	1	7	1995

Sources: Humphrey and Oeter (2000: 61), DTI (1997: 12)
Notes: a Excludes models with production of under 1000 units in the relevant year.
b Data for Proton refers to 1997

Figure 5.2, which is based on interviews conducted in the mid 1990s, indicates that at the time the MIDP was being formulated, the output level of many component firms was indeed well below world scale. In addition, firms produced a much wider range of products and part numbers than was the case in advanced countries. Firms such as these suffered from what Lamming (1990), in the Australian context, termed the 'transplant/outpost' problem. For example, a South African component firm producing 20,000 units of a low volume domestic model had to compete with a German firm supplying say 500,000 units per annum to a couple of large European assembly plants. The German supplier could easily increase output to 520,000 units per year to supply the South African plant and the South African firm then had to compete with the marginal cost of the German supplier's additional 20,000 units of output.

The issue of proliferation in the assembly industry is less of a problem for firms producing standardised products such as batteries. This is the case especially where replacement demand adds to total domestic volumes. For firms involved in export markets, domestic volumes are clearly less of a constraint. Export markets, even if they are niche markets, will tend to be large and allow local component suppliers to achieve economies of scale. But if production for the domestic market is an essential first step, small domestic volumes will jeopardise the likelihood of eventual entry into export markets.

Some firms have been able to turn their expertise in small batch production developed to cope with South Africa's highly differentiated market to advantage. For instance, by using a highly flexible but labour intensive production process, Silverton Engineering, the radiator manufacturer listed in Figure 5. 2, was able to successfully enter the US radiator aftermarket by offering a substantial product range and targeting specialised niche markets. This enabled it to expand exports to the US at prices well above products from Taiwan and China, which had been competing on the basis of low prices and high volumes. But the exploitation of such niche markets is clearly not the basis for an integrated and low cost automotive industry.

Alfred Teves Technologies (Ate), the brake component producer in Figure 5.2 produced braking systems under licence from the German firm, Alfred Teves AG. At the time Ate produced 15,000 disc brake sets for the 3 series BMW at a cost of R146.00 each which was 28 percent above the price in Germany. If volumes increased to 60,000 vehicle sets the firm expected that they would have been able to match the German price. These savings could be achieved by a reduction in fixed costs especially in the amortisation of machinery. The key contributor would be reduced machine downtime because of a smaller number of machine changeovers)°

10 The case study of Ate in Chapter Six provides more detail.

Figure 5.2: Examples of the Scale of Production in South African Components Producers Compared to International Producers, 1993-1995

Body pressings — SA firm makes 1000 different components. Press shop in Japan would typically make 150 with much higher total volume.

Alternators, starter motors, electronic control units — SA firm produces 300,000 alternators per year. German parent company had recently established new plant in Wales with a capacity of 8 million alternators per year. The new SA plant producing electronic control units was more suited to low volume production as it was organised on a cellular basis. A European plant would be similar but with a larger number of cells replicating a similar production process.

Brake components — SA firm produced 28 different part numbers of brake calliper for total production of 300,000 pieces per year (an average of 10,700 units per part number). In contrast, the licensor company supplying fist callipers to BMW in Germany produced 425,000 vehicle sets per year of the same part number on dedicated lines out of plants in the UK and Germany.

Exhaust systems — largest SA plant was one third of the size of group's largest European plant and made a larger variety of products.

Steering Wheels — SA plant had capacity of 300 000/year compared to 2 million in German plant, which produced a smaller variety.

Pistons — SA producer used five lines to manufacture a wide range of pistons at a rate of 60,000 per month. Current batch size of 500 was being reduced to 200. A US based piston producer in the same world-wide group used seven highly automated lines to manufacture only seven variants but had a capacity of 600,000/month.

Engine castings — Local foundry was built with capacity of 12,000 tons per annum to make 20 types of casting. German plant had a capacity of 85,000 tons per annum and produced only 14 types of casting.

Radiators — Relatively low volume producer (1200-1800 units per day) produced an enormous variety of products. It had the tooling to produce in excess of 200 types of radiator and frequently produced in excess of 30 types per day.

Various components — Major automotive holding company with several component subsidiaries had conducted a survey of parts produced which indicated that less than 5 percent of the various parts produced were in volumes of more than 2000/month.

Source: Interviews. See also Black (1994).

3.1 The Costs of Low Volume Production

3.1.1 Vehicle Assembly

While there are no detailed calculations of the cost premium for assembling in low volume in South Africa, these costs are likely to be fairly small in line with international experience. There are three reasons for this. Firstly, assembly costs only constitute approximately 20 percent of total ex-factory costs; secondly, minimum efficient scale is reached at lower levels in assembly than in component manufacture and, thirdly, as I have indicated, firms are able to adapt to low volume production by limiting levels of automation and outsourcing. The main point, however, is that assemblers make the decision about whether to produce based on effective protection in the domestic market. If built up vehicles are heavily protected and local production is not subject to stringent local content requirements or heavy tariffs on imported parts, firms are likely to maximise their market share by producing multiple models even in low volumes.

3.1.2 Component Production

The main concern is with the considerable cost penalty borne by component makers for producing a wide range of products at low volume. Increased costs can result from a number of factors. These include the fact that capital and tooling costs have to be amortised over a lower volume of output, machine changeovers are more frequent leading to higher levels of machine downtime, quality becomes more difficult to manage and stock levels of materials and finished product tend to be higher. In low volume plants, high levels of automation are uneconomic. While flexible machinery may be available this is generally far slower than dedicated equipment.

The costs of low volume production and complexity vary enormously between firms depending on factors such as the nature of the production process and the level of capital intensity. The market is also an important consideration. In the aftermarket, competitive volumes may be lower for non-standardised replacement parts as in the Silverton Engineering example cited above.

Nevertheless, the cost penalties facing component firms at the time of the introduction of the MIDP, were generally high. These are indicated by the results of a survey conducted in 1994, the results of which are presented in Table 5.3. There was considerable variation in the potential cost reductions that could be achieved from reduced complexity and higher volumes by the various types of components firms. As was to be expected, firms which were totally oriented to exports and already achieving high volumes (e.g. catalytic converters) or produced mainly for the aftermarket (e.g. shock absorbers, exhaust systems) reported little benefit from higher volumes. Among the 52 firms who responded, it was expected that there would be an average 16.4 percent unit cost saving if volumes were doubled and complexity reduced by half. For firms where raw material comprised 25 percent or less of the selling price, this average potential saving was as high as 19.5 percent (Table 5.4). These results are broadly in line with studies in other countries)'

[11] See for example the studies cited in Bureau of Industry Economics (1988).

Table 5.3: Cost Reduction as Result of Complexity Being Reduced by 50 Percent and Volume Doubled, According to Type of Supplier

Percentage cost reduction					
No effect[1]	0-5	6-10	11-15	16-20	>20
Bearings	Shock absorbers	Electronic components	Transmissions	Seats	Brake pads
Catalytic converters	Exhaust systems	Cylinder blocks and heads	Body panels	Wheels	Filters
Bearings	Batteries	Cabling	Lighting	Wheel forgings	Wheels
Sparkplugs, ignition components	Shock absorbers	Starter motors and small motors	Ignition components	Castings	Sparkplugs
Catalytic converters	Seats	Tubing	Wheels	Filters	Gaskets
	Moulded interior components	Assorted sub-components	Propshafts	Springs	Pistons
	Sintered precision components	Cylinder heads	Sealants	Engines	Steering parts
		Plastic exterior components	Transmissions	Seating components	Exhaust systems
		Brackets, hinges, small pressings	Moulded interior components	Iron castings	Pistons
			Harness components	Jacks	Pressings
			Axles	Hooters and components	Various machined components
			Disc and drum brakes	Body pressings	Forgings
			Exhaust systems	Bearings	
			Engine castings	Trim Components	
			Rubber mats		
			Transmission components		
			Heating, cooling equipment		

Source: Compiled from raw data obtained from NAACAM.

Notes: [1] Most firms in this category were either operating in the aftermarket or fully engaged in export and already producing at close to minimum efficient scale.

Where a type of component appears more than once, this indicates more than one company among respondent firms producing that component.

Table 5.4: South African Component Firms – Average Cost Savings Resulting from Reduced Complexity and Higher Volumes

		Average cost saving at current volumes but with complexity reduced by half (%)	Average cost saving if complexity is reduced by half and total volume doubled (%)
Raw material as % of selling price	No. of firms		
0-25	7	10.1	19.5
25-50	30	9.2	18.0
50-75	15	7.2	11.9
All firms	52	8.7	16.4

Source: Compiled from raw data supplied by NAACAM.

4. POLICY RESPONSES

4.1 Trade and Industrial Policy in Industries with Scale Economies

As has been indicated, the level of proliferation in the South African automotive industry in the early 1990s constituted a critical impediment to the ability to compete internationally. The main costs were borne by supplier firms arising out of the production decisions taken by assemblers to produce a wide range of low volume models. These negative external costs borne by suppliers constitute a form of co-ordination failure and even in terms of neoclassical theory could justify industrial policy intervention. The argument for industrial policy to deal with coordination failure usually arises in the case where a project requires a series of simultaneous investments by independent agents in order to be viable (Murphy et al, 1989; Chang, 1996; Pack and Saggi, 2006). If all these investments are made (this is assumed to require some form of intervention) then all become economic whereas individually none are viable.

Tariffs and production or export subsidies could be used to address the problem of coordination failure leading to under-investment. Tariffs, local content and trade balancing restrict foreign access and encourage investment by distributing rents from consumers and foreign firms to domestic firms. [12] Consumers are unorganised and foreign firms have limited influence. These policy measures are therefore politically quite easy to implement. But as has been shown, protection can easily lead to a second type of coordination failure in the form of excessive entry (of new firms) and excessive proliferation (within firms) as new models are introduced. The result is significant scale diseconomies (Huang, 2002). Interventionist policies to limit entry and model proliferation are difficult to implement partly because of administrative complexities but also because they distribute rents among domestic firms and

12 Domestic firms are defined here to include foreign owned firms operating within the home country

require some selection of winner firms rather than sectors (Huang, 2002). This requires both strong institutions and a capable bureaucracy.

The South African case involves the restructuring of an established industry rather than the establishment of a new industry. The purpose of restructuring is to avoid the following scenario. Both Industry A (final product) and Industry B (intermediates) are profitable with protection (Period 1). Both sectors are subject to economies of scale, but these are more significant in Industry B which requires high levels of protection to operate below minimum efficient scale. In Period 2, as protection declines to moderate levels, Industry B, ceases investing. In Period 3 (low protection), Industry A rationalises its own production structure but is left without a viable source of intermediates and also becomes unprofitable.

4.1.1 Policy Options for Achieving Economies of Scale

For the developing country automotive industries facing this kind of problem in a situation of growing international competition, there are essentially four policy options available to rationalise the production structure. Options (ii) to (iv) below involve some element of industrial policy in the sense that they are sector specific interventions. As Pack and Saggi (2006) have argued, making the theoretical case for the more interventionist forms of industrial policy is usually easier than actually implementing them given the administratively demanding nature of industrial policies and the potential for unforeseen side effects.

1. **Rapid liberalisation:** The problem could be addressed via rapid trade liberalisation, which is aimed at reducing prices to domestic consumers as well as reducing input costs. With much reduced protection, firms would have to become globally competitive or shut down. This in turn would require firms to rationalise operations and produce at volumes which approached world scale. In the short to medium term, the costs to producers of such a strategy, probably in the form of plant closures, could be very high. Also, increased imports would reduce volumes being built domestically unless compensated for by exports. It is quite possible that economies of scale could, therefore, be reduced in the short term. One of the arguments for protection in heterodox trade theory where there are increasing returns to scale is precisely that protection would allow firms to increase output and reduce unit costs (Rodrik, 1995).

   While rapid liberalisation would clearly offer short term benefits to consumers, its impact on the industry would depend very much on the response of the major vehicle firms. Firms could either invest more to make their plants competitive and raise output to achieve scale economies or, alternatively, adopt an exit strategy. In turn this choice would depend not only on production costs within South Africa but on perceptions about the future of the domestic market, levels of investor confidence and so on. Rapid liberalisation would have been particularly inappropriate in South Africa in the mid 1990s with the economy growing only weakly and a high level of political uncertainty.

2. **Protection and local content requirements:** An alternative would be to maintain import duties on built up vehicles and impose local content requirements. High local content requirements would reduce the effective rate of protection for vehicle assembly and raise the cost of introducing new models. Because of the high tooling costs required for high levels of local content, it has typically been the case that assemblers in developing countries choose to skip new model introductions in order to amortise investment over a larger volume of total vehicle and component output. Countries such as Brazil used high local content requirements to encourage the development of the component sector and develop a manufacturing rather than assembly based industry. In the South African context of a relatively small market, the associated inefficiencies and lack of competition would have resulted in high costs for consumers not only in terms of vehicle prices, but because of the likely continued production of very dated models in the domestic market. Unless supported by other measures, exports would most likely have been minimal. Apart from the anti-export bias resulting from high levels of domestic protection, the tendency to skip new model introductions because of the associated high investment costs, would make it difficult to export.[13] At the time that the MIDP was being formulated, local content requirements had already been reduced (under Phase VI) and any steps to reintroduce them would have been seen as a major policy reversal as well as being in conflict with South Africa's WTO obligations.

3. **Trade balancing and export subsidies:** Another approach which has been adopted in various forms in a number of developing countries is some form of trade balancing or 'import-export complementation' by which firms are required to (at least partly) balance their trade. Again, a prime objective has been to promote exports as well as local content but in many instances, an objective has also been to promote economies of scale. The advantage of these

13 In the low income countries of southern Africa there is a small market for older models

kinds of policies over pure protection is that by encouraging exports while allowing firms to import some of their low volume requirements, the level of specialisation can be increased. A common method of achieving this is to allow exporters to rebate duties on imports. In some countries, for example Brazil, firms could achieve the required trade balance by exporting and also by making specified investments.

4. **Specific industrial policy interventions:** The policies mentioned above do not have rationalisation as their main objective and are, at best, rather blunt instruments. A fourth approach is to use specific industrial policies to restructure the industry and address the problem of coordination failure resulting from high protection. This can be achieved by limiting entry and/or by reducing the number of makes and models being assembled domestically. Such policies could be more or less interventionist. Korea provides an example of heavy, and generally successful, intervention applied from an early stage in the development of its industry (Oman, 1989; Huang, 2002). Entry was restricted and different sectors of the vehicle market were allocated to selected producers, which were required to produce at specified volumes. At the same time, the government imposed an effective ban on vehicle imports. High volumes were thus achieved virtually from the outset — a very unusual situation among developing countries. Japan used similar policies in the early stages of its automotive development and was to some extent used as a model by Korean policymakers. This, however, was not a route open to an established industry with a large number of existing, foreign owned, producers such as existed in South Africa.

Australia, seeking to liberalise its well established but highly protected industry, adopted a much milder form of industrial policy as part of the 1985 Australian Passenger Motor Vehicle Manufacturing Plan, more commonly known as the Button Plan (Industry Commission, 1990). This was achieved by applying a set of penalties and incentives to encourage the dropping of low volume models. Vehicle producers were able to import a certain portion of their component requirements duty free and this duty free allowance was made partly contingent on achieving specified model volumes. This policy, combined with quite rapid tariff reductions, was certainly effective in rationalising the industry. The Nissan plant closed in 1992 and the number of models being produced fell sharply (Table 5.5) resulting in an increase in average model volumes. Although the share of the market taken by imports increased, Australia was able to preserve the bulk of its industry, although employment in vehicle assembly fell by 30 percent from 1985 to 2002.

Table 5.5: Passenger Vehicle Production per Model in Australia, 1985-1993

Sales volumes	1985	1986	1987	1988	1989	1990	1991	1992	1993
0-19 999	4	8	6	2	2	0	1	2	0
20 000-29 999	6	2	4	4	2	2	2	1	2
30000-39 999	1	1	1	1	3	2	2	3	0
40 000+	2	2	2	3	2	4	3	2	4
Models manufactured in the year	13	13	13	10	9	8	8	8	6
Total production (units)	382,167	317,289	309,773	320,755	364,274	377,461	288,380	277,725	294,070
Average volumes per model	29,397	24,406	23,828	32,076	40,475	47,183	36,048	34,716	49,012

Sources: Automotive Industry Authority (1990, 1993, 1994)

4.2 Policy and Industry Rationalisation in the South African Automotive Industry Prior to the MIDP

The conundrum outlined above had been a concern of South Africa's automotive policy since before the imposition of the MIDP. However, in the various phases of policy leading up to and including Phase VI, while it was recognised that the desirable objective of increasing plant and model volumes could only be attained through rationalisation and a reduction in the number of assemblers, it was argued that this should be allowed to happen through normal market processes. No specific measures to deal with this problem were introduced.

So while local content rose rapidly in accordance with the requirements of the various phases of the local content programme, contrary to government expectations, this did nothing to reduce the number of assembly operations. Apart from the producers, which currently have assembly operations in South Africa, companies such as Leyland, Peugeot, Renault, Citroen, Chrysler and Daihatsu were all assembling vehicles in South Africa by the late 1960s (Duncan, 1991). There were also no less than eight engine plants in operation together with more than 200 component firms, most of which were producing solely for the local market. Rapid growth was thus accompanied by the proliferation of assemblers and also by the development of a low volume components industry oriented towards the production of heavier components such as body pressings (due to local content being measured by weight).

In all these developments, the main motivating factor for increasing local content remained the desire to save foreign exchange. A series of Board of Trade (1965, 1977) reports recognized the need to increase production volumes and the advantages of standardisation and frequently referred to the need for rationalisation. But at the same time they sought to maintain a choice of vehicles and, therefore, did not introduce very stringent local content requirements. There was a rather naïve belief that market forces would bring about some rationalisation. Proponents of more interventionist polices to rationalise the industry by limiting the number of assemblers and pushing up local content to the 90 percent level did not prevail. Thus, high rates of protection were maintained on built up vehicles, no restriction was placed on the number of assemblers entering the market and local content requirements were kept at moderate levels (Black, 1994).

The problems inherent in the above approach to the promotion of local content had become obvious during the recessionary years of the 1970s. The situation was aggravated by the severe slump, which followed the gold boom of the early 1980s. This sharp decline accompanied by disinvestment pressures did lead to some rationalisation. The assembly of Alfa Romeos and Renaults ceased. Amcar (assembling Mazdas) and Ford merged to form Samcor. Thus by late 1986, there were seven assemblers producing over 20 basic model variants for a market of 172,000 passenger cars. Even though this represented a considerable improvement on the situation in the 1970s, when there were no less than 16 assemblers and 53 model lines (BTI, 1988: 64), volumes were still very low and the industry remained uncompetitive.

As indicated in Chapter Three, local content requirements were relaxed under Phase VI, which was introduced in 1989. One of the problems of previous programmes was uneconomic volumes and the resulting high cost production structure. The support for exports under Phase VI combined with sharply reduced protection for imported components meant that this problem was partially addressed from the perspective of vehicle assemblers. However, a major defect of the programme was that it did not address the major factor impacting on the scale of production in the components sector — proliferation of makes and models in the domestic market. In fact, the impact was rather the reverse. By increasing the flexibility of component sourcing (and hence reducing protection on components) but at the same time maintaining high nominal protection levels on built up vehicles, the effective rate of protection on vehicles increased sharply under Phase VI. The predictable result was an increase in the variety of models and makes being assembled locally in spite of the stagnant market.

Exports of vehicles could have led to greater specialisation and higher volumes but under Phase VI these were minimal and were motivated by the incentive and under-utilised capacity rather than a drive to specialise in the production of one or two models for the world market.

The major problem facing component producers was that they faced increased import competition but their base load in the domestic market had become increasingly varied. Thus low volume, high variety domestic component producers were being pitted against high volume, low variety international producers. Some could deal with this problem through niche market or high volume exports but many component suppliers faced serious constraints in embarking on such a strategy.

4.3 The Motor Industry Task Group and the MIDP

Key automotive industry stakeholders were represented in the Motor Industry Task Group (MITG), which was established in 1992 to advise government on a new automotive industry policy. Industry rationalisation was one of the objectives of the policy being developed. The motivation was simple — under Phase VI component producers faced growing competition and had to compete with foreign, high volume producers on what was effectively an uneven playing field. This was because the volumes per model being produced in the domestic assembly industry were exceptionally low. From the start, the component producer's federation, NAACAM, motivated strongly for intervention to encourage industry rationalisation. Certain carmakers supported the objective but favoured a facilitative policy framework rather than direct intervention to bring it about.[14] MITG participants soon decided that the proposed programme for South Africa would draw on the basic architecture of the Australian automotive strategy. This would entrench the system of import-export complementation established under Phase VI and add gradual duty phase downs.[15] Vehicle producers would receive a duty free allowance which would enable them to import a certain percentage of their component requirements duty free. In addition, proposals similar to the Australian system of penalties and incentives to reduce the number of models being locally produced were put forward by NAACAM with support from the metal workers union, NUMSA. The Chairman of the MITG, Derek Riley, also favoured policies, which would encourage rationalisation in the industry.[16] The various variants of this proposal all made the level of duty free allowance partly contingent on certain model volume requirements being met. This direct approach to volume rationalisation proved to be the most contentious issue in

14 See "Cut car model numbers urges new BMW head", *Weekend Argus* (19/20 December, 1992)

15 Duties remained substantially higher than had been the case in Australia.

16 Riley had previously been chief executive of a large component firm and was familiar with the impact on component suppliers resulting from a fragmented assembly industry.

the Task Group's two years of deliberations and led to bitter conflict between NAACAM and NAAMSA. The proposals eventually put forward by the Task Group MITG provided for substantial penalties for firms which did not attain specified model volumes. In order to achieve a basic DFA of 10 percent of turnover, it was proposed that assemblers should attain the minimum average volumes set out in Table 5.6. Additional DFA of up to 17 percent of turnover could be achieved depending on the volumes produced for each model.[17]

Table 5.6: Model reduction proposal – Report of Motor Industry Task Group

Year	Average model volume
1995/96	7,500
1996/97	8,500
1997/98	9,500
1998/99	10,500
1999/00	11,500
2000/01	12,500
2001/02	13,500
2002/03	15,000

Source: Motor Industry Task Group (1994)

The specified model volumes were very low by any kind of international standard. For instance, in order for firms to achieve the maximum DFA, which would apply in 2000/2001, they would need only to produce a minimum of only 17,000 vehicles of each model. While this would have represented a significant increase on the model volumes that prevailed in the mid 1990s, it was nowhere near sufficient to justify a significant increase in 'economic' local content. Nevertheless, this aspect of the proposals was vehemently opposed by NAAMSA who cited a number of concerns. They argued that the loss of a significant portion of the duty free allowance could be crippling for vehicle manufacturers. A particular firm's production could fall as a result of exogenous factors such as a decline in domestic demand. Also, they argued that luxury carmakers could not be expected to achieve the same volumes as assemblers of economy vehicles. The result would be competitive distortions. If rationalisation was strongly pursued, the outcome could be a lack of choice and a reduction in competition. This was because achieving minimum efficient scale of 150,000 - 200,000 units would allow for the production of only two basic models in South Africa, which would neither allow for sufficient choice nor competition among producers. A third problem was the definition of exactly what constituted a model. While it was felt that all vehicles built on a single 'platform' would qualify the definition of 'platform' was itself problematic.

17 The MITG Report recommended that the maximum DFA decline gradually from 27 percent to 23 percent by 2002/2003 (Motor Industry Task Group, 1994).

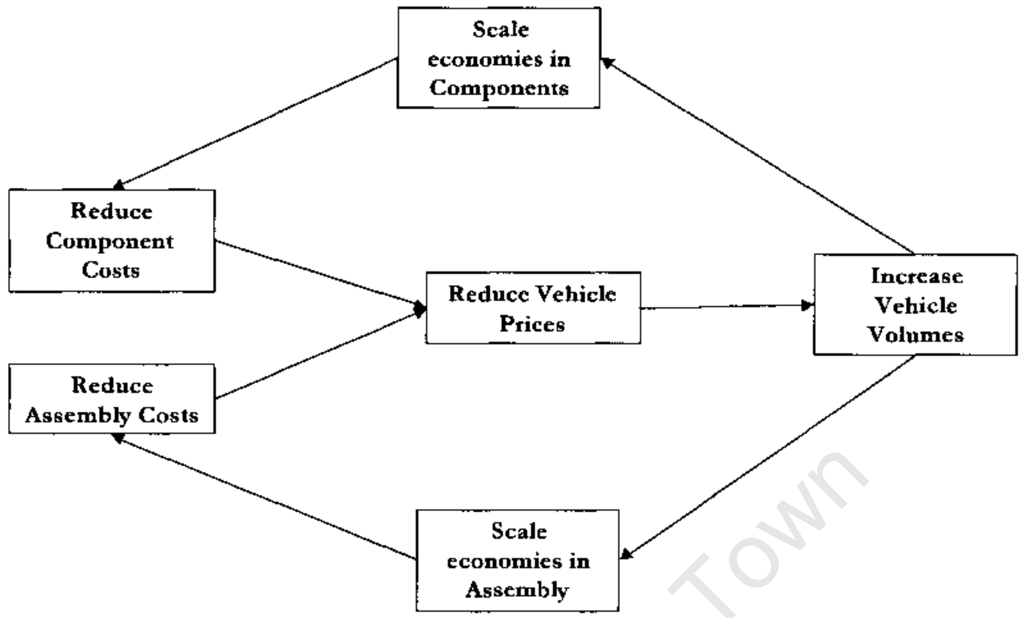
NAAMSA presented a united front on the issue, although it was clear that its member firms had different views. Mercedes Benz, a low volume carmaker at the time, was most strongly opposed, citing "grave reservations as to the effectiveness of a differentiated DFA" and hinting that it may force the closure of the East London plant. [18] Samcor managing director, Robert Herbertson, argued that that the recommendations will become an "administrative nightmare and force the industry down certain routes with mathematical precision".[19] Toyota, with two relatively high volume models and a dominant share in the South African market, was supportive of the general principle, although the company did not publicly break ranks with the NAAMSA position.

These problems illustrate the complexity of this form of industrial policy. As Huang (2002) has argued in the Chinese context, the selection of 'winner' (and hence also loser) firms as opposed to sectors creates major difficulties for policy makers. Government itself was not united on the issue and the combination of strong opposition from NAAMSA together with the perceived complications of introducing this system led to government rejecting this aspect of the MITG proposals. The Motor Industry Development Programme that was finally introduced in 1995 had the stated objectives of high quality affordable vehicles, sustainable employment and a greater contribution to national growth. However, the policy did state that one of the measures by which these objectives were to achieved was via "increasing the volume and scale of production by the expansion of exports and gradual rationalisation" (DTI, 1987: 2). The MIDP sought to increase the volume and scale of production though a greater level of specialisation in terms of both vehicle models and components. It was hoped that higher vehicle volumes would allow for the attainment of economies of scale for component producers moving them further down their respective cost curves and enabling a higher level of localisation on an economic basis. In turn this would bring down assembly costs further (Figure 5.3). The route to achieving this was by encouraging a phased integration into the global automotive industry and achieving increased specialisation and economies of scale via increasing trade.

18 Minutes of the twenty sixth meeting of the MITG Long Term Working Group, 28 January 1994.

19 See 'Motor industry reacts to 'flawed' MITG report' *(Engineering News,* 8 April, 1994).

Figure 5.3: The Schematic Impact of Higher Volumes and Economies of Scale



4.4 Mid-Term Review

After the implementation of the MIDP, NAACAM continued to strongly argue the case for direct intervention to ensure higher model volumes both in the newly established Motor Industry Development Council (MIDC)[20] and in separate representations to government. Certain sectors of government were sympathetic to this position. Government was concerned about reductions in local content and believed that some direct form of penalty or incentive could encourage a shift to a more rational industry structure, which would enable component producers to achieve the volumes necessary to lower their cost structures.

The issue came to the fore again in the Mid-Term Review of the MIDP which got underway in 1998. Government initially proposed making the Duty Free Allowance partly contingent on achieving specified model volumes. This was in addition to a rapid phase down of the valuation of exports for import rebate purposes. By the time of the Mid-Term Review, there was greater unity in the industry than previously. The assemblers who had been so bitterly opposed to specific measures to promote rationalisation were now more keenly aware of its importance for the survival of the industry as lower tariffs began to bite.

20 The Motor Industry Development Council was established in 1996 with representation from all major stakeholders. Its purpose was to monitor the MIDP and advise government on the development of the industry.

However, a number of factors led to directive measures not being adopted:

a) Although NAAMSA now viewed some form of rationalisation measure as acceptable, the precise form of this remained in dispute. There were clear differences between various assemblers based on their own market and production situation. Those with high domestic sales volumes or the prospect of large export contracts were naturally more supportive of a volume incentive than those that had little prospect of achieving higher volumes in the short term. Ford raised a further complication. The company produced a large number of low volume models but argued, with some justification, that its large scale engine plant was creating high volume opportunities for suppliers of engine components.

b) The proposal would have added significantly to the complexity of the MIDP while, in principle, government wanted to make it simpler and reduce administrative costs.

c) Some areas, in particular, posed major administrative and regulatory challenges. For example, the definition of a model posed problems with important ramifications. The precise meaning of the term platform was also open to dispute. The result was that technical design decisions by parent firms regarding the configuration of platforms and models would have had major implications for the viability of their South African affiliates. The measurement of what constituted target model volumes also posed challenges — for example, if an absolute target was set, firms would face major penalties if the market declined or if they lost market share. Producers of luxury vehicles with limited market share felt that they would be discriminated against. Another group of firms who felt unfairly penalised were those without the short term prospect of an export contract. Of course, it could be argued that direct intervention may have forced the hand of the parent company to award an export contract to its South African affiliate or run the risk of weakening its position in South Africa. Nevertheless, as a result of all these factors, it is clear that the proposed measures would have introduced a large element of discretion into the administration of the programme. This in itself need not have been an overwhelming obstacle as long as appropriate bureaucratic capacity was established.

d) Such a measure would have forced rationalisation in the domestic market and accelerated the dropping of ageing, lower volume models including those which had high local content. The short term implications for employment were thus a concern. Rationalisation would also lead to job losses in assembly plants, at least in the short term.

e) Most importantly, with little growth in the domestic market, it had become evident that the key to raising volumes was exports. The growth in vehicle exports gave hope that greater volumes were at last going to be achieved even if at a pace which was much slower than desirable. Forcing rationalisation in the domestic market would be a blunt instrument to achieve higher volumes as the potential gains in model volumes were, in any event, modest in relation to the volumes required for component producers to reach minimum efficient scale.

f) A further complication was the involvement of Southern African Customs Union (SACU) countries, in particular Botswana, which had established its own low volume motor assembly plant. The Wheels of Africa plant produced Hyundai vehicles under licence and was a flagship of Botswana's nascent industrialisation. The company wielded considerable political influence and argued that on 'infant industry' grounds it should be treated differently and that it would unfair for it to be subject to the same volume requirements as the 'mature' South African industry. This indicated the extent to which industrial policy is compromised within a customs union or even in a free trade area.

The result of all these factors was that specific rationalisation measures were not adopted. What the Mid-Term Review did do was to continue the reduction in tariffs until 2007 and also phase down the valuation of exports which effectively required the vehicle producers to export more to import the same amount under rebate of duty. [21]

5. THE EFFECT OF POLICY ON ACHIEVING SCALE ECONOMIES

As indicated above, the MIDP had two main elements; moderate but declining levels of protection and a system of import-export complementation. There were no specific measures to promote rationalisation or to restrict the introduction of low volume models.

21 See Chapter Four.

Gradual tariff reductions certainly raised the competitive temperature. But falling nominal duties on imported vehicles were complemented by falling duties on components and a Duty Free Allowance for component imports. The result was that the effective rate of protection on vehicle assembly remained quite high so in the initial stages of the MIDP, the pressure to rationalise was limited. A number of new, low volume models were introduced in the years following the introduction of the MIDP. Manufacturers such as Daewoo, Renault and Peugeot also investigated the establishment of small scale assembly plants in South Africa [22] although these investments never materialised.

The objective of the import-export complementation system was to encourage specialisation. The idea was that firms could focus on producing one or two models for the domestic market and for export. Raising production volumes would enable firms to reduce unit costs through simplifying production processes and by bringing down purchasing costs. It would also enable them to increase local content on an economic basis. However, market share considerations dictated that a prerequisite would be that they were able to maintain their model range — and this required importing. Import- export complementation allowed them to do this by offsetting import duties on imported vehicles.

One strategic choice that faced firms was to reduce the number of models and expand production of remaining models for both the local market and export.[23] Significant investment was, however, required to upgrade the plant to meet higher volume and quality requirements. Thus the decision would be made by the parent company and determined by its global requirements. But firms could also pursue a strategy of exporting large volumes of components and offsetting duties on imports of CKD components[24] and thereby introduce low volume models with low local content. Initially most firms opted for this latter strategy. Although declining tariffs on vehicles led to growing imports, assemblers were insulated to some degree because protection of components had been significantly reduced. The industry was also expanding exports very rapidly, especially of components, which were in many cases facilitated by the vehicle manufacturers. The Low Volume Strategy was less risky in the short term as car makers did not have to invest in upgrading plants to raise volumes and improve quality to international standards.

In the aggregate, no rationalisation took place in the first phase following the introduction of the MIDP (Table 5.7). In fact, there was a spate of new models introduced during this phase,

22 See for instance 'New Daewoo plant on the agenda' *(Financial Mail,* 30 May 1997), 'Renault could start production engine up in SA' *(Sunday Times,* 20 July 1998), Peugeot to set up shop again, says council report' *(Business Report,* 19 April 1999).

23 See 'Rationalisation Strategy', Table 8, Chapter Four.

24 See Tow Volume Strategy', Table 8, Chapter Four.

many of which had very low levels of local content. The number of passenger vehicle models being domestically assembled in volumes of 10,000 or less actually increased from 10 in 1995 to 13 in 1999. This process was encouraged by the Small Vehicle Incentive, which allowed assemblers to achieve higher Duty Free Allowances for vehicles sold below a specified price. [25] It therefore acted as an incentive for most firms to introduce a low end model where they did not already have one and led inadvertently to greater proliferation in this sector. This created difficulties for the component sector especially for 'traditional' suppliers to the domestic assembly industry.

With the exception of one or two models, which attained high sales in the domestic market, the domestic production of high volume models could only be attained by exporting. While most South African based assemblers had supplied the countries of the region for some years, these volumes were negligible and high volume export contracts required an allocation from the parent company. Rising production efficiencies, pressure on local margins as well as clear government policy were necessary to force the hand of the parent company. VW began delivery on a large export order to the UK in 1998. BMW started its large scale export programme after investing heavily in its Rosslyn plant and domestic production of the 3 Series reached 42,000 units in 2000 with 70 percent of output being exported to markets such as the UK, Australia and Japan. [26] Other firms then began to follow suit and by 2001 vehicle exports exceeded 100,000 units and the three German assemblers (BMW, VW and DaimlerChrysler) had all established significant export programmes. Mainly as a result of these export programmes, production of the 3 series BMW, and the Golf/Jetta exceeded 40,000 units with the C Class Mercedes being the next highest volume model at 38,000 units. Only the domestic market leader, Toyota, was able to achieve reasonable volumes on the basis of the local market. It produced the Hilux and Tazz in volumes in excess of 20,000 while its production of the Corolla was 19,000 units.

The expansion of export volumes at some plants also meant the dropping of certain models. For example BMW terminated local assembly of its 5 and 7 series cars. In 2000, DaimlerChrysler discontinued contract assembly of Honda cars and other low volume models. Up to that point, according to Fritz van Olst, DaimlerChrysler's director for sales and marketing:

> *"the plant was one of the most complex facilities in the DaimlerChrysler stable where two different brands of trucks (Mercedes-Benz and Freightliner), one line of buses and*

25 See Chapter Three.

26 See 'BMW's vote of confidence in SA pays off(*Sunday Times Business Times,* 18 February, 2001).

three different brands of passenger cars (Mercedes-Benz, Honda and Colt) were *produced under one roof. In order to integrate ourselves with the rest of the group, it was felt that we would do far better, through economies of scale, to focus on fewer models in greater numbers "*[27]

A visit to the DaimlerChrysler plant in 2002 revealed a totally transformed operation to what had existed previously.[28] Before it was upgraded, the plant produced a wide range of truck and car models in tiny volumes in a rambling, outdated facility. After the major capital expenditure undertaken in 2000, the plant was producing just two platforms but overall capacity had doubled and the plant had been extensively modernised. Nevertheless, levels of automation and output remained significantly below DaimlerChrysler's European operations.

Table 5.7: Volume Performance and Average Model Volumes for Passenger Cars

	1992	1993	1994	199519	96	1997	1998	199920	00	2001	2002	2003	2004	2005
0-9999	10	8	8	10	9	12	12	13	12	7	7	6	5	4
10 000 - 19999	9	8	8	7	8	7	6	5	4	5	4	3	2	1
20 000 - 29999	0	0	1	3	3	2	3	2	3	1	1	2	3	2
30 000 - 39999	1	1	1	1	1	I	-	1	2	1	-	2	1	1
40 000 +	-	-	-	-	-	-	-	-	-	2	3	2	3	4
Models manufactured	20	17	18	21	21	22	21	21	21	16	15	15	14	12
Production	192662	205032	196979	242488	242527	228179	193212	212291	230577	269651	276499	291249	300963	324875
Average model	9633	12061	10943	11547	11549	10371	9201	10109	10980	16853	18433	19416	21497	27072

Sources: DTI (various years); NAAMSA (various years)

Firms such as Ford and Nissan continued to follow a low volume, multi-model strategy. By 2001, they had only limited export programmes and their position in the domestic market was not particularly strong. Ford produced only 47,000 units in 2001, spread across no less than five models. This included production of Volvo cars which was moved to the Ford plant following the closure of the Wheels of Africa plant in Botswana.[29] In addition very small volumes of the Landrover were produced at a separate plant. The Nissan facility produced only 36,000 units with six model platforms including two Fiat models. The more recent models introduced by both Ford and Nissan had very low local content but in the short term this strategy could be sustained through large scale exports of components. Ford, for instance, had invested heavily in its high volume engine plant which was producing primarily for the export market.

27 'Honda assembly ends' *(Business Day*, 19 January 2000).

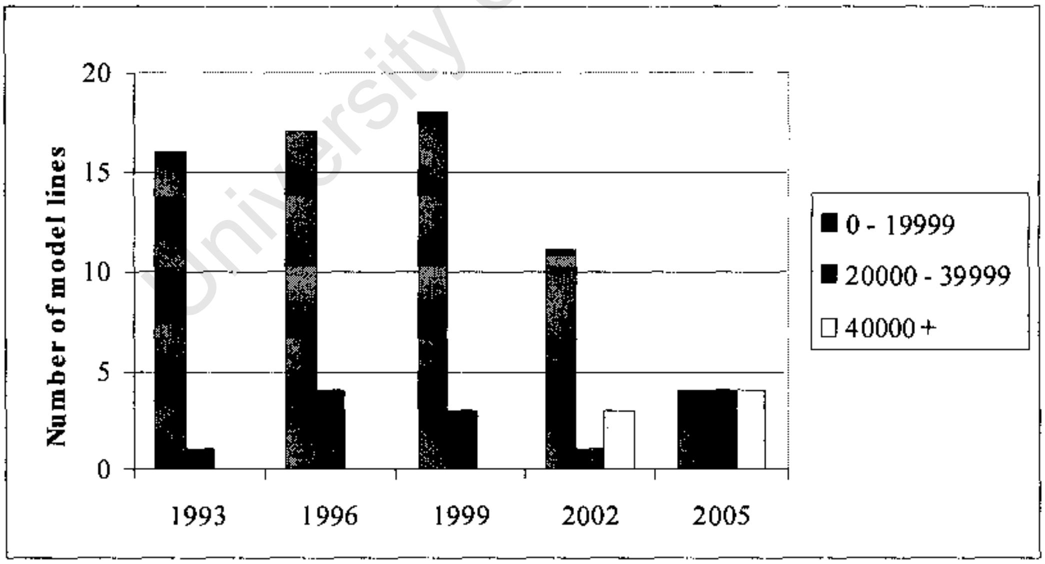
28 Plant tour, DaimlerChrysler, East London, 2002

29 'Volvo SA to move manufacturing to Samcor plant' *(Business Day*, 28 February, 2000).

Since then other carmakers have announced the introduction of large scale export programmes. In 2002, exports began with the Corolla mainly to Australia and in 2005 Toyota began large scale exports of the Hilux pickup, a programme which will raise production at its Durban plant to 200,000 units per annum. [30] By 2005, there were five models produced in volumes in excess of 40,000 units (Table 5.8). The structure of the industry had by this stage changed quite significantly (Figure 5.4). Low volume models were increasingly being imported, although as Table 5.8 indicates, some vehicle models continued to be produced in very low volumes. There were also indications that the Indian firm, Tata, was planning to invest in assembly. [31]

In spite of higher volumes being achieved in South African assembly plants, from the perspective of policy makers, levels of local content have remained frustratingly low. [32] Given the fundamental objective of the MIDP, government would like to have seen both higher levels of localisation and a wider range of components being exported. In interviews conducted in 2002, assemblers indicated that they faced major difficulties expanding local content and developing exports of new types of components. This is because domestic suppliers lacked the technology and capacity to supply them. To deal with this constraint would require large-scale investment, including a substantial expansion in foreign investment.

Figure 5.4: Structural Change in Passenger Vehicle Production: Volume Production per Model, 1993-2005



Source: Derived from Department of Trade and Industry, various years; NAAMSA (unpublished data)

30 See 'Export plan should put R120bn into Toyota's coffers by 2011' *(Business Day,* 26 April, 2005).
31 `Indian group hopes to align imports with exports', *(Engineering News,* 25 November 2005).
32 Chapter Four provides more detail on this question.

The key problem in persuading both local and foreign firms to undertake such investments remained the problem of low domestic production volumes. Even the highest volume models (40-50,000 units) being produced in South Africa at that stage were insufficient to justify local content levels significantly above (low) existing levels. World scale volumes necessary to justify investment in the bulk of components required a model build of at least 100,000 units per annum. [33]

Table 5.8: Models Manufactured in South Africa, 2005

Manufacturer	Model	Total Production (units)
VW	Polo	45,761
BMW	3 Series	43,356
Toyota	Hilux	42,942
DaimlerChrysler	C Class	42,149
Toyota	Corolla	41,251
Delta	Corsa/Utility	40,395
VW	Golf/Jetta	39,113
VW	Citi-Golf/Pickup	28,816
Toyota	Tazz	24,506
Nissan	Hardbody	22,313
Delta	KB/Frontier	20,612
Ford	Ikon/Bantam	20,289
Ford	Mazda 3/Focus	19,844
Ford	Ranger/Drifter	17,016
Toyota	Hi-Ace	9,922
Nissan	1400 LDV	9,055
DaimlerChrysler	Colt	8,980
Nissan	Almera	8,954
Fiat	Palio/Siena	3,935
Ford	Ford other	2,182
Toyota	Condor/Stallion	1,717
Ford	Mazda other	1,032
Fiat	Strada	1,031
Ford	LR Defender	959

Source: Compiled from NAAMSA (unpublished data)

The question then arises as to whether it was possible for a local subsidiary of a foreign first tier supplier to supply say 50,000 units to domestic assemblers and export a further 150,000 units thus achieving minimum efficient scale and allowing the domestic assemblers also to benefit from lower cost, locally produced components. Assemblers argued that attracting such

[33] Interviews

investment would require competing with capacity in established plants in Europe, the US or other locations.[34] It became common practice, therefore, that the main criteria for the selection of the type of components to export were the requirements of the parent company networks and actual or potential competitiveness. This resulted in a situation whereby the development of component exports was not necessarily linked to the component requirements of domestic assemblers. This was a major drawback because local assemblers were not benefiting from the economies of scale being generated by high volumes achieved in part through exporting.

With the introduction of vehicle export programmes, there was some investment, mainly by foreign firms or joint ventures, in high technology, first tier components. But as chapter three indicated, many of these new suppliers were themselves primarily assembly operations and used mainly imported sub-components. Again the reasons for this were that these components were being produced in volumes of under 50,000 units per annum which did not justify the localisation of component manufacture in most cases.

6. CONCLUSION

In spite of the adoption of new forms of production organisation and flexible technologies, the automotive industry remains characterised by considerable economies of scale. High levels of effective protection on assembly have led to low volume production in many developing country automotive industries. This has constituted the major structural problem in the South African industry and remains a serious impediment to competitiveness. While it raises costs in the assembly sector, the negative external costs on the component sector are even more significant.

While a clear theoretical case on the grounds of coordination failure can be made for industrial policy to deal with the problem, design and implementation is not a simple matter. In practice competing interest groups and conflicting objectives create further difficulties. As is always the case, the lack of a counterfactual (in this case, the imposition of rationalisation policies) makes it difficult to assess whether more specific industrial policy measures would have been successful. Even assuming that government had been prepared to override strong opposition from multinational firms, such policies would have encountered a number of further problems. First, there is the problem of governmental capacity to design and implement a suitable set of measures.[35] Essentially the objective would be to restrict entry and

34 Interviews.

35 See Kaplan (2006) for a discussion of the limitations on South Africa's industrial policy imposed by governmenta1 capacity.

reduce the number of models being produced domestically. Designing such a policy is complicated and the potential for unforeseen outcomes is high.

Secondly, the purpose of promoting specific rationalisation measures was to achieve higher volumes and as result, higher local content. Higher volumes have been achieved by supplementing the domestic market with exports, with the latter being supported by the import-export complementation system. This has happened in any event and it is by no means certain that this could have been achieved more quickly by forcing rationalisation on firms. Certainly rationalisation could not have achieved significantly larger volumes than are now being produced without drastically reducing choice and competition.

Thirdly, it turns out that higher volumes have constituted at best a partial solution. Volumes exceeding of 40,000 units per annum have been achieved in certain vehicle models but this has not been enough to ensure high levels of local content. While there have been investments by first tier suppliers, these themselves frequently have low local content (see Chapter Four). High volume component exports have been developed but these have had a limited impact on the cost structure of the domestic assembly industry. It remains to be seen whether the recent boom in sales and production will alter this dynamic.

Import-export complementation has facilitated the achievement of higher volumes although as we have shown in this chapter[36], this can also lead to perverse outcomes as firms initially used the trade balancing measures to rebate import duties on component imports while introducing large numbers of low volume models. It is probably true that lower tariffs were necessary to impose a degree of discipline on carmakers. It forced them to make their plants more efficient and the trade balancing mechanism then facilitated the expansion of vehicle exports. With hindsight, higher levels of protection on the component sector (with rebates for exporters) may have encouraged further investment in this sector and accelerated the rationalisation process. Rapidly rising vehicle imports are now increasingly becoming a factor in the rationalisation process. Unless export growth can be maintained, it is likely that the negative impact on production resulting from a growing import share will limit further progress.

36 See also Chapter Four.

CHAPTER SIX

THE TRADE REGIME, TECHNICAL CHANGE AND FIRM LEVEL RESTRUCTURING IN THE AUTOMOTIVE COMPONENT SECTOR

1. INTRODUCTION

As indicated in earlier chapters, the South African automotive industry has become much more open to international competition over the last decade and a half. A key determinant of the outcome of the liberalisation process is the effectiveness with which existing firms are able to adjust from being protected, high cost producers to becoming effective competitors in domestic and overseas markets. This outcome is more important, at least in the short term, than the emergence of new firms and sectors which may develop in a more open economy.

This chapter examines the process of restructuring in the component sector by analysing firm level responses to globalisation. From a policy perspective, it is naturally preferable that firms select the high road of new investment, technical change and upgrading rather than allow accumulated capital and capabilities to be dissipated in a gradual exit strategy. While liberalisation usually requires difficult adjustments by domestic firms, the destruction of large swathes of industry carries high costs because of the associated losses of established plant and production capabilities.

Key areas of focus in this chapter are the processes of learning and technical change, which in turn govern the capacity of firms to respond to a new, more competitive environment. The nature of fixed capital and accumulated capabilities under the previous protectionist regime may constrain the capacity of domestic firms to restructure production. But the accumulation of technological capabilities may also make it possible for firms to adapt quite rapidly and take advantage of new international links in the form of export markets and new supply opportunities to multinational firms establishing domestic operations. Increased foreign control and ownership has frequently been central to the adjustment process. This in turn has significant implications for the nature of technological development and for upgrading more generally.

Section two briefly establishes how I understand processes of learning and technological change. It then goes on to examine the character and trajectory of technical change in manufacturing firms in developing countries, which differs in important ways from that in the developed world. Apart from different factor costs and much lower technological capacity, developing countries are characterised by differences in industrial structure, smaller markets and relatively higher levels of protection. The result is that technical change takes place mainly through incremental adaptations and improvements. It has been argued, therefore, that it is more appropriate to cast LDC firms in protected industrial sectors not as technologically un-dynamic, but more as technologically `mis-directed', in terms of the requirements of global competitiveness. This has important implications for their capacity to adjust to global competition. While they may have developed significant technological capability and adapted efficiently to the conditions in the protected market, low volume production and limitations in core product and production technologies may place them at a serious disadvantage to foreign competitors.

Liberalisation has a shattering effect on the previously protected industrial structure; it impacts on the operations of firms, on their markets and on their supply chains. The impact is all the greater because of the much increased role of foreign firms. While there have been a number of greenfield investments in the South African automotive sector, much foreign direct investment has involved the takeover of domestically owned firms or the establishment of joint ventures.' This section also, therefore, briefly surveys the international experience regarding the implications of growing foreign control for firm level upgrading in the automotive industry.

Section three outlines recent developments in the South African component sector from a learning perspective. It illustrates how the technological capabilities of the industry were shaped by protection. Import substitution policies had important implications for the trajectory of technological development in terms of the investments undertaken, the degree of automation and type of learning processes within firms. The production and technological capabilities of firms were geared to the requirements of a small, protected market rather than international competition. For example, in the era of protection, firms had to serve a market characterised by low volumes and wide variety. They became highly proficient at supplying this market but at costs well above international prices. So while considerable learning took place, costs were high. The lack of specialisation had implications too for the development of design. Domestic firms tended to rely on licensed technology as low volumes could not justify large investment in R&D. All these factors had important implications for how firms

See Gelb and Black (2004) for a discussion of the entry strategies of foreign firms in South Africa.

have responded to the onset of tariff liberalisation. A more open trading environment has brought greater competition and much greater involvement by foreign firms. The transition from low volume, flexible producer to high volume supplier to international markets is a wrenching one. This in turn has substantial implications for technological capabilities in the sector. For example, the R&D requirements are totally different and in some cases have been downgraded.

The main section (section four) presents a series of case studies of how component firms developed under protection and how they have responded to changes in the trade regime. [2] Case studies naturally suffer from the usual limitations of this approach. [3] They are instructive on the complex links between the technological capability of firms, changes in the trade regime and firm level restructuring but do not allow for generalised conclusions regarding the pattern of restructuring and the measurement of productivity gains or cost reductions. Nevertheless, they provide a series of useful pointers regarding the restructuring process and support the sector level analysis in Chapters Four and Five. The usefulness of the case studies has been enhanced because they have been conducted at various points in the liberalisation process (Table 6.1). The first set of interviews was conducted in 1992. The same firms and others were then visited at various points up until 2007. It has therefore been possible to track their progress over an extended period of rapid change in the automotive industry, giving a `before and after' picture of firm level responses to liberalisation.

Table 6.1: Dates of Case Study Interviews

Firm	Date of interviews
Alfred Teves (Ate)	1995, 2006
Atlantis Diesel Engines (now Atlantis Foundries)	1992, 1995, 2007
Behr	2002, 2007
Gabriel (now ArvinMeritor)	1992, 1995, 2006
NGK	2002
Toyota	1995, 2007

Section Five pulls together the conclusions from the case studies. They show that firms had adapted quite efficiently to the previously protected environment in a number of ways. When the liberalisation process began they embarked on major changes — they refocused their product lines and expanded exports as traditional markets shrank, revamped their shop floor practices to improve productivity and invested in upgrading the supply network. For local

2 One case study is of supplier development at an assembler firm (Toyota).

3 See Pack (2006) for a discussion of econometric versus case study approaches to technology transfer.

firms these changes proved difficult in many cases as investments and production capabilities were singularly inappropriate for the new era. In spite of this, significant learning had taken place and firms had developed considerable technological capability. This has made it possible for them to adapt to a changing environment, by absorbing foreign technology and responding to new export opportunities. However, the limitations of what can be termed `internal restructuring' are also very evident. For many firms, as the industry was opened up to international competition and follow sourcing, it became increasingly difficult for them to continue to operate as locally owned entities, reliant on licensed technology. For firms to continue as first tier suppliers, foreign links, including foreign ownership in some cases, became essential in order to source technology and gain access to global networks. The alternative was to become a second tier supplier or shift towards supplying the aftermarket. Growing foreign ownership in turn has a range of implications for domestic firms and for the industry as a whole.

2. LEARNING, TECHNICAL CHANGE AND THE TRADE REGIME IN LDC MANUFACTURING

In a classic article published in the Harvard Business Review in 1989, Magaziner and Patinkin give a compelling description of the entry of the Korean conglomerate, Samsung, into microwave oven production in the early 1970s. The firm advanced from scratch with small teams of engineers working all night in poorly equipped laboratories producing the first simple prototype, which promptly melted when switched on. But the engineers persisted and in less than 20 years Samsung had become the world's largest producer of microwave ovens.

Bell et al.'s (1982) case study of the "very protracted infancy" of a Thai sheet metal producer sketches a very different scenario. In the four measures of production efficiency used there was no significant improvement over a period of nine years. The firm's technological resources were minimal, just sufficient to operate the plant. There was no attempt to upgrade these capabilities. Even though the firm employed 540 people it had no R&D section and did no R&D work. Adei (1990) documents another example, in this case of a Ghanaian tyre company, where minimal effort was invested in developing technological capability either by its state or multinational owners.

Firms will always differ and examples of the above extremes could be found in most countries although the Samsung case is much less common than the Thai or Ghanaian example. However, the former is likely to be more prevalent in high growth countries such as Korea and Taiwan. Of greater importance for economic growth and for policy is the probability that the average Korean firm is likely to be more dynamically innovative than the average South African firm, at least from the perspective of successfully breaking into international markets.

In the late 1980s, the literature on technical change in LDCs started to shift from a view of technological dependency to one which pointed to the substantial amount of technological activity that goes on in developing countries. This was evident in productivity improvements in protected industries, the increasing level of competence evident in the capacity to undertake more complex tasks as well as growing exports of sophisticated manufactured products, technology and capital equipment. [4]

These findings are no longer contentious and the key areas of debate are now the main forms of acquisition of technological capability and how these are affected by factors such as the industrial structure, ownership and the trade regime as well as by more direct policy interventions. Part of the large differences in the technological achievements of firms in similar circumstances relate to their own technological effort — but why does this vary between firms? Are the reasons purely idiosyncratic? Can government policy make a difference and what difference does foreign ownership make?

It has been a widely held view that South African manufacturing firms have not on the whole been very dynamic in a technological sense. Indicators are relatively low levels of R&D and low patenting activity in international markets. This lack of dynamism is manifested in low productivity growth and low export to import ratios of technology intensive products (Kaplan, 2004). The automotive industry, which has historically been highly protected, was at least until the early 1990s, widely regarded as less technologically dynamic and even more reliant on foreign technology than most other sectors.

The case studies in section four show that learning and the accumulation of technological capability in the automotive industry under previous policies of protection has been quite significant. However, much technological effort has been directed at countering the problems that arose from a small, protected domestic market rather than being directed at achieving efficiencies in high volume production, which would enable firms to compete in the price competitive, international market place. Given their relatively small size and limited technological capability, there are limits to what small, domestically owned component firms can achieve in a globalised environment. This has meant that growing international links have become increasingly central to the restructuring process. These range from formal and

4 See, for example, Katz (1987) and Lall (1987). For a review of this early 1iterature see Herbert-Copley (1990).

informal links with foreign firms to joint ventures, acquisitions by foreign firms and greenfield investments by MNCs.

2.1 The Character of Technical Change in LDCs

The acquisition of technological capability is multi-faceted. In developing countries, in particular, large R&D departments with corporate scientists dreaming up smart inventions are really only a small part of the picture. The reality is more mundane, about small improvements and adaptations, about firms learning over a period of years how to achieve optimal output from imported machinery, how to adapt these processes to local conditions and occasionally to develop their own improvements. The small R&D departments in South African firms do hit upon major breakthroughs and there are firms, which are world leaders; but for the most part it is the small incremental, difficult to measure improvements, which are the key to enhancing productivity and competitiveness. What is important in a country like South Africa is less that there are some firms at the cutting edge but that the broad mass of firms should be learning fast and catching up. Many firms in the automotive sector have shown themselves to be adept at introducing adaptations especially with regard to process technology. Arguably, there is more scope for incremental adaptation to process technology because in the case of original equipment components, specific product requirements are set by customers (vehicle manufacturers or first tier component suppliers). Nevertheless, the limitations of licensed technology are evident and developing foreign links has become an increasingly important competitive response especially for firms operating in the first tier.

Following Bell and Pavitt (1993), it is useful to distinguish between two key resources, which impact on industrial output: production capacity and technological capability. Any manufacturing firm has a certain production capacity, the components of which are its fixed capital, the operating skills of workers and management, its organisation of production etc. (or factors of production in the conventional sense). Technological capability on the other hand refers to the capacities required to generate and manage technical change. This includes the knowledge, skills and experience of workers technicians and managers and also institutional structures. These capabilities are accumulated through learning which is, therefore, of fundamental dynamic importance as it impacts directly on the capacity of the firms to generate and manage technical change. The process of technical change itself occurs in two main ways — through the introduction of technology embodied in new product or plant and perhaps, more importantly, through incremental adaptations and improvements.

The brief outlining of this approach allows us to highlight some key characteristics of technical change as follows:

Technology is tacit — the neo-classical assumption of a pre-existing shelf of available technologies, which can be easily transferred makes little sense. Technology is by its nature tacit (Nelson, 1991). It is not fully codified and effort is required in transferring even well established technologies into new situations.

Technical change requires effort by firms — any form of technical change requires effort by the firm in question. For example, a firm buying a new turnkey plant will have to invest considerable resources in operating this plant at optimal capacity. The same applies to the development of new designs, the introduction of new production organisation or the introduction of minor new machines. The point is that while these technologies may be well established among international firms, transfer is not costless and automatic and the receiving firm needs to expend resources to make optimal use of new techniques.

Learning is not automatic — Learning does not automatically arise from doing. Production experience is necessary for the acquisition of technological capability but it is not sufficient. Bell and Pavitt (1993) argue that increasing specialisation has widened the gap between the knowledge required to operate certain technologies and that required to change them. From this it follows that in late industrialisation, doing is a less effective method of learning. Firms need to undertake technological effort by investing in training, organisational change, technical improvement and other forms of learning. Learning takes place in a variety of ways. Absorptive capacity is an important requirement for learning to take place, whether it be to cope with the introduction of new capital equipment or a new form of production organisation.

The importance of incremental changes — there are important processes of learning and technical change going on within LDC firms. The acquisition of technological capability takes place through incremental changes, which cumulatively are in most cases more important than major jumps in the form of the introduction of new technologies. So technological activity takes place in all aspects of the production process.

2.2 The Direction of Technical Change in Protected Markets

Historically, the trajectory of technical change in semi-industrialised countries has differed in important ways from that in the developed world (Katz, 1984, 2000). This resulted from two main factors. Firstly, the economic conditions and industrial structure have generally been very different in semi-industrialised countries and, secondly, these countries were not at the forefront of technology but were followers in industrial development. The result has been differences in industrial structure which include the following (Katz, 1984, 2000):

a) Smaller markets
b) Higher levels of tariff protection
c) Lower levels of automation with the use of older vintage capital equipment
d) Higher levels of concentration of industry with limited competition in a wide range of sectors
e) The existence of acute market imperfections (e.g. skills shortages)
f) Poorly developed networks of supplier firms.

Limited markets and protection have meant that plants were frequently small in relation to those in developed countries and economies of scale issues were a key consideration in technical choice. This implied the need to scale down to smaller plant size and diversify product mix requiring in turn simpler more universal, lower capacity machinery. This frequently led to discontinuous technology and low levels of automation. A key problem of adjustment for firms being exposed to greater competition and trying to break into export markets, therefore, has been to make the leap from a discontinuous flow situation to a continuous flow, mass production scenario (Katz, 1984).

The small size of developing country plants affected the technology initially selected. Continuous flow, highly automated technologies were not appropriate both because of the size of plants and, in some cases, as a result of operational complexity. In products such as vehicles and components where continuous flow is necessary, firms in developing countries could "end up with the worst of all worlds — that is, with a small continuous flow 'line' turning out a highly diversified output mix, intended for various, small individual markets" (Katz, 1984: 11). The complexity of small batch production and high levels of machine down time all add substantially to costs.

Katz (1984) also points to the weakly developed layers of subcontracting firms, which resulted in higher levels of vertical integration within the firm than would be the case in developed countries. This reduced the level of technological specialisation and was also likely to result in the under-utilisation of installed capacity.

As a result of a differing production structure, the focus of technological activity has differed between advanced and developing countries. In the developed world, cost minimisation is likely to be central and the effort to gain a technological lead is also likely to be important in certain types of firms. These are important objectives for competitiveness and are also likely to be important in developing countries. But firms have operated under different parameters in the developing world. For example, a prime concern has been the transfer of process and product technology and the achievement of standards where the benchmarks are set in the developed world. In a real sense, these firms have been followers. They needed to learn and master processes and technologies, which have been developed elsewhere. So technical change was heavily focused on adapting imported technology to local market conditions. It tended to be ad hoc and incremental as new machines were added and adaptations made.

With these kinds of developments, it was not surprising that the view that industrialisation behind tariff barriers was likely to produce un-innovative and inward-looking enterprises became something of a conventional wisdom on the subject, with the automotive industry a frequently cited example. However, work especially in Latin America by Katz and others showed that it would be an oversimplification to cast most firms in protected industries within this category. Many of the firms within protected industries may have been technologically quite dynamic within the parameters in which they operated, with rapid learning taking place and a considerable accumulation of technological capability. However, as a result of the trade regime, industrial structure and factor prices that can emerge under import substituting industrialisation (ISI), much of this effort may be mis-directed according to benchmarks of international competitiveness. An example is the vast amount of effort in areas such as logistics, materials flow, machine changeovers and production scheduling that is undertaken in order to deal with the problems of complexity that arise in low volume, multi product plants, which have characterised the automotive and component industry in developing countries. Another example, where local content requirements prevailed, was the effort undertaken to raise domestic local content among suppliers. Firms thus became well-adapted or even 'over-adapted' to the circumstances of captive, protected markets — what Pirela et al. (1992) refer to as the 'platypus effect'. With reference to the Turkish truck industry, Ansal (1990) argued that although firms had become technologically self-reliant during the ISI phase, they were a long way from being internationally competitive. The problem, therefore, was not so much a lack of technological effort but the fact that cost minimisation and achieving optimal potential from world scale plant was not the central objective of technological effort. Lall (1987: 11) put it in the following way:

> *"A firm's technological efforts may be highly successful in resolving the problem it confronts, and may signify a greater basic capability than another's which is more competitive internationally. However, the first firm's efforts may have been directed at overcoming obstacles rather than improving competitiveness."*

These preliminary observations will be shown to have a clear resonance in the South African case studies in Section 4.

2.3 Liberalisation, Technological Capability and FDI

Liberalisation has a number of important effects at the firm level. In his survey of the experience of Argentina, Brazil and Mexico, Katz (2000) argues that MNCs and large domestic conglomerates were the main beneficiaries. But MNCs tended to become more specialised and scaled down their local engineering activities, engaging more in final assembly and distribution. Small and medium enterprises also tended to become more involved in final assembly operations with a greater reliance on imported inputs. These conclusions are supported by Rheinhardt and Peres (2000), also in relation to Latin America, who argue that enterprises linked to international markets were the major gainers and also that "domestic linkages and the development of endogenous technological capabilities have been weakened" (p. 1557) in the liberalisation process.[5]

Greater openness usually leads to an expansion of international linkages including greater FDI. Whether they establish greenfield sites or take over existing enterprises, foreign firms bring with them new technology and may also establish new supplier networks involving both domestic and foreign firms. The dynamics of the interaction between foreign capital and domestic manufacturers, whether locally or foreign owned, is therefore key and has considerable implications for the trajectory of the development of the sector in question. Two issues are of direct concern here. The first is the role that foreign links, especially equity links, may play in enabling existing firms to successfully integrate themselves into global networks. The second is the related question of the impact of increasing internationalisation and foreign ownership on the capabilities of the domestic industry.

5 See also Miozzo (2000).

Technology transfers take various forms, which can be divided into internalised and externalised transfers (Ivarsson and Alvstam, 2005). The former fall under the ambit of FDI and incorporate access to the technological, organisational and marketing assets of the multinational on terms which are naturally dictated by the parent company. Externalised technology transfers take place outside of the ambit of direct ownership, for instance via minority joint ventures, sales of capital goods or licensing. It can be argued that the latter have more scope for upgrading by local firms. There are also potential spillovers to local firms via demonstration effects and labour turnover (Saggi, 2006).

The restructuring of production networks has important implications. In the automotive industry, trends towards 'global sourcing' and 'follower sourcing' have had a major effect in emerging markets where the trend is towards fewer first tier suppliers and the greater use of foreign owned suppliers. For domestic firms, much will depend on the terms under which they are able to position themselves in these developing networks. They may emerge as favoured first tier suppliers, or be relegated to a more subordinate position as second tier suppliers or even find themselves excluded completely and increasingly dependent on the aftermarket. In trying to optimise their position, domestic suppliers may seek out a foreign partner. Naturally, a key potential asset brought in by a prospective foreign shareholder or owner is the access to markets, which they can provide. This is complemented by their control over technology necessary to supply export markets and to meet the increasingly demanding requirements of domestic vehicle assemblers.

The literature on the impact of FDI on upgrading of domestic firms is mixed. For instance, the inflow of foreign capital may create a more demanding and competitive environment requiring domestic firms to upgrade but it may also limit the need for indigenous technological adaptation (Lorentzen and Barnes, 2004) which can lead to downgrading both in terms of technological activity and in terms of position in the value chain. But a higher level of absorptive capacity and more robust capabilities within domestic firms and the host economy generally, are likely to lead to more positive spillovers and more developed linkages with the domestic economy (Kokko et al., 1996; Narula and Dunning, 2000; Lall and Narula, 2004). If firms lack absorptive capacity they might find themselves being 'crowded out' by FDI.[6] Humphrey and Salerno (2000) refer to the increasing centralisation of design by multinational auto and component firms and the fact that in countries such as Brazil, first tier suppliers are now virtually all foreign owned. Rasiah (2007) found that foreign automotive component firms in East and Southeast Asia were less R&D intensive than their local counterparts. However, Humphrey and Salerno (2000) also point to the emergence of a 'sun

6 Agosin and Meyer cited in LaII and Narula (2004: 454)

and planets' model in which developing countries have regional design centres linked to the global design headquarters (2000: 172).

Foreign firms appear to exhibit higher levels of productivity and more rapid growth but again the evidence is not overwhelming (Saggi, 2006; Haddad and Harrison, 1993). In part this depends on how domestic firms are integrated into the global networks of multinationals. Typically, firms which are fully integrated into such global networks operate at larger scale with more advanced technology and attain higher levels of productivity than those which supply protected domestic markets. Saggi (2002) makes this point for the vehicle industry, arguing that the spillovers resulting from foreign investment have mainly been of a vertical nature accruing to those suppliers who have had greater access to markets and technology as a result of being drawn into the international networks of the multinational car companies.

A key form of linkage with the domestic economy is through purchases of inputs. There is a considerable international literature, which cites the limited linkages of foreign firms in developing countries. This argument has also been applied to inward investment in developed countries, for instance in the Scottish electronics industry where Turok (1993) argues that foreign firms were not deeply embedded. Nevertheless, there is considerable evidence that where large scale assembly plants are established by foreign firms, considerable backward linkages do develop. And the level of linkages is not static. In the Mexican automotive industry, substantial upgrading occurred but much of this was with other foreign owned firms rather than with Mexican suppliers (Carrillo, 2004b). In a study of Volvo truck and bus plants in developing countries, Ivarsson and Alvstam (2005) found that while 'follow source' suppliers had gained a large share of purchases by these assemblers, the technology transfers via domestic firms were very significant. The Taiwanese electronics sector presents the case of development of strong linkages between foreign owned firms and rapidly developing local suppliers (Lowe and Kenney, 1999; Amsden and Chu, 2003). Also, as Saggi (2006) points out, the appropriate yardstick is the total value of inputs purchased domestically in relation to the number of employees of the multinational. This is because while multinationals typically purchase a smaller share of their inputs domestically, linkages may be substantial because the nature of their production may require more inputs relative to the number of employees.

The impact of liberalisation and FDI is therefore very much contingent on circumstances. What is clear is that the nature of learning and technical change changes substantially when the trade regime is liberalised and even more so if ownership changes. Larger firms and especially foreign firms are frequently better placed to benefit from liberalisation. For domestic firms, including those which come under foreign ownership, there is certainly potential for deskilling but there are substantial opportunities as well. Higher levels of absorptive capacity will be helpful in extracting greater benefits from whichever way domestic firms engage with international markets or MNCs.

3. THE SOUTH AFRICAN AUTOMOTIVE COMPONENT SECTOR

3.1 Technological Development under the Import Substitution Regime

As shown in section 2.2, import substitution policies have had important implications for the trajectory of technological development in terms of the investments undertaken, the degree of automation and type of learning processes within firms. The production and technological capabilities of firms were geared to the requirements of a small, protected market rather than competing on global markets. For example, in the era of protection, firms had to serve a market characterised by low volumes and wide variety. They became highly proficient at supplying this market but at costs well above international prices. So while considerable learning took place, costs were high. The lack of specialisation had implications too for the development of design. Domestic firms tended to rely on licensed technology as low volumes could not justify large investment in R&D. Firms tended also to be vertically integrated with weakly developed suppliers.

The South African automotive industry has historically depended heavily on imported technology. The predominant form of technology transfer has been through foreign investment (either wholly owned or on a joint venture basis), through licensing or through the purchase of imported capital equipment. Although there has been until recently, a high degree of local ownership, the locally owned vehicle manufacturers and the bulk of locally owned, first tier component producers operated under licence from European, Japanese or American firms. This involved royalty costs and also imposed restrictions on exporting, which was a serious constraint for some firms as the domestic market came under pressure and firms were forced to develop export strategies. In spite of these disadvantages, many firms considered licensing to be the most cost effective way to obtain up to date technology.

A small survey of larger component firms conducted in the early 1990s well before the introduction of the MIDP, found that firms were by no means lacking in technological capability.? Developing their own technology was difficult for most component firms, competing with multinational suppliers with huge R&D budgets. While surveyed firms spent

7 See Black (1994). The survey included only 16 firms and so the results should be seen as indicative. But they are supported by many 1ess formal interviews. See Appendix Four for the questionnaire.

relatively little on R&D and were generally highly dependent on foreign licences, they were by no means totally lacking in technological capacity. Firms were asked to rate their own technological capabilities on a scale ranging from very limited capacity (the ability to choose among alternative technologies) to the capacity to generate new products and processes. Most of the larger firms were able to adapt both product and process technology and a quarter of the sample (4 firms) claimed to be able to generate new products and processes. While for the most part these were minor adaptations, they were important in two ways. On the product side they illustrated the capacity for design even if only in a limited form. On the process side, the findings showed that firms were not only able to fully master the technologies they were working with but also to upgrade them by introducing adaptations.

A significant number of firms were also able to generate new products and processes. All these firms were locally owned (two were independent) and most devoted significant resources to R&D. Most were specialised in terms of their product and were generally much more oriented to exports than the sample average. Two were involved in the production of wheels and had developed their own designs and brand names. While quality is extremely important, the manufacture of wheels is not as technologically demanding as, say transmissions, and it is, therefore, an easier industry to operate in without licence agreements. Clearly this kind of opportunity is not open to South African producers of more sophisticated components.

Some firms were able to introduce innovations, which were ahead of advanced country competitors. One aluminium wheel producer, for instance, had introduced modifications to the die cooling system, which reduced casting time to 180 seconds compared to 300 seconds in Europe. A number of firms were also engaged in attempting to make machinery more flexible (see the Teves case study in this chapter) and new equipment was chosen with this in mind. Some important innovations resulted from the experience of high variety, low volume production, which characterised the South African components industry (Black, 1994).

So although firms for the most part were dependent on foreign licensors for new technology and spent only moderately on R&D there was a significant level of technological competence and clear capacity to introduce productivity raising technological adaptations. Furthermore, in some limited areas, component producers were relatively advanced.

Some firms producing less sophisticated products had proprietary technology and their own brand names. There were also a small number of firms producing more sophisticated products, which incorporated their own technology. Some of these resulted from the electronics expertise developed in the defence industry.

As one would expect in a scale intensive sector with a heavy global concentration of product development, the strengths of the local industry were primarily in process development. Exact product specifications are determined by customers but processes have had to be adapted to meet the low volume and wide product range of a small domestic market. Significant capabilities have developed over the past decades in investment and production capability, process engineering, quality control and workforce skills. There are numerous instances where process innovations developed in South Africa have been transferred to a parent company or licensor.

In the era of heavy protection, certain adjustments were made to local vehicles to adapt them to local needs and purely South African derivatives [8] were also developed. Local adjustments included higher specification radiators and trim to deal with strong sunlight and higher temperatures, stronger suspension and superior dust-proofing. A high level of standardisation in the use of medium and heavy truck engines was achieved via very high protection for the state owned engine producer. This in turn required considerable modification of a number of truck makes to take the Mercedes and Perkins engines produced by the state owned producer Atlantis Diesel Engines. [9]

The impact of protection on quality standards and supplier capability is a complex issue. On the one hand, a long period of protection has enabled the local industry to acquire key manufacturing competencies in terms of production experience and quality. However, there is also no doubt that protection created major distortions, which negatively impacted on efficiency. An extreme example was the deliberate building of heavier components during the period up to 1989 when local content was measured on a mass basis. Heavy protection has also encouraged a proliferation of locally assembled makes and models with an associated requirement for a very wide variety of components in low volumes. South African firms, as a result, achieved a high level of expertise in low volume, multi- product production. [10] This technological capability is, however, of limited value in the international market place except in the production of certain low volume aftermarket and replacement parts.

The issue of complexity of specifications and standards poses a further problem for developing country industries. Staying at the world frontier in terms of new models, and emission levels imposes considerable costs in terms of required investments in new tooling. However, falling behind makes it difficult to penetrate export markets both for vehicles and

8 Derivative is used here to indicate fairly superficia1 variations such as number of doors, engine size or minor changes to the body design. A basic mode1 or platform can have many derivatives.

9 See ADE case study in this chapter.

10 See Teves case study in this chapter

components although it may allow one to supply run out models and components to selected niche markets. South African firms faced difficult choices in this respect as they were trying to increase exports to both highly developed countries and into the rest of Africa, where the demand was for rugged, less sophisticated vehicles.

3.2 Trade Liberalisation, FDI and Technological Development

During the import substitution period, firms had developed significant capabilities but these were not well suited to the demands of international competitiveness. The industry was highly inward oriented so that access to export markets was not a critical consideration for South African firms. This also meant that quality and technological considerations were not particularly pressing and it suited locally owned automotive firms to operate under licence and produce for the domestic market.

As discussed in Chapter Four, the liberalisation of the component sector was quite rapid partly as a result of the dropping of local content requirements, the lowering of tariffs and the ability to rebate import duties by exporting. Firms had to rapidly develop exports and this meant a substantial reorientation of existing production and the necessity to re-position themselves in the international value chain.

For many firms this was difficult. A number of divisions within the largest domestically owned groups such as Murray and Roberts, Metair and Dorbyl found themselves vacating the first tier for the second tier (Lorentzen and Barnes, 2004). Nevertheless, productivity growth was rapid according to a range of benchmarks and according to data collected by the South African Automotive Benchmarking Club database, a significant number of firms of firms continued to carry out R&D at levels which were close to world norms (Barnes and Lorentzen, 2004).

In the late 1980s, levels of foreign ownership were quite low both among vehicle manufacturers and component producers in South Africa. The low share of foreign ownership was a function of a number of factors. The 1980s had been a period of economic stagnation and political turmoil unattractive for foreign investment. In the 1980s there was an active international campaign to encourage disinvestment from apartheid South Africa. This was particularly effective against American firms and both Ford and General Motors transferred ownership to local interests during this time. Japanese firms had for many years been prohibited by their government from making direct investments in South Africa although many had licence arrangements and there was considerable two way trade. This changed with the advent of democracy in South Africa in 1994 and the country's reacceptance back into the international community.

The change in trade policy and resulting internationalisation of the industry manifested in growing exports and imports has also had major implications for ownership. With the domestic market under pressure from imports and the introduction of an import-export complementation system, which effectively supported exports, it became increasingly important for local firms to have links to global networks as a way of facilitating access to international markets. The pressures on South African firms to secure foreign partners, have been complemented by the rapid internationalisation that has taken place in the world automotive component industry and the impact that this has had on the structure of the supply chain. In South Africa, and indeed in other emerging markets, assemblers increasingly prefer to source components from joint ventures and wholly owned subsidiaries rather than domestically owned firms (Table 6.2). The result for many South African firms has been that they either needed to seek out an international partner or faced the prospect of being confined to the aftermarket (Barnes and Kaplinsky, 2000b). [11] The change in ownership in the component sector has been quite rapid. As Table 6.2 illustrates, assemblers have shifted towards sourcing from first tier suppliers, which are either subsidiaries of foreign firms or joint venture partners. [12]

Table 6.2: Ownership Status of South African Based First Tier Suppliers (%)

Category	1997	2001	2003*
Wholly owned subsidiaries of MNC auto component manufacturers	26.0	31.7	37.5
Joint ventures between SA companies and MNC auto component manufacturers	18.5	26.0	32.5
SA companies with technology agreements with MNC auto component manufacturers	29.8	24.3	20.0
SA companies with SA technologies	25.8	18.0	10.0
Total	100.0	100.0	100.0

Source: Lorentzen and Barnes (2004: 476)
Notes: $n = 4$
* Values for 2003 were projections

Growing foreign ownership has accelerated technological upgrading but this has taken a particular form (Barnes and Morris, 2004). The main conduits have been through transfers from foreign sources rather than an increase in domestic R&D. Domestic firms, under

11 See also the Behr and Toyota case studies in the following section.

12 Similar trends are evident elsewhere. See, for example, Humphrey and Salerno (2000) on the Brazilian and Indian automotive industries; Carrillo (2004b) for the Mexican automotive sector and Katz (2001) for Latin American manufacturing in general.

pressure to upgrade their technological and production capacities, have turned to foreign sources through the establishment of joint ventures, for example. The growing internationalisation of the industry has also led to a number of informal transfers and the number of foreign technical experts and advisors working in South African assembly plants and component firms, has been increasing.

There has been some debate as to the impact of this. Earlier work by Barnes and Kaplinsky (2000b) took a somewhat pessimistic view about the prospects for domestic suppliers, especially those without foreign connections. Lorentzen and Barnes (2004) and Lorentzen (2005) provide a generally more upbeat assessment of the prospects of domestically owned firms. In a series of case studies of South African component firms, Lorentzen (2005) argues that innovating firms tended to be either domestically owned or owned by 'passive' foreign investors. The latter, by supporting the R&D strategies of local managers may improve absorptive capacities in domestic subsidiaries as opposed to typical TNCs, where decisions about upgrading or downgrading capabilities in a particular subsidiary will be subordinate to the overall demands of the worldwide group with possibly very negative implications. [13] There is plenty of evidence that when local firms have come under the control of transnationals, existing R&D establishments are downsized or shut down. [14] It does not follow, however, that these firms downgrade technologically because the shutting down of formal R&D facilities can be accompanied by the introduction of new specialised product and process technologies which bring host firms closer to the world frontier. The Behr case study in this chapter provides an example. With global sourcing, locally owned firms may also stop carrying out adaptations and reduce their R&D capacity. But as we argue in the case of the Alfred Teves below, this technological effort may in fact have been of little value in a more open trading environment.

Perhaps a more useful distinction is the orientation of firms. There is a small group of component suppliers in South Africa which are either locally owned or have South African roots, but which have established themselves as world players. Examples include Tiger Wheels, Bosal and Plate Glass. These firms are very different in their technological trajectory to first tier suppliers which depend on foreign licenses and may well do R&D but within much more circumscribed parameters. This latter group are at a substantial disadvantage especially in export markets, and as Lorentzen (2005) points out, there may be little incentive for either the licensor or licensee to expand the level of competence of the domestic operation.

13 Lorentzen is careful to mention the 1imited sample that this study draws on.

14 Lorentzen's (2005) case studies provide some examples. See also the Behr case study in this chapter.

Car-makers have actively sought out component suppliers who are able to export and to supply components which meet the exacting standards of their own increasingly export oriented assembly operations (Gelb and Black, 2004b). This may entail access to a much larger market even if only in a specialised or niche area. It could also mean confinement to an inferior position in the global value chain. So foreign owned car firms have played a major role as conduits between domestic firms and the international market in four main ways. Firstly, they have arranged large export contracts for component suppliers by facilitating access to their global networks. Secondly, they have brokered new investment by encouraging foreign suppliers to establish joint ventures with foreign firms or to set up new plants. Thirdly, they have brought in new technology and, fourthly, they have frequently accelerated the transfer of industry best practices in production organisation to their suppliers. [15]

There is no doubt that foreign ownership, as opposed to licensing arrangements, has in many cases been critical for vehicle producers to obtain major export contracts but the question is more complicated for component producers. A small survey I conducted in 1992 found that while foreign firms were not constrained at all in export markets, four of the seven domestically owned firms were heavily constrained by conditions imposed by foreign licensors. [16] Since then, many firms have been able to renegotiate the terms of their licence agreements. It is nevertheless surprising that recent data collected by the South African Automotive Benchmarking Club (SAABC, 2006), found that the level of export orientation for foreign and locally owned firms was the same, with both types of firms exporting 17 percent of their output. At least a part of the reason for the surprisingly low orientation towards exports by foreign owned firms is the fact that a number of foreign owned suppliers have established facilities in South Africa with the sole purpose of supplying component subsystems to domestic assemblers.

On the other hand, a very striking difference between foreign owned and domestically owned firms was the share of imports as a percentage of output. In the South African component sector, affiliates of multinationals imported 53.7 percent of their requirements compared to only 29.4 percent by local firms (SAABC, 2006). There are a number of possible reasons for this. The main explanation is that many new foreign component firms are 'systems integrators', supplying entire sub-assemblies to the vehicle manufacturer. This is more of an assembly than a manufacturing activity. [17] As argued in chapter four, foreign firms are also clearly less embedded in the domestic economy although this may also reflect the fact that

[15] The case study of the Toyota supplier system in this chapter provides an example.

[16] For questionnaire see Appendix Three.

[17] This conclusion is supported by OEM interviews conducted in 2002 and in the Toyota case study cited in this chapter.

many of these foreign firms are fairly new and so have not yet developed local sources of supply.

4. CASE STUDIES OF FIRM LEVEL RESTRUCTURING

As explained in previous chapters, the South African component sector was subject to a long period of protection but since 1989 became increasingly exposed to foreign competition. Coping with increasing competition was particularly challenging because firms had been operating in a fragmented domestic market with associated demand for a wide variety of components in low volumes. To some extent they had become adapted to this. Exporting became a key imperative for many firms, partly to replace loss of domestic market share but also to achieve the benefits of specialisation through higher volumes. In their endeavour to adjust to a new environment, firms pursued a range of strategies including:

a) the introduction of licensed technology

b) new investment

c) incremental improvements and adaptations of processes and products

d) improved work organisation

e) introducing new products and shifting markets, especially into the aftermarket

expanding exports

g) upgrading the network of suppliers

h) reducing domestic sourcing and vertical dis-integration

i) obtaining a foreign equity partner or owner

j) undertaking greenfield investments

All of the above strategies are illustrated in at least one of the following case studies, which have been conducted at various points from 1992-2007 (Table 6.1). The first case of Atlantis Diesel Engines (now Atlantis Foundries) is a firm, which was originally state owned and previously had received monopoly protection. The firm had developed significant technological capability but faced major problems in responding to massively increasing foreign competition. The engine plant closed in 1998 and Atlantis Foundries was later taken over by DaimlerChrysler. This case study focuses on the transfer of foreign technology, learning through exporting and the importance of incremental improvement. What was a domestically owned, low volume, integrated engine producer has become a foreign owned, high volume supplier of engine castings and machined components to international markets. The latter part of the case study, based on recent interviews, assesses the impact of the transfer to foreign ownership.

Demanding customers can be important in raising standards of production and this is particularly the case in the automotive industry where best practice increasingly involves assemblers working closely with component suppliers. This is the objective of the reorganisation of the Toyota supply system, which is examined in the second case study. Toyota (SA) itself no longer operates under licence but is owned by Toyota Motor Corporation and has been incorporated into the global network of the parent company. The recent follow up visit examines the radical transformation of the supplier network that has occurred over the past decade.

The problem of scale in the South African automotive industry was examined in Chapter Five. The case study of brake manufacturer, Alfred Teves illustrates how firms adapt to the problem of complexity and short production runs. Such firms demonstrate significant technological capability but are constrained by low volumes in the domestic market. The types of investment that are made to cater for these low volumes can also make it difficult to reorient production to the high volume, low variety requirements of the international market. This has been the case for Ate which currently continues to face enormous pressure in the original equipment market and is increasingly expanding in the aftermarket.

At Gabriel, a medium sized shock absorber producer, significant and ongoing productivity improvement was achieved through upgrading work organisation. In particular this enabled the firm to achieve efficiencies in producing a wide range of products in relatively low volumes, which gave it the edge in supplying the international aftermarket. The more recent fortunes of the domestic operation have been governed by the consolidation of the component sector at the global level.

While much can be achieved through plant level improvements, the small size and limited technological capacity of most South African component firms has meant that a foreign equity stake has become increasingly important, especially for first tier suppliers, both in order to gain cutting edge technology and access to export markets. This is illustrated in the case study of Behr, a producer of radiators and air-conditioners, which is now controlled by the Stuttgart based, Behr Group. This change of ownership can have major implications for the type of R&D that occurs in the emerging market location

The final case study is of a greenfield investment by a foreign multinational which has been able to take advantage of opportunities opened up by the Motor Industry Development Programme. An unintended side effect of the MIDP was the development of a large new foreign owned, export sector with limited links to the domestic industry. [18] Catalytic converter production constitutes the largest of these new industries and NGK Ceramics (South Africa) is one of a group of greenfield investments, which make up this incentive driven cluster.

4.1 Atlantis Diesel Engines: Reorienting Production from Domestic to Global Markets

In the mid 1990s, Atlantis Diesel Engines (ADE) was a large, state owned engine producer. The parastatal Industrial Development Corporation (IDC) owned 87.5 percent; DaimlerChrysler, 12.5 percent. Together with its affiliated companies, ADE manufactured diesel engines, castings and components for the automotive, agricultural and industrial markets. Its core business activities were:

1. Manufacture (casting, forging and machining of six major diesel engine components (cylinder blocks, cylinder heads, crankshafts, camshafts, connecting rods and flywheels) for the domestic and export market.

2. Assembly of diesel engines in the 30 to 450kW power range for local original equipment manufacturers, primarily for truck and tractor applications. The firm also undertook remanufacture of diesel engines and components.

3. ADE also manufactured, supplied and distributed ADE replacement parts to the local market and distributed industrial diesel engines and parts (2 to 1000 kW) to South and southern Africa.

ADE was established as a 'strategic' industry in 1981 as South Africa's political isolation deepened and economic sanctions became a real possibility. In the early stages, the viability of the plant was ensured by a virtual prohibition on imports. The initial objectives were production capability of a wide range of products to high quality standards with production costs and profitability being lesser considerations.

The plant was designed with an annual capacity of 45,000 engines (two shifts) divided into two engine makes (Perkins and Mercedes Benz) and the capability to produce a wide model range. World scale diesel engine plants produce in excess of 100,000 engines a year of a

18 The development of this export sector is discussed in Chapter Four.

single make with a smaller model range. High production costs put exports out of reach and the slump in demand in the mid 1980s led to severe under-utilisation of capacity. Thus ADE represented an extreme form of the inefficiencies of protection in an industry where economies of scale are important.

4.1.1 Strategic Direction

By the late 1980s, ADE recognised that that it had to restructure and when the first set of interviews were conducted in 1995, the company was half way through the transformation process from a monopoly engine supplier to component exporter. This process involved, firstly, a major internal focus on costs, which enabled ADE to sharply reduce engine prices in real terms from 1990-1995. Secondly, the company sought to define areas of competitive advantage — which in its case were forming and adding value to metal rather than assembling engines. So the objective became one of gradually moving out of engine assembly to become a world class flexible manufacturer of main engine components such as crankshafts. These competitive advantages arose out of the skills that had been developed and also the nature of existing investments. For instance, the forge was designed for a particular size of crankshaft and some of the machining facilities were very flexible.

Faced with these pressures, ADE went through an accelerated process of improving plant efficiencies, which built on the production capabilities established in the era of high protection. In the earlier phase, the emphasis was on the accumulation of investment and production capability. The major source of technology was licensing, which although expensive was regarded as the only viable source of technology. Innovation has been directed at adapting processes to lower volumes.

4.1.2 The Licensing of Foreign Technology

ADE manufactured engines and components under licence from Mercedes Benz and Perkins and from its inception relied on foreign technology and expertise. At the initiation of the ADE project, it was decided that South Africa needed to produce diesel engines in the 35-735kW range and seven producers were approached to present proposals to the IDC. Mercedes Benz and Perkins were the only two that could offer the full spectrum together.

The licences covered trade and manufacture with the manufacturing licence supported by agreements on technical assistance, collaboration and supply. The agreements covered specific engine types and their derivatives. For example, in the case of Perkins, there was a master agreement plus supporting agreements for the 3, 4 and 6 cylinder engines that were to be manufactured under licence.

Licensing costs involved three elements:

1. An initial fee for the right to manufacture which was paid when the plant was established

2. A technical assistance fee

3. A royalty which was based on a formula according to the number of engines and components produced.

There was also a supply agreement by which ADE undertook to purchase requirements at a pre-determined price. Imported components could be replaced with local components as long as quality standards were met. The initial agreement was for ten years and was renewable.

ADE was quite clear about the reasons for going the licensing route and did not anticipate moving heavily into product design. It regarded licensing to be a far more cost efficient method of getting access to technology in spite of the costs and the restrictions it imposed. Engine development is extremely expensive. For example, at that time to design a new engine family similar to the existing one would have cost Perkins approximately £60 million.

The alternative of allowing licensing agreements to lapse and going its own route would have meant the loss of technical support resulting in the freezing of the level of engine development. The Polish firm, Kamaz, which used to produce under licence from MAN and a number of Indian truck makers had gone this route but according to the financial director "if we (ADE) ever have visions of developing South African designed engines, we should kill them immediately it is virtually impossible". [19]

Nevertheless, licence arrangements were expensive. The initial licence payment to Daimler Benz in 1981 was DM10 million. This was an upfront fee giving ADE the right to manufacture. In addition there was a royalty of 1-3 percent of the engine/component selling price. In the case of Perkins, the initial fee was £100,000 for each of the three engine models. A fourth was later added at a cost of £250,000. Additional payments for technical assistance were made as this was required. These payments had fallen sharply as ADE developed its own production capabilities.

[19] Interview with ADE financial director.

4.1.3 Acquiring Investment and Production Capability[20]

In the early stages, the Mercedes and Perkins plants were run as separate operations. The infant company was very reliant on its licensors. In the case of the Mercedes plant, early operational decisions were in the hands of Finasco, a finance house set up by the IDC. Mercedes Benz provided information on what was required and recommended suppliers but the purchasing decisions were made by Finasco. ADE itself had nothing to do with the initial purchase of equipment.

Expatriates from Mercedes Benz AG were initially responsible for getting the factory running. They were gradually replaced by staff from ADE who received training in Germany. The length of time taken for expatriate staff to be replaced by local ADE management partly reflected the importance attached to particular functions by the licensor. Process technology capabilities were quickly acquired and transferred while the licensor kept greater control over product technology, skills which in any event would take much longer to transfer.

Table 6.3: Localisation of Management at ADE

Management function	Time taken to replace expatriates with local ADE management
Maintenance	Almost immediately
Production	3 years
Manufacturing engineering	3 years
Quality	12 years
Product engineering	13 years

Source: Interviews

In the case of the quality function, the licensor wished to maintain some control. Product engineering management was really responsible for application engineering and the adaptation of engines to a variety of trucks with basic design being carried out by the licensor.

The acquisition of investment and production capability can be divided into three phases.

20 This section is based on an interview with J. MacEwan.

Phase 1: The first phase involved the licensor advising on the choice of equipment. Partly as a result of this and partly because of demand projections, which proved hopelessly optimistic they adopted dedicated equipment. Some of the initial technology was fairly dated because the licensor thought this would be appropriate for African conditions. This caused problems. For example, some of the initial machinery purchased made use of switchgear even though NC or CNC machinery was available at the time.

Phase 2: From the mid-eighties, all planning was done by ADE with Mercedes Benz "looking over their shoulder". For example in 1985/6 ADE needed to introduce a new engine block because of local content requirements. They approached Mercedes Benz for advice. According to an ADE manager, "MBAG responded that you use a big transfer line which takes up a whole building and produces one block every 1.8 minutes and our requirement was one block every six hours." Therefore, ADE did the planning themselves. This involved process innovation in the sense of adapting flexible technology (using a machining centre to perform all operations) to conventional technology. This was a lengthy process but eventually worked and the process technology went back to Mercedes in Germany who used it in the production of low volume engines.

Phase 3: From 1990, ADE were able to carry out all investment decision making and planning themselves and had developed full investment capability. The licensor no longer tested engine components produced by ADE - a privilege, which has to be earned through investment hi people and technology.

By the time the initial interviews were conducted in 1995, ADE's capacity to select technology appropriate to its operating circumstances was highly developed. In line with its strategic direction, it was specialising in certain technologies involved in the manufacture of crankshafts, blocks and cylinder heads as well as forgings and castings. Use was also made of external consultants in selected areas, for example in induction hardening technologies. In the future the company expected to move more into process design. Product design was not a priority, the view being that there would be little purpose in "reinventing the wheel."

4.1.4 Export Expansion

ADE expected to move out of the truck engine business in the future. As a result of falling tariffs, local truck manufacture was giving way to SKD assembly with much lower levels of local content. The commonisation process which virtually required South African truck makers to use ADE engines was being reversed. As its share of the domestic engine market was likely to drop rapidly as protection declined, the future viability of ADE depended on the extent to which it was able to remodel itself as a component exporter. Export growth was rapid with exports for 1997 of R200m up from R20m in 1989/90. ADE exports were in two main areas — machined engine blocks (cast) and crankshafts (forged). Exports enabled ADE to achieve the volumes necessary to produce components, which were competitively priced.

Export expansion was achieved in spite of the limitations that licensing placed on exporting. All exports needed the licensors' approval and engines could not be sold outside the Southern African Customs Union unless they were already installed in a vehicle. The licensors were more flexible with regard to exporting components and exports back to the licensors accounted for a significant proportion of export turnover. This required that ADE kept up with changes in specification. They chose this route rather than limiting engine changes even though this may have resulted in savings in terms of investment costs. The small MBAG stake did mean that ADE had a close relationship with its licensor but nevertheless the licensor favoured its wholly owned subsidiaries. For exports of Perkins parts, ADE dealt with Perkins in the UK and components were shipped through Perkins' Peterborough headquarters. For Mercedes components, ADE dealt directly with MB subsidiaries in countries such as Brazil and Argentina.

The reorientation towards exports involved a steep learning curve and the company found it very difficult initially. Exhibiting at international shows proved unrewarding. Export contracts were secured through contacts with licensors and networking rather than mass marketing drives. For example, in 1995, ADE had recently negotiated a substantial contract with the Korean conglomerate, Daewoo. The initial approach was made by the Korean firm and arose out of Daewoo discovering that another Korean company, Ssangyong, had bought components from ADE.

Quality and reliability were the two prerequisites for exporting. Once these had been achieved, then price became the key factor. The global industry for truck engine components is relatively small and a company's reputation is of great importance. ADE reported that a senior director of MAN had informed them that he had "never dealt with a company which delivers products at the same quality level as ADE." This kind of reputation in the market place led to further orders. Flexibility in supply was also a competitive attribute. ADE also prided itself on keeping in close touch with customers. The incentives offered under Phase VI and the MIDP were important to help fund investment in export capacity but the policy was to export only if reasonable margins could be obtained without the incentive so that it was felt that taking away export assistance would not adversely affect the export business.

4.1.5 Continuous improvement in the foundry [21]

The foundry was established to supply castings for cylinder blocks and heads and was designed to supply 80-90 percent of requirements for the planned engine capacity of 50,000

21 This section is based on an interview with J Davies (foundry senior genera1 manager).

Mercedes Benz and Perkins engines per year. As was the case with the main plant, the major problem has been the under-utilisation of plant capacity and the need to raise throughput and simplify product variety.

Initial design was a blend of technology in use for the range of castings to be produced. Total planned output of 12,000 tons/year was very small by international standards as most foundries had a capacity of over 50,000 tons per annum. ADE was also designed to produce an unusually large range of castings (approximately 20). By means of comparison the Mercedes Benz Mannheim plant produced only 14 types of casting and had a capacity of 85,000 tons. These large volumes enabled it to run three separate lines for small, medium and large castings. The South African plant, therefore, had to be more flexible requiring compromises, for example, in machine selection. Also the flask size had to be large enough to accommodate a range of castings. Although the plant was designed to be relatively flexible, higher volumes were a key objective and given the small size of the depressed domestic market, exporting was the key to success.

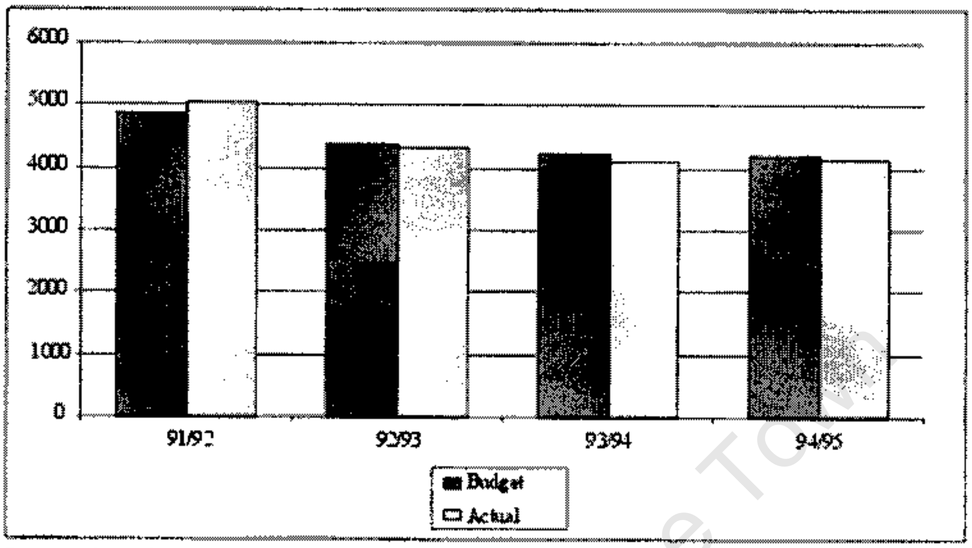
The casting process requires four separate operations - core-making, moulding, melting and finishing/fettling. Productivity improvement in all areas of the operation took place in three overlapping phases. The first was simply through the downsizing of employment. The second stage was to increase capacity utilisation by specialising the product line and then by making investments which both expanded capacity and increased productivity in selected areas of focus. The third stage was an emphasis on continuous improvement.

From the mid 1980s, improved rates of capacity utilisation were achieved through exports and incremental investment, which enabled the foundry to achieve reasonable economies of scale. From the late 1980s, machined engine blocks, which were exported to Perkins only on an overflow order basis, were exported in volume (12,000 per year). By 1995, 40,000 engine blocks were being exported to Perkins of which 20,000 were machined.

In 1990 a new pressure operated pouring furnace was installed which created the opportunity to synergise melting and moulding at the maximum output of the moulding capacity. This investment expanded capacity to 15,000 tons per annum and allowed ADE to service a new export contract to Eaton of 3000 tons of gearbox casings per year. From this stage, the foundry was exporting 60-70 percent of its output.

Exports of rough castings especially to Ssangyong were expected to grow to 130,000 blocks per annum by the end of 1996. Another large contract was with MAN in Germany and from 1997, ADE planned to export machined Vblock crankcases. The company had also invested heavily in support of a large export contract for Daewoo, which had moved off licence and produced engines similar to Mercedes Benz. ADE also planned to export cylinder blocks for Perkins new engine model.

Figure 6.1: Atlantis Foundries: Total Cost per Ton Sold (Rands)



Source: Interviews

As a result of the expansion of export volumes, the plant was working at close to its 12,000 ton capacity by 1995, working three shifts in some areas. The melting operation was operating at the limit of its capacity. As a result, capacity in the foundry was being expanded especially in the melting area. Melting capacity of 6t/hr was being increased by 10t/hr although this would only be used at the off peak electricity rate (thereby adding an initial 5t/hr). Production was being increasingly focused towards the heavier end of the casting range requiring a higher mass per mould. The foundry was also investing in fettling and cleaning capacity. In all, investment projects worth R10 million were underway in 1995 with a further R40 million approved.

ADE did not do real research themselves but sought to apply available technologies to specific operations. Formal and informal links with the licensor were important — for example, the foundry manager was in regular contact with his counterpart in Mannheim to keep up to date with developments. Through the licensor they received exposure to international developments and new technologies. Mercedes Benz was at the forefront of engine technology and because they were launching more new projects were able to apply more innovations. So ADE was a follower attempting to catch up rather than establish a lead. According to the foundry senior general manager, "twenty years ago South Africa was probably 20 years behind — now just two to five years".

Initial technology for the foundry was a compromise. Mercedes Benz was used as a sounding board rather than a provider of complete technology transfer and technology was selected from MB and Perkins with expertise provided by consultants. For later investments, use was made of project management consultants, specialist foundry consultants such as the Swiss firm Georg Fischer as well as ADE's own experience. According to the foundry manager, ADE regarded themselves "as a little blinkered and use outside expertise to get outside the existing paradigm."

ADE did not do fundamental research and had no formal R&D department. However, they had expertise in the selection and assessment of equipment and were constantly introducing improvements in process technology some of which incorporated their own innovations. The foundry undertook its own sub-assembly in the core shop and had found ways to integrate core assembly with minimum jointing. Another recent improvement was the shift away from hotbox methods to coldbox methods of core making.

Automation levels were quite low but the signing of large export contracts such as the one with Sangyong justified further automation such as the introduction of robotic fettling. The new furnace plant used the latest power sharing technology in induction furnace smelting in which a single power pack splits the heat to two furnaces — keeping the metal warm in one while melting with the other. This required a higher level of operator skill, including computer literacy.

Another recent development was to increase the number of castings per mould. It was traditionally common to manufacture in a single or twin (Siamese) mould. Where possible four castings using multi impression patterns were being produced in a single mould. This allowed ADE to use its large flask size to the optimum — but the technique was only suitable for export because large volumes were required to justify the initial investment.

The drive towards continuous improvement through the establishment of teams had led to major improvements. As the foundry manager put it,

> *"by driving the objectives of the company in bottom line teams there is identification with specific goals, so in the teams you have output and other productivity drive goals that are tracked by the team so its a self measurement of their own improvement - I think that has helped to build motivation and morale at team level"*

ADE's initial attempts to introduce quality circles never really worked. The teams were able to handle a variety of problems — for example, if a backlog arose, the team would develop solutions. Incentive bonuses were paid four times a year and could amount to 8-10 percent of annual salary.

Teams had come up with numerous suggestions for incremental improvement such as:

Improvements in the fettling process

2. Improved design of lifting hooks /chisels

3. Reducing labour required in the spot-face machine used for pressure testing.

4. Reversing the order of assembling cores which led to better consistency and more rapid throughput.

No monetary award was given for these innovations although they could be celebrated by a special lunch, for example. Training had been increased and was more results driven and broader with five days per year the new minimum. This was seen as a start but still far from the world class norm of ten days.

4.1.6 Conclusion

By 1995 ADE had shifted from being a monopoly engine producer for the domestic market to being reliant on component exports for most of its revenue. Because of heavy protection in the initial stages, the changes associated with a more open trading environment had been all the more wrenching involving a complete reorientation of the production process, which was initially established to supply a full range of engines at low volume. The firm was planning to develop key areas of competency — cylinder heads and blocks — and to become an international player because "international markets are where (ADE) see economies of scale where we can drive through productivity gains."

4.1.7 The Takeover by DaimlerChrysler[22]

In 1998, ADE discontinued engine assembly, a step which had long been expected.[23] In spite of the fact that it had well developed markets for engine components the position of the firm was quite precarious.

22 This section is based primarily on an interview with John McEwan, managing director of Atlantis Foundries and a plant tour conducted by Tony O'Brien in Apri1 2007.

23 See 'ADE to discontinue truck engines', *Business Times,* 21 June 1998

In 2000, Atlantis Foundries and some of the machining lines were taken over by DaimlerChrysler and became fully incorporated into the parent company's Mannheim based truck engine division. Its main business became the casting and machining of engine blocks. Large scale expansion of the foundry followed. At the time of the take over it was exporting 20,000 tonnes per annum. By 2005/2006 this had increased to 45,000 tonnes, mainly of cylinder blocks, and capacity was being expanded to over 90,000 tons with the option of further expansion to 120,000 tonnes. [24] This expansion included the installation of a third induction melting furnace and a third holding furnace was planned. One of mould lines from DaimlerChrysler's Mannheim plant had been transferred to Atlantis. The foundry is therefore now producing at world scale although its range is still extensive in terms of the number of types of castings produced. Fifty percent of turnover was still accounted for by machined components but this was changing as the foundry expanded.

Approximately 8250 million had been invested in the foundry expansion. This included new mould and melting furnaces and the addition of a new core making line designed for smaller blocks. In the machining facility a new highly automated line for machining Perkins blocks had been installed along with sophisticated testing equipment.

Atlantis Foundries became fully integrated into the Mannheim truck division in a series of steps. The first phase was the installation of new machining capacity to handle high volume exports of machined engine blocks to Perkins, for which it has a contract until 2012. Atlantis Foundries is the 50 percent supplier of four cylinder blocks to Perkins, and is a preferred supplier to Perkins controlling company, Caterpillar.

The next phase was to "many up" AF with DaimlerChrysler's Mannheim foundry which produced blocks, cylinder heads and other products for Mercedes Benz and DaimlerChrysler subsidiaries. It also supplied into the north American market via DaimlerChrysler's wholly owned subsidiary, Detroit Diesel, which in turn supplied engines to another subsidiary, the heavy truck manufacturer, Freightliner.

Atlantis Foundries was selected to supply blocks to a major new project codenamed "the heavy duty engine programme" which supplies to Fuso in Japan, Mercedes Benz in Germany and Detroit Diesel in the US. Atlantis Foundries thus became fully integrated into the DaimlerChrysler's supply chain but also remained as a supplier to Perkins. It continued to produce for other customers, for instance it was the 100 percent supplier of engine blocks for Ssanyong SUVs in Korea and was starting to produce a new block range for Cummins. Table

24 Interviews. See also 'Massive expansion of 1ocal foundry to meet global demand', *SA Instrumentation and Control,* January, 2007.

6.4 illustrates the close integration of Atlantis Foundries with the Mannheim Foundry, which was the development, marketing and distribution centre for the group and produced certain engine components. Atlantis Foundries was a manufacturing centre with its advantage being a lower cost base. While Atlantis Foundries does no product design it has been involved in simultaneous engineering for example in developing a new block with Perkins. It has extensive expertise in process design and innovations developed at Atlantis Foundries had been adopted at Mannheim. One such example was a higher level of specialisation on the fettling line. Atlantis Foundries is also able to select new machinery such as furnaces with guidance from Germany. The current foundry manager who was overseeing the expansion is an expatriate from Germany but it was expected that he would be replaced by a South African within a few years.

Table 6.4: Functional integration of Atlantis Foundries with the Mannheim truck division

	Atlantis Foundries	Mannheim Foundry
	Manufacturing centre	Design, manufacturing and marketing centre
10.8 litre blocks	-	100%
12.8 litre blocks	100%	-
14.8 litre blocks	75%	25%
Cylinder heads	-	100%

Source: Interviews.

Foreign ownership had conferred a number of advantages for the firm. The Mannheim foundry was able to provide expertise and technology. But most important was the expanded access to global markets. All quoting for exports went through DaimlerChrysler who managed marketing and distribution. They also were able to see the bigger picture and managed import credits on behalf of Atlantis Foundries.

Brazil, Mexico and Korea — not Germany — were regarded as the major competitors. Electricity pricing was still considered to be an advantage but this was changing when compared to Korea for example. Atlantis Foundries also has a labour cost advantage although not in relation to Mexico.

The transformation of ADE from small scale, monopoly engine producer for the domestic market to a large scale exporter of castings and machined components probably involved a degree of change comparable with the restructuring of east European manufacturing operations in the post-socialist era. Employment had fallen to 700 in 2004 but by 2007 was up to 1100 with another 400 employees in Atlantis Forge and related operations, which had formed part of the original ADE. The case of Atlantis Diesel Engines illustrates that even though the nature of initial investments that took place made it impossible to compete internationally, learning had been rapid and with more appropriate investments, ADE (and then Atlantis Foundries) has been able build a rapidly growing export business on the basis of its accumulated skills in core capabilities such as the manufacture of engine blocks.

4.2 Toyota – Upgrading the Supply Network

In a producer driven value chain, involving the assembly of large numbers of components, the strategy adopted by the assembler is of key importance. In the development of the automotive industry in Japan, vehicle assemblers such as Toyota played a key role in the development of ancillary firms.[25] As indicated in Chapter Two, best practice in the automotive industry has increasingly involved assemblers developing closer linkages with component suppliers and providing them with technological assistance as well as devolving responsibility to them. This system, pioneered by Japanese caretakers in the 1980s was swiftly emulated in Europe and the US. This link between assemblers and component producers is important both because it provides technological assistance to suppliers as well as placing demands on them to upgrade standards in terms of price, quality, delivery and in the case of first tier suppliers, the capacity to carry out research and development.

As Addis (1999) has shown in the case of the Brazilian automotive industry, market liberalisation can also lead to new forms of industrial governance, which encourage greater cooperation between assemblers and small suppliers. This has taken the form of large firms promising long term contracts to small firms in return for improved productivity. Large firms have also acted as mentors over the restructuring efforts of smaller firms while smaller firms have worked collectively to upgrade their capabilities. In the case of the Indian automotive industry, Okada (2004) shows that assemblers created institutional mechanisms, which played an important role in upgrading suppliers.

By the mid 1990s, more co-operative relationships between assemblers and component suppliers had not yet emerged to any significant extent in South Africa except insofar as the industry was small and personal contacts played an important role. Most component producers did not receive significant assistance from assemblers and most firms did not see a more significant trend towards closer co-operation. Many regarded the assemblers as expedient and short-sighted for moving swiftly to use foreign components and endangering the long term viability of the component sector on which the assemblers ultimately depend.

25 For an overview of Toyota's relationship with its suppliers at the globa1 level, see Tsuji (2007).

However, Phase VI, by encouraging the assemblers to seek component exports did encourage some collaboration at the same time as it gave assemblers firms greater flexibility in sourcing. The MIDP gave further encouragement to both these processes. Firms which were making use of local content either for export or for the domestic market required these suppliers to upgrade their capabilities. In return they could offer access to higher volumes and export markets. Assemblers such as BMW and DaimlerChrysler, for example, encouraged German component makers to take equity stakes in their South African licensees. This led to an upgrading of equipment and technological capability in order to raise output and exports from these plants.

Another index of co-operation between assemblers and component suppliers is the just-in-time (JIT) system. In the mid 1990s, this was not well developed in South Africa although a number of assemblers had introduced elements of the system for certain components. Constraints on the fuller implementation of the JIT system in South Africa included:

a) The lack of high quality and reliable suppliers.

b) Low volume requirements for each model and the wide variety of products produced by component suppliers. More exacting JIT requirements by assemblers therefore generally result in simply shifting inventory costs onto component producers rather than removing them from the system.

c) Large distances between production centres.

The limited development of JIT needs to be kept in perspective, however. CKD packs, which comprise a large proportion of the components used were imported from Germany or Japan with lengthy shipping times.

Toyota, South Africa's largest motor vehicle assembler had gone further than most others in developing its own supplier network. It was more focused on the local market partly because of its licensing arrangement with Toyota Motor Corporation in Japan and also because it had developed an extensive supply network both of in-house components and partly owned supply companies. So while Toyota had been developing global sourcing, it saw its local suppliers as stakeholders and had the objective of raising them to world standards.

In the mid 1990s, Toyota, which historically had close links through ownership ties with component suppliers, activated a number of programmes aimed at upgrading the capacity of its component suppliers. The Toyota supply network included a large number of wholly owned, partly owned and independent component producers. A number of activities such as seat manufacture, engine assembly and injection moulding (TSM) took place on site. There were also a number of satellite plants. Toyota Automotive Components (TAC) produced components including seats, exhausts and canopies which in 1995 accounted for approximately 14 percent of local components used in the production process. The Toyota Stamping Division (TSD) produced a further 13 percent of local components used.

Wesco, the holding company for Toyota (South Africa), also controlled the listed Metair group whose subsidiaries produced airconditioners, wiring harnesses, batteries and other components. Forty seven percent of Toyota's domestic suppliers (accounting for 51 percent of domestic supplier turnover) were located in the Durban - Pietermaritzburg area in close proximity to the Toyota plant.

In the face of increased price competition which had already led to reduced market share, Toyota had introduced a two pronged strategy aimed at driving down component costs as well as improving quality and delivery. Domestic suppliers were not regarded as being very competitive, except in areas such as machined castings and aluminium wheels and in aftermarket components such as glass and radiators, which generally required smaller investments. So while domestic suppliers were regarded as stakeholders, they nevertheless had to compete and Toyota was aiming at cost reductions of 2.5 - 5 percent per annum. It was also increasing global sourcing from the international Toyota network. For example, engines for the Camry were to be imported from Australia. It was clear that the prevailing local content levels of 52-55 percent[26] were unlikely to be maintained at least for the lower volume models. Toyota had reduced the number of suppliers and planned to further reduce these numbers as a result of increased global sourcing following the abolition of local content requirements. Increased access to world-wide sourcing meant that Toyota was able to enforce a policy of no price increases during 1995.

The second prong of Toyota's supply strategy was aimed at upgrading the capacity of its supply network through various forms of assistance coupled with a detailed system of performance benchmarks to which suppliers had to adhere.

These interventions took a number of forms:

> For firms within the Toyota group, Toyota SA was very involved in the negotiation of license agreements to ensure that exactly the right types of technology were secured. This was important particularly as there was little sign at that time of direct investment by Japanese component suppliers into the industry.

26 This measure is as a percentage of wholesale selling price and therefore includes assembly.

2. The firm had recently introduced the Toyota Supplier Assessment system, which benchmarked all suppliers according to a detailed set of criteria. This was to be one of the major criteria in future sourcing and would enable problems to be isolated and appropriate action taken. Toyota had developed a detailed system of supplier assessment which made use of five basic criteria each with its own weighting. The criteria included best practice, quality, purchasing, delivery and technical support. Each of these criteria was in turn broken down into sub-categories. The criterion of technical support (15 percent of the overall rating) benchmarked firms according to engineering staff and structure, testing and laboratory facilities, *goshi* systems and the adoption of Toyota requirements. Interestingly, there was little or no importance attached to design or R&D capability, which would be a key requirement of a first tier supplier to Toyota's plants in Japan or the US. Firms which achieved a minimum of 95 percent in the overall Supplier Assessment qualified as preferred suppliers while those scoring below 65 percent would be regarded as unsuitable for business and would be required to make immediate improvements.

3. The *kanban* system which already encompassed 66 percent of component suppliers by value was being extended. Toyota carried 2-5 days of inventory for *kanban* suppliers.

4. Attempting to reduce levels of CKD inventory on site by increasing the number of monthly sailings from Japan.

5. A Suppliers Council consisting of top suppliers had been established. It currently had 10 members. Quarterly meetings were held at which suppliers showcased their plants and other members of the council had to provide a critique.

6. A Product Engineering Group consisting of *goshi* teams comprising engineers, quality specialists and platform teams who work with suppliers had been established.

7. The Supplier Quality Assurance department provided audits on quality.

8. The Field and Tool Group provided technical support in Johannesburg and Port Elizabeth.

9. Japanese engineers were also used for supplier development.

10. Sub-contracting to small firms. Sub-contracting to small firms was seen as a development objective with little commercial benefit in the short term. The limited success achieved by that stage was not in components but in services and peripheral items such as metal pallets, taxi seats, tonneau covers for trucks, cleaning services and security lockers. But in the longer term, small black owned suppliers were likely to be important sources of supply particularly to major component suppliers. This programme was very modest in scope and appeared to have met with limited success.

Intensive involvement with suppliers was at an early stage at Toyota and by 1995 it was too early for the company to make an assessment of the impact. At that stage there appeared to be two key constraints to the supplier development process, however. Firstly, the relatively low volumes and wide range of components required by Toyota and other assemblers militated against achievement of world class productivity standards most glaringly in the case of JIT production. Secondly, Toyota's own progress in terms of work organisation was limited at that time so that the company may have been placing demands on suppliers which it had not itself met and had difficulty introducing in South Africa's troubled industrial relations milieu.

A determining factor was likely to be the seriousness of the effort in this direction on the part of Toyota itself. The increased pursuit of world-wide sourcing enabled Toyota to place pressure on suppliers as well as to simply import if productivity improvements were not forthcoming. However, Toyota realised that if the domestic supply base was seriously eroded in the process, the longer term implications for a viable assembly industry would be very negative.

4.3.1 The Impact of Foreign Ownership

As mentioned in Chapter Four, Toyota's situation had changed very fundamentally by early 2007 when the follow up interviews were conducted. [27] The company had become a subsidiary of Toyota Motor Corporation and was being converted into a global production hub with production volumes set to increase to 220,000 units by 2008. This includes two high volume models, the Corolla and international multipurpose vehicle (IMV). Full incorporation into Toyota's global production system and the transition to world scale production had important implications for suppliers as the firm was trying to increase local content and was achieving

27 The following section draws heavily on interviews conducted in January 2007 with Henry Pretorius (Senior Vice President, PD&P, Toyota SA) and Nigel Ward (Genera1 Manager Purchasing, Toyota SA).

the volumes which made this possible. A recent poll of suppliers found that they regarded Toyota as the assembler firm which was most supportive of building the supply network. According to TSA president, Johan van Zyl,

> *"unless you have strong supplier base there is no reason for your existence.... its in everyone's interest for us to go to our suppliers and help them with quality and logistics, and link them into our system "*.[28]

But at the same time, the number of domestic suppliers was being reduced and by 2007 consisted mainly of global firms.[29] In 2002, Toyota had 7 platforms with 160 local suppliers (Table 6.5). By early 2007 there were only two primary platforms and 75 suppliers. While local content was hardly changed, the position and image of suppliers had been transformed. For the Corolla model that was launched in 2002, 41 percent of locally produced parts (by value) were from global suppliers. For the model being launched in 2007, this figure was 82 percent (Table 6.5).

Toyota's preference was to deal with foreign owned suppliers or joint ventures. In line with global practice, Toyota no longer issued drawings requesting quotations from suppliers. Suppliers in the global design centres in Europe, Japan and America were involved from the concept stage. This meant that access to the design centres was crucial for local suppliers and from 2002 Toyota SA had spent much effort trying to partner local firms with major foreign suppliers. For example, Toyota had helped facilitate two joint ventures by firms within the large local Metair Group and a third was in the pipeline. This was a complicated process and could take from 2-3 years. Given that Toyota may have three global suppliers for any one component, an important question was with whom the joint venture should be concluded.

Even a 25 percent foreign owned joint venture would effectively be run by the foreign firm and in most cases the foreign partner would increase its stake over time. For this reason, local firms were frequently not supportive of this initiative as they were reluctant to cede control. Many asked Toyota to help them set up a technical agreement but while this route remained a possibility, it was not Toyota's favoured option as licence payments were cost raising. In dealing with locally owned firms reluctant to relinquish control, TSA cited itself as an example of a firm which had only been able to survive and expand because the previous

[28] 'Fortuner favours the brave' *(Financial Mail Special Report: The motor industry*, 15 September, 2006).

[29] Globa1 supplier in this context refers to a foreign owned or joint venture operating in South Africa or a domestically owned firm with a technical agreement with a globa1 supplier.

owners, the Wessels family, had seen the necessity of Toyota Motor Corporation taking a controlling stake.

Table 6.5: Changes Affecting Toyota Suppliers from 2002 to 2007

	2002	2007
No of platforms	7	2
No of suppliers	160	75
Local content (%)	40-45	40-45
	Old Corolla (2002 model)	New Corolla (2007 model)
% of local components produced by global suppliers (Corolla)	41	82 (45% - global firms – non Japanese 22% - Japanese firms 13% - technical agreements with global company)

Source: Interviews

According to TSA, the parent company strategy was to localise in the country of assembly and it was also important to achieve certain levels of local content in order to meet EU rules of origin for duty free market access. In spite of the high volumes being achieved and the fact that Toyota was keen to increase local content, this had not increased and remained at approximately 40 percent for both the Corolla and the IMV. To move to 60 percent local content would require a local engine and there were no plans to do this. Engines for the IMV were built in Thailand, the global hub of the project. Transmissions were being produced in Indonesia.

Previously, a large number of components had been produced by in house firms such as Toyota Automotive Components (TAC) and the Toyota Stamping Division (TSD). Soft trim and plastic parts, wheel and tyre assembly and small stampings had now been outsourced. Plastic painting, which is regarded as a core competence had been brought in house. TSD continued to produce major stampings.

The position of local suppliers excluded from this network was extremely precarious. This group consisted of a multitude of smaller firms with capabilities in areas such as tooling and press parts. However, without close links to the design and technology of global suppliers they faced marginalisation. Ironically, while the lack of volume has always been a concern in the component industry, these smaller firms found it difficult to cope with the model volumes in excess of 100,000 units per year that Toyota was now achieving. From Toyota's perspective, these firms had three limitations; financial risk, labour risk and also management capability.

The second tier of suppliers was also regarded as weak with limited skill levels. Toyota were pessimistic about their prospects. This is one reason that local content remained low. While the new global suppliers were encouraged by Toyota to expand their own local content, these firms were importing from countries such as China and local firms could not compete. Even large raw material suppliers appeared to be losing ground. Only 30 percent of the steel used in the new Corolla was to be locally produced compared to 90 percent on the previous model.

Supplier development depended on the cycle of new model introductions. Following the launch of the IMV project in April, 2005, Toyota had identified 17 high risk suppliers and appointed a team of mainly retired technical staff, dubbed 'grey berets', to work with these firms in areas ranging from *kaizen* plans to press loading and human resource development. These firms had been assisted through to the end of 2006. At the time of the interviews in January 2007, production preparation was in progress for the new Corolla launch in mid 2007. After this, product development staff would again be deployed to assist 15 key suppliers to the Corolla and IMV. These firms were smaller, domestically and foreign owned suppliers. The larger, foreign owned suppliers received back up from their parent companies but according to Toyota management, many foreign owned firms received little support from the parent company and were quite weak in some respects.

Toyota's evolving relationship with its suppliers is fairly typical of assembler-supplier relations in the context of globalisation. The supplier base had been consolidated and the level of foreign ownership was much increased. Toyota increasingly dealt with global follow-source firms which had either established operations in South Africa through wholly own firms or joint ventures. Much effort had gone into facilitating these arrangements. Toyota continued to work with local suppliers but the number of these was much reduced. Some domestic firms, which were not part of this new supply chain, would become second tier suppliers to the new global first tier and others would seek out opportunities in the aftermarket. The remainder faced very bleak prospects.

4.3. Alfred Teves Technologies (Ate) — Supplying a Low Volume Assembly Industry

The scale of production is one of the central issues in the South African automotive industry (see Chapter Five). The cost premium incurred by component makers for producing a wide range of products at low volume is considerable. As is typically the case in the protected Latin American economies, the resulting market structure and pattern of investment has considerable influence on the development of technological capability. The case of Ate illustrates the cost penalties incurred by low volume production and how this has influenced investment patterns and technological effort.

Alfred Teves produces braking systems under licence from Alfred Teves AG, which was in turn owned by the giant US component maker ITT but is now owned by Continental Automotive Systems. Ate was set up originally for volume production in the early 1980s when the South African market was booming and there was the perception that it would also become a major supply source to Africa. Instead, however, volumes declined and a wider range of vehicles was produced. At the time of the first set of interviews in 1995, the firm was being further squeezed as it lost its export markets when ITT divested and was struggling to compete because of the high costs resulting from short production runs in the domestic market.

The firm was fairly capital intensive and compensation to all employees comprised only 16 percent of sales. Recent investments at that stage were aimed at process improvements but the emphasis in future was expected to fall on capacity expansion. The future of firms such as Ate depended very much on the strategies of local assemblers. The advantages of higher volume production were apparent in the strategy of BMW, which at that stage was planning to source the right hand drive version of the E46 from South Africa. The firm planned to be producing 50,000 3 Series vehicles out of South Africa by 2000.

This would have had a major impact on the local component sector as BMW wished to source 70 percent of its components domestically and was encouraging its German component suppliers to take equity stakes in South African licensee firms. The price savings that could be achieved from greater economies of scale were considerable. Ate's production at the time was 15,000 disc brake sets for the 3 series at a cost of R146.00 each and was 28 percent above the price in Germany. If volumes increased to 60,000 brake sets it could have matched the German price.

These savings could have been achieved by a reduction in fixed costs especially in the amortisation of machinery. The key factor would have been reduced machine downtime because of a smaller number of machine changeovers. As the chief executive of Ate put it:

> *"If you want to have a Japanese JIT system and make (a part) when the customer wants it, this would require 280 hours/week (35 part numbers — changeover time of 6-8 hours) just to change over and since a week on a triple shift basis has 168 hours you could not make every part each week so you have to do cost comparisons of how much it costs to*

change over — make an appropriate quantity for a month (or even 6 months) worth then carry the costs of inventory. The alternative is to put in other machining equipment - so you have six lines but then you have excess capacity".

On the existing line, 380,000 pieces (190,000 car sets) could be machined per year at 65 percent machine efficiency. Change-overs also required that before a volume run began the first off sample was tested for quality. Then production could begin at a rate of one piece per minute. In theory at the end of one shift (480 minutes) 480 parts could be produced. This amounted to five months worth of stock for a low volume vehicle such as the BMW 5 series. So for low volume vehicles, the tendency was to invest in flexible CNC equipment (R1-2 million at the time) with a changeover time of 20 minutes. This machinery was highly flexible but very slow for low volumes with a machining time of 14 minutes per piece (Table 6.6). Dedicated machining lines were designed for speed and comprised a set of eight hydraulically operated fixtures on a rotating table. Eight processes (drilling, milling etc.) were, therefore, happening simultaneously. With flexible CNC machining equipment each process is separate, accounting for a total of at least eight minutes plus the time for the machine to replace each tool back in the magazine. Machine changeovers on dedicated equipment are a complicated and arduous task involving removal of the machining table, fixture stations and tools and the disconnection of hydraulic clamping devices. These tasks were carried out by artisans. This type of dedicated machinery is not designed for frequent changeovers and foreign technical experts visiting the plant had been amazed that what they consider to be machine rebuilds were carried out on a routine basis. Frequent changeovers can also lead to quality problems.

Table 6.6: Flexible Machinery versus Dedicated Automation, 1995

	Flexible CNC machining line	Dedicated automation
Cost	RI-2m	R10m
Changeover time	20 minutes	6-8 hours
Machining time per piece	14 minutes	1 minute

Source: Interviews

Low volumes and the proliferation of models in the domestic market was therefore the major obstacle to improved competitiveness. For example, Ate produced 28 different part numbers of brake calliper for total production of 300,000 pieces per year (an average of 10,700 units per part number). The minimum number of changeovers was therefore 28 but in reality would be much higher because otherwise the firm would be holding a year's worth of stock. The decision on how many times to change over depended on the balance of the cost of downtime versus the cost of inventory. Because of the length of changeovers, low volume parts were only produced once or twice per annum. In contrast, the Ate licensor supplying fist callipers to BMW in Germany produced 425,000 vehicle sets per year of the same part number on dedicated lines out of plants in the UK and Germany. The only changeover required was between left and right which was not as complicated as a changeover between different makes. The diversity of part numbers and the resultant need to queue production meant that machine utilisation levels were low particularly for dedicated machining facilities (Table 6.7).

Another problem arising out of such low volume requirements, was the huge levels of inventory that had to be carried. Ate had a huge inventory store and stocks of raw material, components, half assembled and completed products were valued at R24 million for a firm which at the time had a turnover of R130 million. With higher production levels, raw material subcomponent costs could also be substantially reduced.

Table 6.7: Comparative Machine Utilisation Rates in a European and a South African Brake Plant, 1995

	Europe	South Africa
Dedicated machining	75-80% #	55-60
CNC machining	85%	80

Source: Interviews
Note: # 80 percent can be achieved without machine change ovets.

Considerable technological effort went into incremental changes to increase flexibility. To reduce tooling costs for the wide diversity of part numbers produced, a number of innovations had been introduced. For example, broach tools had been divided into segments to make them more versatile. Another large investment was in milling cutters, which cost R20,000 each. The numbers of these required had been reduced by putting in special inserts which allow 4 sides of the cutter instead of two to be used. The presetting of tools on CNC equipment had reduced downtime in that area due to machine changeovers. On transfer lines, changeover times had been reduced from 16-20 hours to 6-8 hours.

Ate's initial investment was in high volume transfer lines, which were unsuitable for low volume production runs. Since then the firm had invested in flexible machinery, which minimised machine downtime but could not compete with dedicated lines where high volumes were required. Many other South African component producers were in an even more intractable situation now that they were confronted with international competition and the need to export. Since the early 1980s, a number of component firms (and assemblers) have geared themselves for flexible production and simply lacked the output capacity for high volume production. This was a major obstacle for breaking into high volume production for overseas OE markets.

The cost penalties incurred as a result of low volumes and complexity in the domestic market were considerable. What was clear, however, was that firms such as Ate had developed considerable production capability in operating complex machinery under very unfavourable conditions, in introducing small innovations to increase flexibility and in the capacity to undertake machine rebuilds to stretch the life of capital equipment. In terms of technological capability, firms like this were a match for many low cost producers internationally although on a simple, price comparison they would be regarded as "uncompetitive".

4.3.1 Recent Developments

At follow up interviews conducted in December 2006,[30] the firm's position had not changed dramatically. It still operated under licence from Alfred Teves and was reliant primarily on the domestic market. Exports accounted for only 3-4 percent of sales.

One major new development had been the investment of R17 million in a new plant, opened in 2004, to manufacture friction products for the local and international aftermarket. But this shift to producing for the aftermarket, which now accounted for 33 percent of sales, reflected the low margins in OE production and in itself was a defensive response to fiercer global competition.

OE volumes had increased to some extent but were still a major constraint and the firm reported that the benefits derived from this had been offset by increased competitive pressures resulting from global sourcing. The main domestic markets were BMW and DaimlerChrysler. In spite of the fact that BMW was building 50,000 3 series vehicles per year this model incorporated three different front ends and three different rear ends each with differing brake requirements. Ate's total 2006 calliper production of 245,000 units was therefore spread across 12 part numbers giving average production per part number of just over 20,000 units. While this had doubled from ten years previously, it was still a very low volume and the company required 50,000 units per part number to be reasonably profitable in OE production. Calliper production was expected to increase substantially to 427,000 units in 2007 but the addition of eight new part numbers meant that production per part number would hardly increase. Ate considered that ideal volumes would be 900,000 units per year so the plant remained small in terms of total output with a wide range of parts being produced. The labour intensive facility producing brake hoses had a total output of only 40,000 units per annum compared to the state of the art plant in Germany producing 120,000 units per week. Low volume, multi part production together with the fact that the vehicle producers expected Ate

30 Interviews with Peter Hocknell (managing director) and Mike Teasdale (OE director), Ate.

to maintain large buffer stocks resulted in inventory levels remaining high at 20 percent of turnover.

Ate accepted that foreign ownership would yield major advantages but Continental Automotive had decided against buying the South African operation although it still had an option to do so. This constrained access to the multinational's global network and Continental favoured affiliate suppliers and had established new, low cost capacity in Slovakia, India and China. Its new Welsh plant was focused on low volume, niche products.

Local content in Ate products had been reduced from 65 percent to 35 percent. This was partly as a result of the closing of the foundry in 2004, but other sub-components including brake linings were also now being imported. Employment had fallen from 420 to 230 in 2005 and this latter figure included a staff of 25 in the new friction plant. Over the same period, sales had increased indicating both rapid productivity growth and lower in-house value added per unit of final sales.

Foreign ownership has frequently meant a decline in R&D as domestic firms adopt the precise process and product specifications of the parent firm. [31] But Ate, a locally owned firm, had also reduced its R&D capacity for these reasons. The relationship with the licensor was good although royalty costs were quite high: 3.5 percent for new products, 2.5 percent for locally adapted products and 2 percent in the aftermarket.

Ate illustrates two dilemmas facing component firms. In the 1990s, it grappled with the problems of low volumes and multi product production and showed considerable resourcefulness in dealing with this issue. A decade later, although policy had induced a degree of rationalisation in vehicle production, volumes remained low. In the more globalised environment of the early 21st century a further potential difficulty was apparent. As a domestically owned firm without proprietary technology, Ate's options were quite constrained without a foreign partner. The firm reacted by continuing to improve its proficiency in flexible production, by reducing the level of integration within the plant, by importing a greater share of subcomponents and by increasingly investing in production for the aftermarket where margins were higher. Much hinged on whether it could obtain high volume orders from other volume manufacturers.

[31] See the Behr case study in this chapter.

4.4 Gabriel : Productivity Gains through Reorganising Production

In the mid 1990s, South African manufacturing firms lagged international best practice by a considerable margin and the gap was particularly high in the automotive industry, which has historically been highly protected. South African assembly plants surveyed by the International Motor Vehicle Program (IMVP) in 1993 ranked very poorly at an average of 89 hours of direct labour per vehicle. [32] The reasons for this included the complexity of the domestic production mix and resultant low volumes, low levels of automation, low skill levels and poorly developed work organisation. Relatively low wages and high levels of protection have meant that there had, until early 1990s, been little pressure on South African assemblers to seriously address the productivity question. There was widespread awareness of lean production issues but attempts to introduce them had for the most part been piecemeal and of limited effectiveness as evidenced by high levels of strike action and low levels of participation in management initiatives on productivity. However, the adoption of world class manufacturing methods had accelerated as firms had been forced to improve productivity in the face of growing international competition.

The component sector has also lagged international best practice by a significant margin but there were considerable differences in levels of achievement among firms. One of the pioneers in the area of work organisation has been Gabriel, a medium sized producer of shock absorbers, gas and coil springs and MacPherson struts. From the late 1980s, it had been engaged in a process of production reorganisation aimed at implementing Japanese style production organisation with a view to increasing productivity and thereby reducing manufacturing costs. As such it provides a useful case study of pioneering this process in the South African context.

In the early 1990s, the firm was 86 percent owned by Maremont and in turn by Arvin Industries (both of the US). Arvin Industries controlled more than a dozen shock absorber plants around the world in developed and developing countries including the USA, Canada, Spain, India, France, Venezuela and Argentina. These plants, which to a certain extent had different capabilities, competed with each other for orders all over the world. The parent company had been aggressive in encouraging subsidiaries to reorganise production on a just-in-time basis and provided extensive support for this. Thus all group companies had been adopting JIT but were at different levels.

32 This figure is from the preliminary findings of Round Two of the International Motor Vehicle Programme's Internationa1 Assembly Plant Study by J. MacDuffie and F. Pi1 at MIT. In the follow up survey conducted a few years later there had been a considerable improvement.

Pressure for change also came from within the company and management and engineering staff appeared fully committed to new production principles. They were fully aware of the need to become internationally competitive in the face of changing market conditions. Their share (there was one other major domestic competitor) in the stagnating domestic market was seen as optimal. Also, the company expected protection to be reduced and that they would lose part of their traditional domestic OE market. Exports were therefore regarded as the only area of significant market growth. Unusually, the company did not object to reduced protection in the domestic market.

The firm was therefore seeking to expand exports from the existing level of 10-15 percent of turnover to as much as 50 percent although 30 percent was seen as a more realistic medium term objective. It was targeting the foreign aftermarket and its competitive strengths lay in the large range that the company could offer, high quality levels, acceptable prices and small niche market capabilities. Export growth depended on price, quality and delivery times and it was the latter, especially in terms of reliability, which presented the main problem. Thus an important objective was to reduce lead times to six weeks in foreign markets and achieve 100 percent orderfill reliability.

4.4.1 Production Reorganisation

The main innovations in production reorganisation involved the introduction of JIT manufacturing with a cellular layout, the objective being to "supply only the necessary items at the right time and correct volume to the prescribed quality specifications" (Company manual). This was to be achieved by introducing the following changes:

a) A flow system to move away from large batch production and thereby reduce work in progress.

b) Quick change overs. This would allow for greater flexibility through frequent setting up and smaller lot sizes and could be achieved by training, adaptations to tooling and the elimination of set up by trial and error.

c) Small lot sizes of 250 to 500 units. Small lots were preferred over continuous runs even if a large quantity of one component was required. The objective was flexibility and better service to the end user.

d) Balanced workload with successive work station cycle times to within five percent of one another.

e) Effective layout to allow efficient flow of work and "U-shaped" lines to improve proximity of operators to a number of machines.

f) Built in quality and in-line checking. Inspection was to be performed by operators at point of manufacture. Use of statistical process control (SPC).

g) Frequent parts supply with no interruptions.

h) Operators or cell leaders to be responsible for basic maintenance.

i) Simple visible planning and each cell to be provided with a daily timetable of units to be produced.

j) Continuous improvement achieved by the introduction of action teams (consisting of members of the cell, engineering, maintenance and tool room personnel) and suggestion schemes.

Implementation up to the mid 1990s had been partial with greater success in some areas than in others. The main feature was the gradual introduction and ongoing improvement of a number of JIT manufacturing cells. Gabriel were advised by a Japanese consultant to Maremont and the parent company's own JIT co-ordinator who visited Gabriel plants around the world to advise on implementation and to train personnel. In 1989 an implementation team was formed in Gabriel SA consisting of design engineers, toolmakers and maintenance fitters. The first major project was a gas spring assembly cell followed by the establishment of a shock absorber assembly cell for which most of the machines were designed and built in-house. Further cells had since been established or were in the process of being set up. A *kanban* system was being introduced to address the problem of lead times and levels of work in progress which remained fairly high.

Table 6.8: International Productivity Comparisons in the Gabriel Group, 1992

	Units/person day (early 1992)	Plant size and product variety compared to the SA plant
India	24	slightly larger plant
Mexico	27-28	slightly larger plant
South Africa	30	largest variety of all plants
Spain	200	large scale producer for OEMs (only 400 part numbers)
USA	110-180	larger, less variety
Venezuela	41-42	same size, simpler mix

Source: Interviews

Note: International differences could be accounted for by a number of factors only some of which were directly the result of firm level productivity (advanced production organisation, automation). Other factors such as product range, which impacted negatively on productivity according to the above measure, may have been the result of a fragmented domestic market and/or the company targeting the aftermarket, which required greater variety but also had better prices. Thus the Spanish plant was not directly comparable with the other plants as it produced for the original equipment market. But it also operated on a well developed JIT system and was highly automated.

Table 6.8 gives an indication of how productivity in the South African plant compared to other plants in the Gabriel group in early 1992, according to the measure of units produced per person/day. At this time the South African plant was not really competitive although its niche market capabilities meant that it did have some export capability. The South African plant had attained 45-50 units per person/day within a few months and 80 units per person/day within 12 months at which point it was extremely competitive given its relatively low labour costs. Another measure used was cost of employment as a percentage of sales, which was currently at 19 percent (with a target of 15 percent) compared to the 28 percent achieved in the US.

The substantial productivity improvements achieved by that time had resulted mainly in retrenchments rather than a large increase in output or exports. At that stage the company employed 340 people, down from 540 a year previously and 640 four years previously. This had included cutting salaried staff from 130 to 70. During this period, output had increased.

Productivity gains were very apparent in some of the new cells. For example, the new gas spring cell had increased production and flexibility but with a substantially reduced labour force (Table 6.9). Fifty percent of production from this cell was now being exported as a direct result of productivity improvements. In the new strut cell, five workers (previously nine) had maintained production at over 1000 units per shift.

Table 6.9: Productivity Improvement in the New Gas Spring Cell

	Old assembly line	New JIT cell
No. of workers	8	3
Output per shift*	500-1000 units	1000-1500 units
No. of machine changeovers per shift	3-4	7-8

Source: Interviews
Note: * Shifts were longer on the old assembly line.

4.4.2 Source of Productivity Increases

Machine set up times

This had been a major area of improvement and was the initial focus of the team established to introduce JIT. Set up times used to range from 30-120 minutes. This was reduced to 2-10 minutes in most cases. World class cell performance requires that all machines can be changed within five minutes. Under the old system, downtime resulting from lengthy set up times meant that 50-70 percent of potential production was lost. Reduction in set up times has been achieved in a number of ways. Machine setting was previously performed by a special category of setters while this task was now performed by the operators themselves. Large numbers of adaptations to machinery were introduced to reduce set up times. Some of these were extremely minor but had nevertheless been effective e.g. fitting clips to machinery which means that alien keys or spanners were no longer necessary to change settings.

To assist in this process, the company had established a number of small toolmaking companies (consisting of ex-employees) who specialised in making machines more flexible. Most of their work was for Gabriel but they also worked for other firms.

Batch size

Batch sizes had been reduced but this had proved more difficult than reducing set up times. Average batch sizes were 200-300. At one point, there was an attempt to bring them down to 100 but this proved premature as it was found that too much time was being wasted on setting up.[33] There were other constraints as well. Gabriel's original equipment markets were located at some distance from its Cape Town plant and it only shipped once a week. It therefore made sense to produce a particular part once a week.

Stock levels

Prior to the reorganisation, the company used to have eight weeks of finished stock. This had been reduced to under three weeks and the aim was seven days. [34] Stock turns were at the satisfactory level of 20 per year. However, with reduced stock levels the orderfill rate (percentage of orders fulfilled on time) had come under pressure.

4.4.3 Conclusions: Work Organisation, Economies of Scale and Flexible Specialisation

Most component firms consider that wide variety and low volumes place them at a considerable disadvantage both in export markets and competing with imports in the domestic market. In only a few areas have firms been able to establish world scale facilities with relatively high degrees of automation. Thus there has been a strongly held view that rationalisation of the number of models and makes would result in greatly improved competitiveness. At the same time, it was argued by some of the more vocal champions of lean production that Japanese style production allowed for the efficient production of a large variety of products and reduces minimum efficient scale. [35]

33 In follow up interviews conducted in 1995 batch sizes had been reduced to 50 in some cases.

34 By 1995 a high proportion of orders were completed within 24 hours.

35 See Alcorta (1998) for more detail on this debate.

The experience of Gabriel provides some support for both views. Gabriel was a low volume, high variety producer. During the 1990s production reorganisation had centred around productivity improvement while maintaining this flexible capacity and in fact making a virtue of it. However, even for a firm, which had gone a long way towards implementing lean production methods, the fragmentation of the South African market remained a problem. The firm produced in excess of 700 part numbers and had a product range which was higher than any other two companies in the Gabriel group combined. It had to deal, for example, with 17 diameters of piston rod while the maximum in other companies was 7-8. As an extreme contrast, the Spanish plant which operated on a JIT basis, had achieved high productivity on the basis of dedicated automation. A Gabriel production manager who visited the Spanish plant reported that one of its automated shock absorber lines had been producing 6,000 units per day of the same part number for the past 4 months. The South African operation produced a total of 6,500 units per day including struts and gas springs in a large range of types. Thus in spite of the strides that had been made in flexibility, management believed that significant gains could be made by standardising various components and reducing overall variety.

Gabriel was in many ways a typical South African component company. It produced a vast range of products and historically this had raised costs and limited the scope for further automation. This was a situation faced by many South African component firms. There were two alternative routes available to such companies. One was to increase specialisation and thereby generate greater economies of scale. This involved becoming high volume suppliers with foreign OEMs probably comprising a significant part of their market and required greater levels of automation. The alternative was the direction that Gabriel had pursued - making a virtue of product variety and increasing its efficiency in flexible production.

4.4.4 Recent Developments

Follow up interviews with Gabriel (now called ArvinMeritor) were conducted in 2006. [36] Gabriel had been acquired by Arvin Industries, which in 2000 merged with Meritor. Being part of a multinational was described by the managing director as being "like the curate's egg — good in parts". The South African subsidiaries were buffeted by turbulent events in the global automotive sector. In December 2002, ArvinMeritor acquired ZeunaStarker, which had four South African subsidiaries. In 2004, the decision was taken to sell the global aftermarket division, which included Gabriel SA. [37] Being part of an international corporation had helped

36 This section draws primarily on interviews with Mike Biden (managing director) and Marce1 Mbuyu (genera1 manager) of ArvinMeritor.

37 The sale of Gabriel to a private equity firm took place in 2007.

ArvinMeritor secure business. For instance, the South African operation had gained from business being relocated to South Africa from Europe.

At its peak, the Arvin operation in South Africa had 1500 employees. With the weak rand in 2000-2001, it had been very competitive and exported 85 percent of its output. By 2006, employment had declined to 900. Gabriel remained an efficient, flexible supplier to the aftermarket although its exports had declined in line with the stronger rand. It continued to build a huge variety of domestic parts and maintained high levels of finished stock to cater for the expanding number of models on South African roads. It continued to do engineering for local conditions, but within more circumscribed parameters.

But in line with the shift towards specialisation and greater international integration in the South African automotive component sector, rapid growth had taken place in the catalytic converter division which was also a subsidiary of ArvinMeritor but was run as a separate company, Emissions Technologies. Emissions Technologies was a much more capital intensive operation with relatively low value added as indicated by comparative employment and turnover data (Table 6.10). In a sense, these two divisions represent a microcosm (albeit an extreme one) of the recent trajectory of the South African automotive industry; accumulated capabilities in flexible low volume manufacturing being supplanted by high volume, capital intensive export production.

Table 6.10: Comparison of Gabriel and Emission Technologies, 2006

	Gabriel	Emission Technologies
Product	Shock absorbers	Canning of catalytic converters
Market	Aftermarket (mainly domestic)	Original equipment (export)
Turnover	R300 million	R2-3 billion
Employment	400	500
Level of automation	Low	Very high
Number of parts produced per day	1,500	24,000
Complexity (part numbers produced)	200 per day; 1300 altogether	Very few

Source: Interviews

4.5 Behr – The need for a Foreign Partner

For firms wishing to operate in the first tier, a foreign equity link either in the form of a joint venture or foreign ownership, has become increasingly important both to provide technology and links to global networks. A growing role for foreign owned firms is characteristic of the automotive industry in many emerging markets and brings certain advantages but also raises question marks over the future of locally owned firms.[38] An example is the acquisition of a group of South African based firms by the Stuttgart based Behr Group. [39] Behr is a large German multinational firm with global sales in 2000 of DM4.52 billion, 95 percent of which were accounted for by automotive components. Its major products were vehicle airconditioning and engine cooling systems. While 52 percent of total sales were outside Germany, Europe as a whole accounted for 82 percent of total sales. In emerging markets, Behr had plants in Brazil, India, the Czech Republic and South Africa. In common with many other German suppliers, the share of production outside of high cost Germany was growing. Production (as opposed to sales) outside of Germany accounted for 49 percent of total sales in 2000, up from 37 percent in 1996.

The Behr Group acquired its South African operation from the US firm, Federal Mogul, in May 1999. Federal Mogul had itself purchased a share in the South African listed firm as part of a worldwide deal when it took over T&N plc, the UK based component supplier, a year earlier. The latter firm's divisions were friction materials, pistons, bearings, gaskets and heat transfer equipment. Federal Mogul delisted T&N Holdings in December 1998 and drew the various divisions into its own global divisional structure. The T&N Heat Transfer division did not fit into the Federal Mogul structure as the latter company was not involved in this sector and this relatively small acquisition would not have given it critical mass in the sector. So from an early stage Federal Mogul was open to selling it.

As the South African automotive industry has become more internationally integrated, foreign owned vehicle manufacturers have been drawn more closely into the networks of their respective parent companies. This increasingly meant that they wanted selected suppliers to be located in South Africa. The Behr Group faced these pressures from key customers (BMW, DaimlerChrysler and VW) who were looking to expand vehicle production in South Africa. In particular, the Mercedes C Class export project offered the prospect of large contracts in the form of the airconditioner, radiator and condensor for this vehicle, which was to be built in volumes of 40,000 per annum in South Africa. According to the managing director of Behr (SA), the German group was faced with three alternatives. The first option was to invest in a greenfield facility. A second alternative was to purchase an existing firm and the third possibility was to simply continue their licence arrangements with existing firms operating in South Africa (Waldburger, 2000).

38 See for example, Humphrey and Salerno (2000) for India and Brazil.

39 This section draws primarily on interviews with Ted Waldburger (managing director) and Gavin Simkins (financial director) of Behr SA conducted in 2002.

The greenfield route was considered to be very demanding in terms of resources and also involved fairly high levels of risk. Maintaining a licensing arrangement was seen as risky because it involved losing control of core technology. T&N (and then Federal Mogul) had already been supplying the BMW 3 Series under licence but this was on an assembly basis and Behr was reluctant to licence its core technology. A licence arrangement, which involved assembly would allow only low value added in South Africa (Waldburger, 2000).

Table 6.11: Share of the South African Subsidiary in Sales, Capital Expenditure and Number of Employees

	Sales (DM millions)		Capital expenditure (DM millions)		Employees at year's end	
	1999	2000	1999	2000	1999	2000
Behr Group	3485	4152	285	323	12686	13376
Behr (SA)	73	128	0.9	3.9	1081	1055
SA share	2.1%	3.1%	0.3%	1.2%	8.5%	7.9%

Source: Annual Report, Behr Group

From the side of the South African operation, it was important to have a global partner. In the words of local management "the MIDP was starting to bite" and without a foreign investor the company "could have stagnated into the aftermarket or even died". [4] Behr proved to be an ideal candidate. Not only was it actively looking for an investment in South Africa as a result of pressure from its customers but the Behr Group already had a well developed relationship with the South African company because of technology developed by the latter, which had been licensed to Behr.

Behr purchased 100 percent of Federal Mogul Heat Transfer in May 1999 for an amount of DM 50 million, roughly equivalent to net asset value. Behr (SA) produces radiators, automotive air conditioners and condensers for the local original equipment market and the domestic and foreign aftermarket.

4.5.1 Performance of the Subsidiary

The basic strategy of the South African subsidiary has been to focus its activities in selected core areas. Turnover doubled in the three years up to 2002 to approximately R620m. Half of sales were original equipment and the remaining half were to the aftermarket. Direct exports accounted for a third of sales and were nearly all to the aftermarket. While the company did not export significant volumes of original equipment components, it supplied to domestic vehicle assemblers who supply both domestic and export markets. Rapid growth was

[40] Interviews

expected over the next few years and the South African subsidiary was highly profitable. Of the DM50 million investment, DM40 million was in equity the remainder being a DM10 million loan, which was denominated in rands and had now been repaid. Behr (South Africa) had 1100 employees at four sites in 2002, a number which had increased slightly over the last few years (up from 1055 in 2000). Prior to this, the firm had been experiencing "jobless growth" as it restructured in the face of tariff reductions and growing export opportunities. In spite of these changes, the firm remained very labour intensive compared to the overall Behr Group (Table 12). This was due to lower levels of automation but was also a function of its heavy involvement in production for the aftermarket.

It is clear that this investment was advantageous for the local operation, which faced the prospect of cutting production and increasingly competing on price in the aftermarket. Local management expected that employment would have fallen and the company would have struggled to maintain its technological edge. Since the acquisition, in each business division there had been productivity and efficiency improvements.

As has been typical in the component sector, perhaps the most important contribution of the investor has been to facilitate access to key automotive customers. The Behr Group is one of the largest worldwide suppliers to the three major German automakers (VW, Daimler Chrysler and BMW) all of which have plants in South Africa, which increasingly act as a base for export. The export drive has necessitated the introduction of new technology on a large scale and the car firms have actively promoted investment and joint ventures by German component suppliers. In the Port Elizabeth air conditioner plant, production has been greatly increased through obtaining the contract to supply the C Class Mercedes. The Durban plant produced the radiator for the C Class but has also seen an expansion of exports into the aftermarket. The copper based radiator plant at Silverton, Pretoria which was looking at reducing production because of the transfer of technology to aluminium based radiators has attracted additional business. Production from a recently closed copper based plant in Spain has been transferred to Behr (SA) and the firm expected that the same would happen with a copper based plant in the US.

A few years prior to being acquired by Behr, the South African heat transfer division was spending 4-5 percent of turnover on R&D. This was significantly higher than most component producers in South Africa and the firm was doing fundamental research and development. The South African operation had even developed innovative production technology, which had been licensed to the Behr Group. This 'composite deposition' process involved a new method of braising aluminium using a specially developed powder. But this innovative capability was not a significant factor in the decision to make the acquisition and by 2000 the situation had changed radically. After the acquisition took place, all R&D activity in South Africa was transferred to Germany or shut down. The South African subsidiary only did development work although its capability for this was expanding partly due to the high cost of assistance from the parent company. [41]

South African management saw this development as positive for two reasons. Firstly, the South African subsidiary was able to focus to a greater extent on its core activities. Secondly, they now had access to cutting edge R&D. An example of access to this know-how was the huge saving achieved in the course of a short visit from the parent company by a specialist in furnace technology. The Durban plant was set to invest R13 million in a new furnace to increase capacity but by reorganising the spacing of parts and the adjustment of heating elements they were able to increase the capacity of the existing furnace with no additional investment. Since the acquisition, the management team had remained virtually unchanged and no expatriate staff had been introduced with the exception of technical staff on short term secondments.

The South African location offered some important cost advantages. Labour was regarded as cheap in South Africa. Wages for production workers were one tenth of the German level and while productivity in the more automated German plants was significantly higher, the South African location still offered significant cost advantages. Salaries for technical and management staff were 30-35 percent of the German level. In addition, tooling and overhead costs, such as buildings, rent and some services were very cheap in South Africa.

An area where the South African subsidiary was particularly competitive was in small batch production. Once OE assembly of a particular vehicle model stopped, volumes dropped from hundreds of thousands to 5,000 - 10,000 per annum which was too low for automated German plants to be competitive. This cost advantage had become increasingly apparent to the parent company and the South African subsidiary was "playing an important role in the development of the worldwide spare parts business, as a supplier of heat exchangers". [42] Local management claimed to be able to out compete the German plants by a significant margin when it came to the low volumes required in the aftermarket. This was because levels of automation were relatively low and the South African subsidiary had high levels of experience and expertise in rapid changeovers and low volume production.

41 Interview with Justin Barnes(industry consultant).

42 Behr Annua1 Report (2001: 37)

Some of the plants had not changed very much since the acquisition. The biggest change had been at the Port Elizabeth air conditioner plant, which put in a new, more automated line for the W203 vehicles.

Other changes had been in purchasing, where the company was now able to source sub-components much more effectively and at world prices. Significant savings had, for instance, been made in aluminium tubes. Savings on sourcing components were particularly important in air conditioners, which had levels of imported content as high as 65 percent.

4.5.2 Conclusion

With the liberalisation of the South African automotive industry, the basis of expansion had now become much more export oriented and it has become increasingly important for component firms to have either direct or indirect access to export markets. Carmakers have actively sought out component suppliers who are able to export and to supply components which meet the increasingly exacting standards of their own increasingly export oriented assembly operations. This has led local firms to link up with foreign firms in order to establish conduits to the international market. As mentioned above carmakers have frequently facilitated these arrangements.

4.5.3 Recent developments[43]

Behr has continued to become more integrated into the global activities of the parent company and exports, investment and employment had continued to expand. Sixty percent of its 2006 output valued at R1,700 million was exported.

Along with much of the component sector, Behr has moved from being "wide and shallow to narrow and deep." The mode of integration with the parent company allowed for an optimal combination of activities, which enabled the firm to achieve world scale in capital intensive activities while producing efficiently for the low volume, domestic assembly industry and also using its expertise in low volume, labour intensive production for the aftermarket. Its activities could therefore be categorised as follows:

1. Capital intensive manufacture in specialised areas for the world market.

43 The following section draws on an interview with Behr SA, managing director Ted Waldburger, conducted in May, 2007.

2. Low investment 'assembly type' production of first tier original equipment components for domestic assemblers.

3. Labour intensive aftermarket production.

An example of (1) above was the recent installation of a R100 million aluminium tube plant to meet Behr's global requirements for charge air cooler assemblies. The firm was therefore able to achieve economies of scale in an area which required heavy capital investment. Minimum efficient scale is much lower in assembly type activities and this allowed the firm to be reasonably efficient in these types of processes which were directed to the low, volume domestic assembly industry.

4.6 NGK Ceramics[44]

One of the questions addressed above is the impact of a multinational taking over or entering into a joint venture with an existing firm. There has also been a certain amount of greenfield investment. This has taken two main forms. The first has been the establishment of new first tier suppliers, many of which have been systems integrators supplying just in time to new vehicle export projects. A second important grouping has been the emergence of a new foreign owned export sector especially in catalytic converters and automotive leather.[45]

NGK Ceramics South Africa is a greenfield plant, which produces the ceramic substrate for catalytic converters. It is 100 percent owned by the Japan based firm NGK Insulators Ltd, a leader in the field.

4.6.1 The South African Industry

The catalytic converter industry has been growing rapidly worldwide. The use of converters has been a standard requirement for many years in the case of vehicles operating in developed countries. In the fast growing vehicle markets of emerging markets such as India, China and a number of Latin American countries, legislation increasingly requires the use of converters. Global production of catalytic converters amounted to approximately 100 million pieces (complete converters) in 2000.

In South Africa, the industry has seen dramatic growth of both production and exports and by 2005 the country supplied over 12 percent of global supply from a low base in 1990. Over 95 percent of the production of catalytic converters is destined for the export market once they

44 This section draws heavily on interviews with Steve Bates, managing director of NGK Ceramics (SA) Pty Ltd

45 The emergence of these sectors is discussed in Chapter Four.

have been coated and canned. The share of catalytic converters in South Africa's total exports of automotive components rose strongly from 9.4 percent in 1994 to 26.6 percent in 1999 and 43.1 percent in 2005, this in spite of the fact that component exports as a whole have been increasing very rapidly. According to the Catalytic Converter Interest Group, by 1998 the canning and coating sectors alone employed 1500 workers directly with fixed investment of R800 million. These figures excluded investment in ancillary industries such as flex connections, matt manufacture and manifold, exhaust system and silencer assemblies.

The South African based industry is for the most part foreign owned and started with the establishment of plants, which undertook the coating and canning of the imported ceramic substrate. Coaters established in South Africa include Engelhard, Johnson Mathey and dmc^2. Canners include Arvin, Bosal, Magnetti Marelli and Tenneco. Backward integration into the ceramic substrate was a more recent development with the two world leaders, Coming and NGK Insulators itself, recently establishing plants in South Africa. Both of these plants fire the 'green' substrate, which is imported from Europe and Japan. After firing they are coated and canned and for the most part re-exported mainly to Europe but also to the US and other countries. The process requiring the largest investment, the extrusion of the ceramic monolith, is not yet performed in South Africa.

The phenomenal growth of the South African industry can only be understood in the context of South Africa's automotive policy. As explained on Chapter Four, import export complementation enables assemblers to use import credits to source components and vehicles at close to international prices. Car companies, which do not have operations in South Africa are also able to use import credits to rebate duties and thereby access the South African market. There is, therefore, considerable pressure on assemblers and distributors to gain access to import credits via exporting. Assemblers can of course achieve this through exporting vehicles but they have also played a major role in expanding component exports either directly through subsidiary companies or through facilitating major contracts into their parent company global networks. This has encouraged major investments in certain components, the most important of which has been catalytic converters. [46] Producers of the ceramic substrates do not receive import credits but have benefited from the drive by vehicle manufacturers to increase export volumes of completed converters and to raise local value added. [47]

46 Other important component exports include leather seating, tyres, exhausts, wheels, engine parts and wiring harnesses (see Chapter Four).

47 Only domestic value added to exported products qualifies for import rebates.

The automotive policy was thus absolutely critical to the establishment of the industry but South Africa has other location advantages. The country is a major stainless steel producer. It is also one of the world's largest producers of the platinum group metals used to coat the converters. While domestic production of the latter offers no price advantage given the low transport costs of this high value commodity, South Africa has considerable accumulated expertise in precious metals technology.

By the late 1990s, South Africa had become a leading global producer of catalytic converters with a number of coating and canning plants in operation. The announcement of major export contracts" provided a clear indication of further expansion and also provided the justification for further backward integration through the establishment of production capacity in the ceramic substrate.

In 1999, NGK's major international rival, Corning, announced the establishment of production capacity in Port Elizabeth and this forced the hand of NGK. The Japanese firm ran the risk of losing market share to Corning and it also faced requests from its customers operating in South Africa to open a facility.

4.6.2 The Establishment of the Plant and Resource Transfers

Capital invested in the plant was approximately $20 million including working capital. The plant had a capacity of six million pieces per annum and employed 90 workers. The plant was established according to very tight deadlines with construction beginning in May 2000, trial production in November 2000 and the start of commercial production in January 2001.

The plant technology itself involves firing of the substrate and testing of the product. These are sophisticated processes. The two huge kilns are state of the art - each with 33 burners, each of which are individually controlled to allow for very precise and even control of temperature throughout the kiln. Each kiln has a capacity of 30,000 pieces which are fired for 60 hours at carefully regulated temperatures of up to 1400 degrees Celsius. Testing is extensive involving dimensional integrity, isostatic and compressive strength, web thickness, water absorptiveness and expansiveness. While most of this is selective testing each product is laser tested.

As one of the two largest global producers of ceramic substrate, NGK has a large established customer base and leading edge technology. There was also large-scale existing demand and

48 See for instance "Bosal signs R810m converter deal" *(Business Times,* 8 August 1999), "Delta, Tenneco clean up with R2.3bn catalytic converter deal" *(Business Report,* 13 September 2000), "Renault seals R11 billion export dea1 for catalytic converters" *(Business Report,* 28 November 2000).

clear future growth in South Africa. It was these customers who had pushed for the establishment of the plant. A key resource in this producer driven industry was access to the international supply chain of which NGK was an important part. In this sense the establishment of NGK Ceramics was a natural progression into backward integration.

4.6.3 Concluding Comments

As discussed above, the catalytic converter industry has grown rapidly and attracted substantial foreign investment as a result of the automotive policy, which encouraged export development. While this development was welcomed by policy makers, it also raised concerns about the sustainability of the industry especially as it was initially based on the imported substrate with high associated logistical costs. To some extent this has now changed with establishment of the NGK and Corning plants. An important next step could be the localisation of the extrusion process, which would involve large capital investment and the importation of very sophisticated technology.

The exceptionally rapid growth of the catalytic converter industry is an extreme case of the bi-furcation between 'traditional,' mainly domestically owned firms on the one hand and foreign owned firms on the other. The former group have been squeezed by the abolition of local content requirements, reduced protection and the difficulty of linking in to global networks. The latter have been able to take advantage of a new incentive structure which has strongly favoured exports. In the case of catalytic converters, this has involved the development of a completely new foreign owned sector tailor made to take advantage of the specific incentive structure that now exists but adding little to the overall development of the industry.

5. CONCLUSION

Processes of industrial change take place at the firm level and examining these changes is helpful in illuminating the more aggregated analysis in earlier chapters. The purpose of this chapter has therefore been to use firm and plant level case studies to examine the processes of technological learning and restructuring in the context of a liberalising trade regime.

Based on the case studies in this chapter and on the analysis in previous chapters I have defined three overlapping stages of firm level responses as the sector moves from protection to a more open trade regime. The first stage is the process of adaptation and development under protection, the 'platypus effect'. The second, I have termed 'internal restructuring'.

The third involves external restructuring or 'internationalisation,' and has frequently involved a redefining of relationships (including ownership) vis-a-vis foreign firms.

5.1 Adaptation and Development Under Protection — The 'Platypus Effect'

South Africa's automotive component industry has historically had all the characteristics typical of the industrial structure of protected semi-industrial countries (Katz, 1987, 2000; Lall, 1987). It was inward oriented with low levels of exports. The level of reliance on foreign technology was high and this was mainly secured through licensing and tariff hopping FDI. In the context of the small domestic market, protection led to a fragmented production structure. This impacted on the type of investment undertaken, on the degree of automation, on the type of learning and incremental technological activity within firms and on the capacity for R&D. This was manifested in a wide range of problems, which made the sector uncompetitive. These problems included low rates of machine utilisation, high levels of inventory, a weakly developed supplier network and logistical problems. A further characteristic feature was high levels of vertical integration resulting in a lack of specialisation. This resulted both from the fact that the network of suppliers was poorly developed and also from the fact that historically high levels of protection raised the cost of components being supplied to the assemblers. [49]

I have argued, however, that while most component firms in the early 1990s were heavily reliant on foreign technology and had very limited product development capability, to categorise them as technologically un-dynamic is an over-simplification. Most firms had acquired significant capabilities in undertaking new investments and particularly in process technology. At the product level, however, local design capability was relatively limited except in the case of simpler components or in adapting products to local conditions.

Learning had been significant and was ongoing. Incremental innovation is a key source of productivity improvement and it is evident that automotive component firms were heavily engaged in this form of innovative activity over a long period. However, as was the case in the Katz et al (1987) studies of protected Latin American manufacturing firms, much of their technological effort was directed at the problems of low volume, multi-product production rather than simply minimising costs in a mass production environment. As a result, firms developed forms of expertise, which counted for little in the international marketplace. For instance, they were flexible but unit production costs were high. In many cases (e.g. Alfred

49 See. for example, Teves and ADE case studies

Teves and ADE) they had made investments in machinery, for example flexible CNC machinery, which were poorly suited to high volume, export production.

The fact that firms had therefore accumulated considerable technological capability does not necessarily support the view that the experience of import substituting industrialisation provided the basis for industrial learning and later export expansion as has been argued for Latin America (Teitel and Thoumi, 1986; Katz, 2000). While substantial learning took place, the costs of restructuring have also been high. It is by no means clear that the industry had to go through this process of 'distorted' development under heavy protection. With hindsight a more rational industry structure could have been established from the start with the judicious use of industrial policy and subsidies. The east Asian experience of combining protection with export support from an early stage is relevant here.

5.2 The Process of Internal Restructuring

Component firms have had to make dramatic changes to their mode of operation as a result of liberalisation and have shown considerable resourcefulness in doing so. The key to successful adjustment in the South African automotive component sector has been the effectiveness with which firms have been able to adapt accumulated capabilities to a production environment, which requires higher volumes and lower costs for the global market. Restructuring has taken a number of forms and these responses can be classified as either defensive or offensive; and either internal or external to the plant (Figure 6.2). For instance, exporting could be seen as an offensive strategy and is external to the plant itself. Retrenchment is defensive and is internal to the plant. Other changes have included greater specialisation and the reduction of the product line, improving work organisation, the development of suppliers, new investment and licensing new technology. Specialisation and vertical dis-integration took place in all instances, the most dramatic example being ADE, which shifted from being an integrated, low volume engine producer to a high volume producer of a limited set of engine component castings.

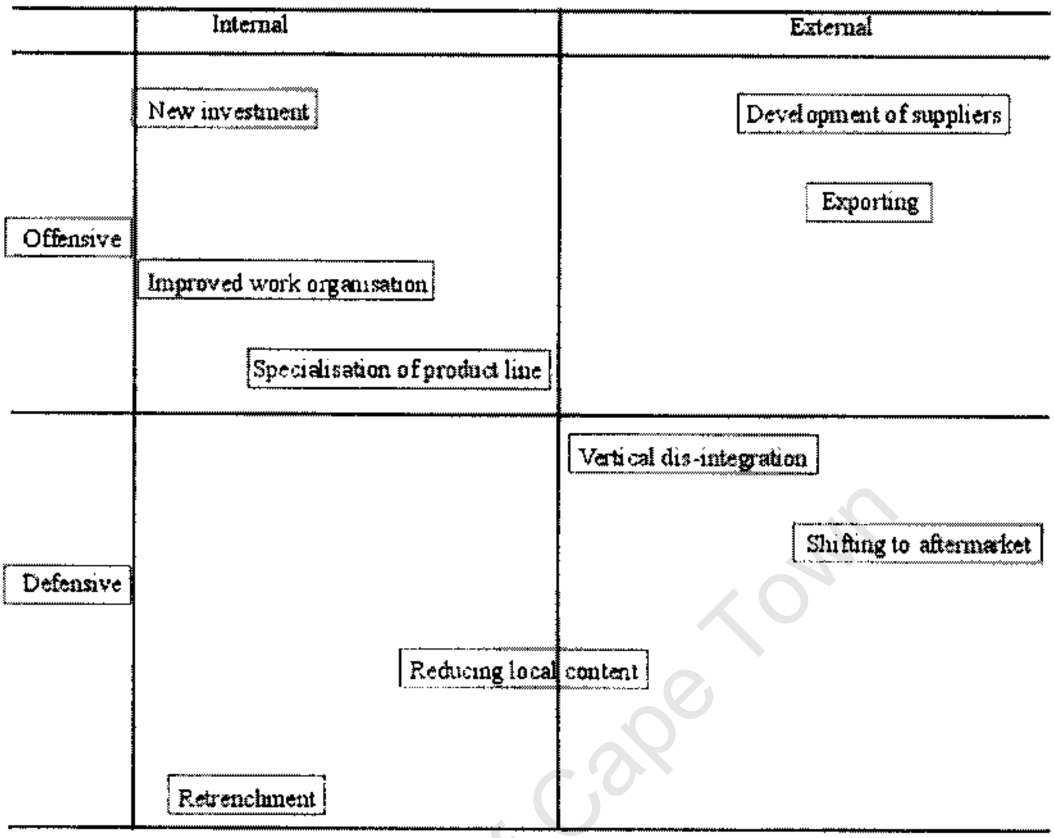
The rapid expansion of exports is indicative of a positive supply response. Nevertheless, the process of adjustment has been extremely difficult, requiring not only new skills and technology but frequently new fixed capital and access to new markets. One important constraint has been in the area of fixed investment, particularly where firms had made investments in flexible machinery well suited to the old, protected structure but generally more expensive for high volume production.

Work organisation is an important part of technological upgrading. Pressure to undertake these changes is driven in part by increased competition. Sources of this capability vary. In the case of the shock absorber producer, they came initially from the foreign parent but in a situation where changes were strongly supported by local management. In the case of the diesel engine producer, specialised consultants played an important role while demanding customers can be important as is the case with suppliers to Toyota. But as Barnes (2001) has argued, workplace change is a necessary but insufficient condition for competitiveness.

The International Motor Vehicle Program showed that in the early 1990s, the assembly industry lagged well behind best practice even in many developing countries and the same applied to the component sector. This conclusion is supported by my observations in dozens of component plants visited during the 1990s. It is also clear that there was considerable variation between plants and as the case of study of Gabriel indicates, some firms adopted these changes at an early stage. And, as a number of studies have attested, there has been a rapid process of catch up over the past decade. [50] Left to the market, firms would be likely to under-invest in this type of improvement. Potential sources of information are inadequate. The source of this productivity improvement is likely to be external - in the form of a progressive (foreign) parent company or in the form of demanding customers. This area seems to be a critical area for policy intervention. Clearly, improved work organisation can raise productivity on an ongoing basis without substantial investment in capital equipment. It is dependent more on training and culture change within the organisation and also has a significant effect on related firms. Most significantly, in the case of automotive components, improved work organisation can reduce the costs resulting from proliferation in the domestic market.

50 See for example Barnes et al. (2004).

Figure 6.2: Typology of Firm Level Competitive Responses



The supply base is weak and assemblers have only recently begun to develop more co-operative links with suppliers aimed at upgrading the supply base. While there are some indications of assemblers increasing investment in the supply base and encouraging foreign firms to invest in local companies, a more common response as tariffs decline has been to source product internationally. On the other hand, assemblers have been keen to promote exports but this has been predominantly from a very small selected group of suppliers, some of which were developed primarily to generate exports for import rebate purposes.

The pressures to undertake technological effort come from disparate sources. A culture of learning within the organisation appears to be an important firm level factor and this is undoubtedly spurred by greater competition as was occurring through tariff reductions. An interesting question was the perceived reluctance to move towards establishing independent technological capability and proprietary technology in product as opposed to process development. Virtually all domestically owned, first tier suppliers operated under licence and the exceptions tended to be in peripheral components. Licensing involves substantial costs in terms of royalties and constrains firms in export markets. But firms producing sophisticated components saw little sense in moving off licence and lacked the capacity and size to catch up to the fast moving technology frontier. Neither did they see much point in "reinventing the wheel". [51] Many firms in fact would see the only alternative being to establish a joint venture with a global supplier rather than establishing their own design capability. In fact, firms were remarkably sanguine in their approach to R&D and technological development more generally. In contrast, perhaps, to academic researchers, they do not see R&D as a goal in itself!

The changes detailed in Figure 6.2 have, therefore, been necessary but often not sufficient to deal with the new environment. They constituted the first phase of the competitive response to globalisation. By improving plant level efficiencies and expanding into export markets, firms did what they could to cope with the new environment. But as the case studies demonstrate, a second phase of restructuring has frequently followed.

5.3 The Limitations of Internal Restructuring: Internationalisation and the Role of FDI

Although firms showed considerable ingenuity in responding to the pressures of globalisation, one of the most striking observations is the limitations of 'internal restructuring' and the resulting requirement for 'external restructuring' or internationalisation. Firms have needed to integrate or re-position themselves within global value chains. Frequently, this has required the introduction of a foreign partner or even the take over by a foreign firm. Both competitive stresses and the demands of customers have driven this process. These pressures fall most heavily on suppliers of original equipment components in a situation where assemblers prefer to source from foreign owned firms in the domestic market and where the locally owned firm will find it difficult to break into international markets in potential competition with its licensor. In most cases it had become necessary for first tier suppliers to either secure an international partner or face relegation to the second tier or the aftermarket.

This has, of course, has been very evident in the assembly industry. One of the case studies is of the Toyota supplier system. But Toyota SA itself had no choice but to sell a majority stake to Toyota Motor Corporation and become a subsidiary of the Japanese multinational. This hugely expanded its potential and it rapidly became South Africa's leading vehicle exporter. It also had dramatic implications for suppliers who were themselves frequently forced to seek out foreign partners.

ADE clearly needed a foreign partner, so did Behr. They were essential to maintain and expand access to global networks. Without a foreign partner, Teves faces increasing pressures

51 Interview, Atlantis Diesel Engines.

as a first tier supplier in the domestic market and also in export markets. Its licensor has recently opened a new plant in Wales to deal with low volume production, an area where Teves had substantial capability. As a result, Teves is increasingly seeking new opportunities in the aftermarket. Foreign firms have also been best placed to take advantage of the opportunities afforded by the MIDP, even though this may not have particularly helped to strengthen the industry. An example is the greenfield investment by NGK, and also the catalytic converter expansion undertaken by ArvinMeritor. An interesting question, which I have not explored, is whether the weaknesses engendered by import substitution in fact led later to more rapid expansion in foreign ownership than may have otherwise been the case. Any negative implications arising from foreign ownership, have to be tempered by the realisation that it was absolutely necessary for the survival of many firms.

Chapter Four showed that foreign owned suppliers themselves make much less use of domestic content. Toyota was pessimistic about the capabilities of second tier suppliers and its first tier, global suppliers were using a growing percentage of imported sub-components. Behr has reduced costs by sourcing internationally and local content in its air conditioner units has been reduced. But growing importation of sub-components was not restricted to foreign owned firms; Ate had also embarked on such a strategy.

Foreign technology transfers are key sources of technological upgrading. They take place through the import of capital equipment, licensing agreements, direct foreign investments, learning through exporting, exchanges of personnel and informal transfers. International linkages are therefore extremely important and need to be encouraged. Exports are a major source of learning because of the demanding nature of the international market place in terms of price, quality and delivery.

Foreign ownership also has implications for the level of R&D in South African based firms. There is less need for ongoing adaptations of products as they become standardised to global designs. Behr, for instance, closed its small R&D division. However, foreign ownership brings new technology and easier access to expertise in the high volume, low cost production required for global competitiveness. Direct support for R&D would therefore be of little benefit to most firms unless its objectives were specified or linked to a major (state sponsored) initiative for example to develop a local engine. Where does this leave policy? Subsidising R&D is unlikely to be particularly helpful for most firms. A large component producer such as ADE did not even have a formal R&D department even though it has been a rapid learner. Given the disparate nature of technology used in the automotive sector which comprises technologies ranging from plastic injection moulding, foundry technologies to machining it is unlikely that technology centres would be useful except perhaps for small firms.

For firms to adjust to a very different trade regime is difficult, time consuming and expensive. It is, therefore, important that the process of trade liberalisation takes account of the fact that a significant amount of firm level "inefficiency" may result from the specific industrial structure and also that the nature of fixed investments mean that adjustment to new market conditions cannot be achieved overnight. South African component suppliers are now more specialised and operate at much higher scale. Levels of foreign ownership are higher and they are more competitive. But the process of restructuring has been a painful one and is by no means complete.

CHAPTER SEVEN

CONCLUSION

I. INTRODUCTION

Since 1990 the South African automotive industry has been through the most tumultuous phase of its long history. The objective of the thesis has been to analyse the restructuring of the sector in response to partial liberalisation over this period. This process provides an important case study of trade liberalisation, industrial policy and industrial transition. The key questions are the following. Has automotive policy and associated changes brought about an industry structure that is more efficient and sustainable? How should the industry be characterised in terms of its level of development? Did protection and export support provide a basis for later competitiveness as tariffs declined or was it simply wasteful misallocation of resources?

After summarising the key points from the main chapters, I consider the question of whether the industry has become more sustainable and present some general conclusions regarding trade and industrial policy and the process of sectoral adjustment.

Chapter two set out to identify the implications for the South African automotive industry of global trends in investment, production and trade. I argued that the shift in location is inexorably in the direction of developing countries and that richer nations are becoming less able to compete against emerging production locations. Changes in the organisation of production have disparate effects on global location. While some of these changes may slow down the process of relocation, others promote it. In some important respects, the shift in location is driven more by regionalisation than globalisation but the impact remains the same — a gradual relocation to middle income and selected low income countries. These changes have created opportunities for certain developing countries. But in a more open trading environment, the number of viable locations is limited and automotive industry expansion in the developing world is increasingly concentrated in a relatively small number of locations or clusters. Key requirements are a large and growing domestic or adjacent market and a reasonable level of technological and industrial capability.

These attributes provide the potential for expansion but supportive policy has been essential to initiate and sustain development. The various policy options facing developing countries were critically assessed in **chapter three.** Historically this has involved protection in the early phases followed in many cases by export support. Appropriate policy depends on circumstances. For countries which do not have large existing or potential domestic markets, policy needs to define an 'automotive space' and provide some protection to anchor the domestic industry. At the same time, excessive protection should be avoided and it is essential to ensure that investment is as close to world scale as possible. Clearly, supportive measures to support the upgrading of skills and technology are important but these have not been a major concern of this project.

Chapter four analyses the key features of automotive policy and the development of the industry in South Africa. Considerable emphasis is placed on the structural changes that have occurred in relation to trade, market structure and investment. With its unfavourable geographical location (in terms of distance to major markets) and history of heavy protection, the prognosis for the South African industry in the early 1990s was not good. Trade liberalisation took place against a background of major political uncertainty with the MIDP being introduced less than a year after the first democratic elections. The economic situation was gradually stabilised but it was only after 2002 that a higher platform of growth was established. The international context was one of rapid growth in emerging markets in Latin America, central Europe and Asia and the South African industry, which had been one of the largest in the developing world in the early 1980s was rapidly being overhauled.

To date the costs of liberalisation have been quite low. The share of imports has grown sharply but falling employment for the period 1997-1999 was attributable mainly to weak domestic sales. Investment has increased and there has been a very rapid increase in exports of both vehicles and components. Vehicle prices have also declined in real terms but remain significantly higher than prices in first world markets. It would be incorrect to say that the industry has become completely liberalised during this time. It remains protected and assisted although to a much lesser degree than was the case previously.

The question of scale and industry structure is dealt with in more detail in **chapter five.** The development of small scale multi-model plants has been the central structural problem in the South African automotive industry. It exacerbated the lack of competitiveness normally associated with high levels of protection and fundamentally limited the prospects for expanding local content. This problem provides a potential rationale for industrial policy. But the chapter shows that implementation is extremely complex. Progress in achieving higher model volumes has been made, but it has not been sufficient to justify investments in high levels of local content.

Chapter six examines the process of restructuring at the firm level. Protection led to the development of an uncompetitive industry structure. The chapter argues that firms under protection proved themselves to be quite efficient and innovative within the constraints that they faced. However, they were efficient in the confines of the domestic market; and not according to the differing precepts of global production. Restructuring has taken a number of forms and firms have proved remarkably adaptable. But internal or plant level changes, while necessary have seldom proved sufficient. In many cases firms have been forced to seek out a foreign partner. Foreign ownership or control in turn has had a number of effects on firm performance and prospects in areas such as exports, R&D and the use of domestic suppliers.

2. A MORE SUSTAINABLE INDUSTRY?

Is the industry sustainable at lower levels of protection? At this stage it remains difficult to say. South Africa's global location remains unfavourable. Neither the country nor the southern African region constitutes a viable 'automotive space'. The regional market is very small and is divided into a number of small national economies which have little interest in buying new cars from South Africa when they can import cheap, used vehicles from countries such as Japan. However, there are a number of considerations which ameliorate the position to a degree. Widely dispersed global markets mean that risk is reduced. Trade arrangements with the EU and the US (AGOA) have been advantageous and South Africa remains an important supplier to a number of niche markets which collectively are very important. Closer trade ties with large and growing proximate markets such as India and Brazil would probably be sensible. In any event, proximity from markets is best measured by cost and time, rather than physical distance. More efficient transport links could reduce these costs.

Policy remains a very important driving factor. However, the structure of the industry is, in most respects, more efficient than what developed in the import substitution phase. Levels of protection are much lower and the level of international integration is higher. The scale of production is higher, both in assembly and components production and in-plant production costs are therefore lower. But volumes in assembly and much of the original equipment component industry remain quite low. In fact, compared to the more dynamic emerging automotive producing countries the gap has probably opened in this respect. Local content in assembly is low, which makes for high logistics costs. It also makes the industry more vulnerable to falling protection. There has been a marked reluctance on the part of some firms to make really large, fixed investments and so assembly rather than integrated manufacturing remains a defining feature.

3. THE IMPLICATIONS OF THE MIDP FOR COMPETITIVENESS, TRADE AND INDUSTRIAL POLICY

There are a number of more general conclusions relating to the nature of competitiveness and the role of trade and industrial policy that can be drawn from the South African experience with automotive policy.

3.1 The Importance of Global Location and Sector Specific Nature of Value Chains and Networks

For developing countries seeking to promote certain sectors the room to manoeuvre is heavily constrained in a number of ways. Policy makers can easily underestimate the impact of the trajectory of global and national trends in the industry concerned.' These include geographical shifts in location and also in the structure of the production and the nature of the value chain and networks which define the industry. The latter are of particular importance when the value chain is so directly and tightly governed by global corporations as is the case in the automotive industry.

As mentioned earlier, the automotive industry is a producer driven value chain (Gereffi, 1994). The key decisions on the sourcing of vehicles from different regions are made in a handful of global companies based in places like Detroit, Stuttgart and Nagoya, while local subsidiaries actively compete and lobby for vehicle export contracts. Access to export contracts entails very demanding requirements and would normally be accompanied by additional parent company investment and support in the form of specialised skills and other assistance. Multinational carmakers also have a major influence on where component production is located and can 'encourage' suppliers to relocate or establish production in South Africa or in any other location. In this respect, there are important differences with buyer driven value chains, which are characteristic of sectors such as garments. In buyer driven value chains, international retailers and brand owners control the value chain and the influence of the actual producers is much more limited. The MIDP places pressure on the `drivers' of the automotive value chain (the carmakers) to source product from South Africa. In turn they are able to use their global influence to facilitate this. But the leverage exerted by

Lowe and Kenney (1999) make this point in their explanation of the failure of the Mexican consumer electronics industry.

the MIDP is not that South Africa is a low cost production location. South Africa offers a medium sized but rapidly growing domestic market. The MIDP effectively sets certain requirements for access to this market. Future policy must take account of this consideration.

With liberalisation, the automotive industry has become much more export oriented and it is increasingly important for component firms to have either direct or indirect access to export markets. The major asset contributed by foreign vehicle producers and component suppliers has undoubtedly been access to international markets (Gelb and Black, 2004). This access to a larger market may only be in a specialised or niche area and could also mean confinement to an inferior position in the value chain.

It is useful therefore to think of the objective of policy as being not only to improve firm level `competitiveness' but rather as elevating the position of the South African industry within global networks. This refers not only to upgrading to higher technology products and processes but to a number of other possibilities including a larger share of the output of the network, the development of related industries and suppliers, a growing role for domestically owned suppliers and the development of the physical and social infrastructure relating to the industry concerned. The key distinction is that it is groups of firms and networks which matter rather than individual firms.

3.2 The Nature of Competitiveness and Comparative Advantage

Recent developments in the automotive industry point to a number of findings about the nature of competitiveness and comparative advantage.

Industry structure and comparative advantage

A decade or two ago, the automotive industry in South Africa was regarded as the very antithesis of comparative advantage, being both inefficiently structured and inward looking. It produced a multitude of models for the local market and as a result the component industry was also uncompetitive, as it had to adapt to a low volume, domestic market. The strong export response lends support to the view that the industry was not necessarily lacking comparative advantage nor even 'inefficient' at the level of the firm. The lack of competitiveness resulted from excessive protection, which led to 'structural inefficiency' primarily resulting from low volume production. At firm level, major technological effort was expended in adapting to specific market conditions. For example, the protected domestic market required that effort be applied to deal with major complications in the areas of logistics, materials flow, machine changeovers and production scheduling arising from low volume production and associated complexity. As a result, firms developed expertise and capacity in low volume, flexible production. But this counted for little in the international market place, which requires cost minimisation and the achievement of optimal performance from world scale plant. Policy makers devising liberalisation programmes need to be aware of this and should probably take steps to increase the scale of production before excessive liberalisation takes place.

Demonstration effects

By encouraging initial investments, export incentives can promote further developments in a number of ways, leading to increasing returns. Easterly (2001) cites the example of spillover effects precipitated by the initial investment made by a Bangladeshi garment entrepreneur, which sparked expansion in this sector. The South African car industry is a similar case in point. The MIDP encouraged BMW to embark on a major vehicle export programme. This provided an important learning experience for others, especially BMW's international rival, DaimlerChrysler who admit that they may not have made the investment without the BMW example. [2] In a sense this is a form of increasing return. The BMW experience — successful as it turned out — lent credibility to the system of incentives and showed that South African firms could successfully build and export high technology vehicles. Other car firms are now following a similar path. [3] This process is akin to what Hausmann and Rodrik (2002) call "self-discovery." [4] The example here is not of a local entrepreneur but of a multinational firm which has to the lay the groundwork. BMW reported that at first the vehicles exported to Japan were met with scepticism. Buyers wanted products made in Germany rather than in Africa. Apart from meeting the most rigorous quality standards, this required substantial investment in marketing to allay these concerns. There are, accordingly, grounds for industrial policy to support these pioneering investments as they can crowd in other investments by demonstrating that certain activities can indeed be profitable. But it is a more complicated matter to implement Rodrik's prescription "that the logic of the problem requires that the rents be provided only to the initial investor, not to copycats" (2004: 11).

Investment determines competitiveness

There is considerable inertia in international investment patterns. Given the risks and start up costs, multinational firms will not generally relocate to new international sources of supply in order to shave a few percent off costs. Whether the low cost production location ends up being Mexico, Thailand or South Africa will depend less on natural endowments or static

2 Interviews

3 For Korea, Kim (1997) argues that Samsung's success with microwave oven exports helped Lucky Goldstar obtain a licensing agreement with Hitachi.

4 See also Rodrik (2004)

concepts of comparative advantage than on where the investment in up to date technology takes place. Once established, the new production centre is likely to be competitive by virtue of sunk investments in modern plant and infrastructure but also because of the complementary investments that occur to serve the demands and requirements of the initial investor. Complementary investments are of considerable importance in establishing competitiveness. Vehicle assembly in South Africa is fairly competitive in terms of actual plant costs, but in the medium term higher levels of local content will be required to offset high logistics costs. This requires growing complementary investments by first tier component suppliers. This raises the question of industrial policy to deal with this manifestation of the co-ordination problem in terms of which assemblers do not invest because they don't have access to cheap components and component firms do not invest because they don't have the high volume demand from assemblers.

3.3 The Role of Industrial Policy

The role of stable and credible incentives in achieving economic objectives

Viewed purely as an export programme, the MIDP has been enormously successful. What does the MIDP experience tell us about the use of export incentives? Firstly, it is clear that stable and credible incentives can have a major impact on firm behaviour. Secondly, it is probably important that the carrot (in this case in the form of export incentives) is supported by a stick (in this case in the form of lower tariffs and growing imports which have placed the industry under considerable competitive pressure). Thirdly, it is important that in the case of interventionist policies, which affect the trade regime, that the structure of incentives encourages firms to invest in plant which is at least close to minimum efficient scale.

The complexity of industrial policy

Industrial policy is difficult to implement both politically and administratively. Pack and Saggi (2006) argue that even where a theoretical case can be made for industrial policy, this does not mean that industrial policy is appropriate. One obstacle is limited bureaucratic capacity. A sophisticated bureaucracy is necessary to implement industrial policies. Chang (2002) may be correct in arguing that this can and should be developed. But South Africa currently lacks this capacity with its resources thinly stretched and inexperienced (Kaplan, 2006). The new democratic government has lacked confidence in dealing with large firms organised into well established lobby groups. High levels of foreign ownership in the sector further circumscribe the possibilities for host country policy because of the enhanced bargaining power at the disposal of multinationals. The South African government has also faced powerful pressures from trading partners and the World Trade Organisation.

While a theoretical case to rationalise the industry can be made, the complexities associated with implementing policy to bring about rationalisation are enormous. In the South African case, the small size of the market means that the gains from more interventionist measures to reduce the number of models would probably have been limited. A lighter touch which has avoided directive measures has probably been appropriate. Support for exports combined with tariff reductions has achieved a degree of rationalisation but the rapid increase in imports and the expansion of 'peripheral' component exports has partly offset these gains.

4. THE FUTURE OF THE SOUTH AFRICAN INDUSTRY

Despite some recent adverse comment relating to its costs, the MIDP is widely regarded in business, government and academic circles as an important policy success. The industry has been extensively liberalised with limited costs to date. But a difficult path for policy makers and for the industry lies ahead. Imports are growing and export assistance will continue to decline.

Another ongoing problem remains that of South Africa's global location and remoteness from major markets. The industry has attracted only moderate levels of investment. Multinational firms do not really see South Africa as an export base except to the extent that exporting facilitates access to the South African market and helps them achieve the volumes required for efficiency. The nature of competition has changed. For large parts of the South African industry many firms now compete with foreign subsidiaries of their multinational parent or joint venture partner. So the future of the South African industry is partly dependent on whether the South African industry can enhance its position in these global networks.

The Australian route has received much publicity in the South African policy debate. While it has certainly reduced car prices to Australian consumers and certain aspects such as the measures to reduce model proliferation and develop export markets, have merit, it is inappropriate in the South African context. Australia is a mature economy with high rates of car ownership. Car production is unlikely to be a major growth area as the economy becomes increasingly service oriented. South Africa's position is very different. With a population that will approximate 50 million by the year 2010, low rates of car ownership and a potentially large regional market, it needs to develop its production capacity take advantage of this growing market over the next two decades.

The domestic market is among the top 20 in the world and is growing rapidly. In the longer term, the regional market also has the potential to become significant and South Africa could become an important regional centre. On these grounds a case could be made for a degree of continuing protection as the regional market expands to a size sufficient to support a more competitive industry. On the other hand, with export support declining, export growth rates have fallen sharply. While export expansion will continue, this will be at a slower pace and exports will not continue to provide the basis for expansion as has been the case since the early 1990s. Rapid growth could take place on the basis of expansion in both domestic and export markets. This requires an incentive structure which is more balanced between production for export and the domestic market.

Appendices

APPENDIX 1: LIST OF FIRMS AND INSTITUTIONS INTERVIEWED

Vehicle Producers and Importers

Bell Equipment Co SA

BMW South Africa

DaimlerChrysler

ERF South Africa

Fiat Auto South Africa

Ford Motor Company of Southern Africa

General Motors of South Africa

MAN Truck and Bus SA

Nissan South Africa

Renault South Africa

Scania South Africa

Toyota South Africa Motors

Volvo (Southern Africa)

Volkswagen AG

Volkswagen of South Africa

Component Firms

AE Engine Parts

AIMS Group of Companies

Alfred Teves SA (Ate)

ASTAS

Atlantis Diesel Engines (later Atlantis Foundries)

August Laepple SA

Auto Industrial

Autocat Manufacturers

Autoplastic

Behr South Africa

Bosal Afrika

Bremco

Conlog

Cooper Automotive

Degussa SA

Dorbyl Automotive Technologies

Feltex Automotive Trim

First National Battery

Gabriel SA (later ArvinMeritor)

Gemtec

G.U.D. filters

Johnson Mathey

Kolbenco

Lemforder

LUK Africa

M&R Foundries

Metair Investments

National Spring

NF Die Casting

NGK Ceramics

Precision Exhaust Systems

Robert Bosch

SA Trim

Shatterprufe

Silverton Engineering

SKF Uitenhage

Smiths Manufacturing

Stateline Pressed Metal

Steelmobile

Supreme Spring Holdings

T&N Holdings

Tiger Wheels Manufacturing

Vacuform

ZF of South Africa

Industry Federations

Catalytic Converter Interest Group (CCIG)

National Association of Automotive Component and Allied Manufacturers (NAACAM)

National Association of Automobile Manufacturers of South Africa (NAAMSA)
Retail Motor Industry Organisation (RMI)
SA Tyre Manufacturers Conference (SATMC)
Verband der Automobilindustrie (VDA)

Government Agencies

Board on Tariffs and Trade (BTT)
Council for Scientific and Industrial Research (CSIR)
Department of Trade and Industry (DTI)
Industrial Development Corporation (IDC)
International Trade Administration Commission (ITAC)
Trade and Investment South Africa (TISA)

Trade Unions

National Union of Metalworkers of South Africa (NUMSA)

Other

Automotive Industry Development Centre (AIDC)
Export Credit Exchange

APPENDIX 2: RAND EXCHANGE RATE, 1995-2005

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Rand per US dollar	2.59	2.76	2.85	3.27	3.56	3.63	4.30	4.61	5.53	6.11	6.93	8.60	10.52	7.57	6.46	6.36

APPENDIX 3: TOP 50 GLOBAL COMPONENT SUPPLIERS

Rank	Firm	Automotive turnover 2003/2004 ($m)
1	Robert Bosch	31 400
2	Delphi	28 700
3	Denso	23 172
4	Johnson Controls	20 500
5	Bridgestone	18 280
6	Michelin	17 347
7	Visteon	17 097
8	Lear	15 746
9	Magna	15 345
10	Aisin Seiki	14 501
11	Goodyear	13 362
12	Continental	12 426
13	ThyssenKrupp	12 359
14	Siemens (VDO + Osram)	11 815
15	Faurecia	11 540
16	TRW Automotive	11 308
17	Valeo	10 527
18	ZF Group	8 346
19	Dana	7 917
20	ArvinMeritor	7 788
21	Yazaki	6 375
22	DuPont	6 087
23	Federal Mogul	5 546
24	Autoliv	5 301
25	Matsushita Electric	5 016
26	Motorola	4 870
27	Calsonic Kansei	4 771
28	GKN	4 706
29	BASF	4 564
30	Schaeffler	4 389
31	PPG Industries	4 290
32	Collins & Aikman	3 984
33	Mitsubishi Electric	3 774
34	Hitachi	3 773
35	Tenneco Automotive	3 766
36	Mahle	3 701
37	American Axle & Manufacturing	3 683
38	Magneti Marelli	3 655
39	Honeywell	3 650
40	Hella	3 525
41	Cooper Tire & Rubber	3 514
42	Pirelli	3 386
43	Takata	3 241
44	Behr	3 153
45	Benteler	3 111
46	BorgWarner	3 069
47	Eaton	2 962
48	Bayer	2 820
49	Tower Automotive	2 816
50	Alcoa	2 800

Source: Becker (2006: 239)

APPENDIX 4: QUESTIONNAIRE

QUESTIONNAIRE FOR COMPONENT FIRM INTERVIEWS – GENERAL

1. Main Products 1. .... % of turnover

   2. ....

   3. ....

2. Number of Employees ....
3. Total Assets ....
4. Are you a subsidiary of a foreign/domestic firm ....
5. Name of holding company and percentage shareholding

   ....

6. Do you have extensive licensing arrangements with foreign firms(s)? ....
7. Percentage of sales to: Final assemblers (OE) ....

   Aftermarket ....

   Export ....

For firms with foreign shareholdings or extensive licensing arrangements:

8. How does parent company view South African Investment?

   ....

9. Are they planning to invest further – why/not? (assume a political settlement)

   ....

   ....

   .

10. What constraints do foreign ownership/licensing arrangements place on your business? E.g. freedom to export

    ....

    ....

    ....

THE SCALE OF PRODUCTION

11. What is the minimum efficient scale of production in your main product line?
    - o Parts for a particular model ....
    - o Plant size ....
    - o Firm size..................................

12. Have these minimum efficient scales changed in recent years?

....

13. Do you expect these minimum efficient scales to change significantly in future years?

....

14. What cost disadvantage does lower scale production impose on you?

....

15. Would you say that generally speaking capacity underutilisation is a more serious problem than lack of economies of scale? ....

16. Has Phase VI led you to specialise more?

....

INPUTS

17. What % of your capital goods (machinery etc.) are imported? ....
Where does your capital goods come from?
....
    - Local suppliers (with what degree of local content) ....
    - Imports ....
18. What percentage of your intermediate goods are imported? ....
19. Are these percentages changing over time? ....

TECHNOLOGY TRANSFER

20. How would you rate the technological capabilities of your firm? (product and process technology)
Firm has capability to:
(a) Choose among alternative technologies
(b) Utilise to designed capability
(c) Extend beyond designed capability
(d) Adapt technologies
(e) Generate new products and processes
21. What is the predominate form of technology transfer?
(a) Wholly owned foreign investment
(b) Joint venture with foreign investors

(c) Importation of capital goods
(d) Licenses (with what restrictions)
(e) Employment of foreign personnel, sending people aboard
(f) Networking with other firms

22. Does the firm have a defined R & D division? ....
23. How many full-time personnel does it have
Qualifications:

24. Total cost of R & D (percentage of sales) ....
(percentage of profits) ....

LINKS TO ASSEMBER FIRMS

25. How would you characterise your relationship with assembler firms?

....

26. Has this relationship changed over the last 10 years in terms of the following?
    - Longer contracts
    - Greater cooperation
    - Technical assistance
    - Single source to any assembler

27. Are assemblers insisting on JIT deliveries?
28. Which characteristics of component suppliers do assemblers value most highly (rank top four)
(a) Low product price
(b) Regular and reliable delivery
(c) Product design capability
(d) Manufacturing capability
(e) R & D activities
(f) Product quality
(g) Long term assembler-supplier relationship
(h) other

INDUSTRIAL RELATIONS AND HUMAN RESOURCES

29. What problems has the firm encountered in the field of human resources and how is the firm responding?

- o Production workers
- o Technical personnel
- o Management

30. How do you see the role of trade unions?

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

31. What would be your attitude to co-planning at plant/national level?

COMPETITITVENESS

The assemblers are always asking to be able to import foreign components freely, the implication being that local components are not internationally competitive.

32. What are the reasons for local components being more expensive that important parts? (rank top four)
    (a) High cost of intermediate goods
    (b) High cost of semi-skilled labour (production workers)
    (c) High cost of skilled and technical personnel
    (d) Short production runs
    (e) Capital equipment and technology not up to date
    (f) Other

    ………………………………………………………………………………………………

33. How is the Phase VI programme impacting on your business?

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

34. What should be the long term objectives of the programme?

    ………………………………………………………………………………………………

    How could this be achieved?

    ………………………………………………………………………………………………

35. Comments on other aspects of government policy?

LONG TERM FUTURE OF THE INDUSTRY

Could we have a large expanding components industry like Taiwan, Mexico?

………………………………………………………………………………………………

36. What would this require?

    ………………………………………………………………………………………………

37. How would you react to the notion of an industry agreement – firms, government and unions working out agreement on productivity, investment, wages, training retrenchments etc?

....

....

QUESTIONNAIRE FOR EXPORT MANAGER/DIRECTOR

1. Percentage of output exported and value – changes over time? ....
2. Products exported and to where?

   ....
3. What changes are happening? Expansion, new markets, new products

   ....
4. What factors were most significant in motivating firm to increase exports? (rank top four)
   (a) Expansion, diversification or specialisation in the product line
   (b) Recession in the domestic market
   (c) A request from a client
   (d) To improve product quality
   (e) To increase the scale of production
   (f) The increased availability of export incentives e.g. under Phase VI
   (g) The ending of sanctions
   (h) The depreciation of the rand
   (i) other
5. Which countries are the greatest competitors for South Africa in components production? Why?

   ....
6. How does your firm intend to confront this challenge and retain/increase its competitiveness?

   ....
7. Which of the following factors have been important to the competitiveness of your firm (rank top four)
   (a) Low cost of labour
   (b) Increased investment in R & D
   (c) Investments in training of production workers and/or technical personnel
   (d) Specialising the product line and achieving economies of scale
   (e) Diversifying the product line
   (f) Investments in new capital equipment

(g) Emphasis on quality control programmes
(h) A close long term relationship with OEM clients
(i) Increasing exports
(j) Increasing clients in the internal market
(k) Reorganising the production process
(l) Other

8. How important are government export incentive programs?

   ....

9. Would you be able to export without these programs?

   ....

10. Are you making investments on the basis of these incentives? Why/not?

    ....

11. Are you improving productivity on the basis of these programmes? How?

    ....

12. Would you be able to continue exporting if these programs were gradually phased out?

    ....

13. What is your experience of dealing with government organisations (DTI, BTI, Dept of Foreign Affairs) and parastatals such as the IDC and SAFTO and private agencies in relation to assisting and promoting exports?

    ....

14. What is your experience of the Phase VI program? How should it be changed?

    ....

APPENDIX 5: QUESTIONNAIRE

QUESTIONNAIRE ON THE PAST IMPACT OF PHASE VI AND THE EXPECTED IMPACT OF THE RECENTLY ANNOUNCED NEW MOTOR INDUSTRY DEVELOPMENT PROGRAMME

PART ONE: GENERAL INFORMATION

1. Company name (optional) ……………………………………………………………
2. Is the firm a subsidiary of a foreign firm?

   Yes ☐

   No ☐
3. Is the firm a subsidiary of a major domestic group

   Yes ☐

   No ☐
4. Number of employees …………
5. Major product lines

   Indicate percentages of turnover if more than one product

   ……………………………………………………………………………………………
6. Percentage of turnover to

   Domestic OE ☐

   Domestic P & A/ Aftermarket ☐

   Exports ☐

PART 2: IMPACT OF PHASE VI FROM 1989 TO THE PRESENT

7. How has your firm responded to the pressures and opportunities provided by Phase VI of the local content programme from 1989 to the present?

   Please rank the FIVE most important responses (1 = most important response; 2 = second most important response etc.)

Standardised product line	
Diversified product line	
Increased levels of investment to raise productivity	
Expanded output	
Reduced employment	
Improved plant efficiency (e.g. work organisation)	
Increased training	
Improved product/process technology	
Expanded exports	

Established links with foreign/local partners	
Sourced subcomponents internationally	
Reduced product prices in the domestic market	
Drastically curtailed manufacturing operations/moved into distribution	
Other (specify)	

PART 3: EXPECTED IMPACT OF THE NEW MOTOR INDUSTRY DEVELOPMENT PROGRAMME

8. What do you expect to happen to employment levels in your firm when compared to your current employment level?

	Next year	Next five years
Decline by more than 4% annually		
Decline by 1-4% annually		
Remain at around current levels		
Increase by 1-4% annually		
Increase by more than 4% annually		

9. What do you expect to happen to investment in fixed assets (in real terms i.e. 1995 rands) when compared to average investment levels over the last three years?

	Next year	Next five years
More than 30% below last three years		
5-29% below last three years		
No significant chage		
5-29% above last three years		
More than 30% above last three years		

10. At what rate do you expect exports to increase/decline (in real terms i.e 1995 rands)?

	Next year	Next five years
Decline by over 5% annually		
Decline by 1-4% annually		
No significant change		
Increase by 1-5% annually		
Increase by over 6-10% annually		

Increase by over 10% annually

11. As a result of the new programme do you expect competition from imports in your product line to:

Increase dramatically

Increase slightly

No material increase in competition is expected

12. How do you expect your firm to react to the pressures and opportunities provided by the new programme over the next few years? Please rank the FIVE most important responses. (1 = most important response; 2 = second most important response etc.)

By standing product line
By diversifying product line
By increasing levels of investment to raise productivity
By expanding output
By reducing employment
By improving plant efficiency (e.g. work organisation
By increasing training
By improving product/process technology
By expanding exports
By establishing links with foreign/local partners
By sourcing subcomponents internationally
By reducing product prices in the domestic market
By drastically curtailing manufacturing operations/moving into distribution
Other (specify)

13. Any further comments on the proposed programme?

....

....

....

Please return the survey by 21 July to:

Mr Anthony Black
School of Economics
University of Cape Town
Private Bag
Rondebosch
7700

APPENDIX 6: IRCC VALUE UNDER THE REVISED MIDP (2003 TO 2012)

IRCC on CKD Imports

Year	Export value	Value portion	CKD Duty	Import rebate for OEMs	Independent exporters' OEM portion*	Value to independent exporters*
2003	100	0.94	0.29	27.26	5.452	21.80
2004	100	0.9	0.28	25.2	5.04	20.16
2005	100	0.86	0.27	23.22	4.64	18.57
2006	100	0.82	0.26	21.32	4.26	17.05
2007	100	0.78	0.25	19.5	3.9	15.6
2008	100	0.74	0.24	17.76	3.55	14.20
2009	100	0.7	0.23	16.1	3.22	12.8
2010	100	0.7	0.22	15.4	3.08	12.32
2011	100	0.7	0.21	14.7	2.94	11.76
2012	100	0.7	0.2	14	2.8	11.2

* Assuming that independent exporters are able to negotiate a 80:20 ratio on the value of their IRCCs when trading with the OEMs

IRCC on CBU Imports

Year	Export value	Value portion	CBU adjustment	CBU Duty	Import rebate for OEMs	Independent exporters' OEM portion*	Value to independent exporters*
2003	100	0.94	0.6	0.38	21.43	4.28	17.14
2004	100	0.9	0.6	0.36	19.44	3.88	15.5
2005	100	0.86	0.6	0.34	17.54	3.50	14.03
2006	100	0.82	0.6	0.32	15.74	3.14	12.59
2007	100	0.78	0.6	0.3	14.04	2.80	11.23
2008	100	0.74	0.6	0.29	12.87	2.57	10.30
2009	100	0.7	0.6	0.28	11.76	2.35	9.40
2010	100	0.7	0.6	0.27	11.34	2.26	9.07
2011	100	0.7	0.6	0.26	10.92	2.18	8.73
2012	100	0.7	0.6	0.25	10.5	2.1	8.4

* Assuming that independent exporters are able to negotiate a 80:20 ratio on the value of their IRCCs when trading with the OEMs

Source: Barnes and Black (2003: 47)

APPENDIX 7: SUMMARY OF AUTOMOTIVE TRADE (R MILLION)

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Imports	(R millions)										
	Vehicles	2,800	2,646	3,733	3,957	7,431	10,014	13,657	14,388	20,188	28,306
	CKD components	9,954	8,894	9,415	11,917	15,008	18,413	24,786	24,325	26,111	30,626
	Aftermarket components	5,283	5,388	5,975	5,653	6,641	8,473	11,755	10,713	11,855	14,369
	Total Imports	18,036	16,928	19,123	21,526	29,080	36,900	50,198	49,426	58,154	73,301
Exports	(R 000's)										
	Vehicles	1,429	2,067	2,482	6,254	8,909	14,163	18,198	18,951	19,301	22,846
	Components	4,146	5,171	7,369	9,394	12,254	17,621	21,863	20,122	21,245	22,709
	Total Exports	5,575	7,238	9,851	15,648	21,163	31,784	40,061	39,072	40,546	45,555
Trade Surplus/	(Deficit)										
(R millions)	Vehicles	(1,371)	(579)	(1,251)	2,297	1,477	4,149	4,541	4,562	(887)	(5,460)
	CKD/Aftermarket components	(11,091)	(9,111)	(8,021)	(8,175)	(9,394)	(9,265)	(14,678)	(14,916)	(16,721)	(22,286)
	Total	(12,461)	(9,690)	(9,272)	(5,878)	(7,917)	(5,116)	(10,137)	(10,354)	(17,608)	(27,746)

Source: NAACAM, unpublished data

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