

“South Africa’s Motor Industry Development Programme: A Case for System Dynamics Approach”

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Abstract

South Africa’s Motor Industry Development Programme (MIDP) adopted in 1995 was hailed as a successful and innovative industry policy by all stakeholders. Despite attracting significant investment by almost all major global vehicle manufacturers, consensus is declining that the programme can successfully steer the industry to sustainable future growth. The paper presents findings of an investigation into the declining consensus on the MIDP. A review of the MIDP mental model is done. Industry performance data from 1995 to 2004 is evaluated against programme objectives. Findings show that the declining consensus is due to failure to acknowledge interrelationships among industry variables. The programme success has not been across board and policy makers have paid little attention to synergies between industry sectors. The MIDP presents a classical case of a system dynamics problem that can benefit from system dynamics modeling.

1.0 Background

Automotive production in South Africa started in the 1920s. Government used tariff regulation and local content requirements to guide industry growth (Black, 2001). By early 1990s, it was evident that the hitherto adopted inward looking policy stance was not sustainable in the long run. The industry had to comply with General Agreement on Tariffs and Trade and World Trade Organisation (WTO) trade regulations (Damoense, 2004). Domestic market constraint meant that exports had to play a big role in the industry growth. Government realised that industry needed encouragement with a number of “sticks and carrots” to change and improve its competitiveness (Motor Business International, 2000). Of major importance to government were ways through which to maintain and grow the industry in a less protected trade environment. Table 1 summarises development of automotive policy in South Africa.

Table 1: Development of Automotive Policy in South Africa

Policy Measure	Period
1. High tariffs	1920 to 1995
2. Local content requirements by mass	1961 to 1987
3. Local content requirements by Value	1989 to 1995
4. Import-export Complementation (MIDP)	1995 to date
5. Investment Incentives (MIDP)	2000 to date

Source: Damoense (2004)

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The major policy shift came in 1995 when government adopted an outward looking policy framework – the Motor Industry Development Programme (MIDP). The MIDP had specific objectives to achieve – international and domestic competitiveness, vehicle affordability, employment, local supplier development and improvement of industry trade balance. Formulation of the MIDP was a consultative process and all stakeholders agreed that the MIDP provided required impetus to grow the industry in a liberalised trade environment (SA, 1995).

In order to extend the consultative strategy to the implementing the programme, government set up a Motor Industry Development Council (MIDC) in 2000. The MIDC was to monitor the programme and make remedial proposals in case of significant deviations from the objectives. The MIDC is comprised of all the major industry stakeholders:

- Vehicle assemblers organised under National Association of Automotive Manufacturers of South Africa (NAAMSA)
- Component manufacturers under the National Association of Automotive Component and Allied Manufacturers (NAACAM)
- Labour under National Union of Metal Workers of South Africa (NUMSA)
- The Catalytic Converter Interest group (CCIG)
- Vehicle after sales group under the Retail Manufacturing Interest Group (RMI)
- Tyre manufacturers under the South Africa Tyre Manufacturers Conference (SATMC)

The Department of Trade and Industry chairs the MIDC and relevant government departments participate in the meeting. Four specialised task teams deal with pertinent issues of the MIDP - Employment, International Trade, Raw Materials and Affordability. Of special interest is the MIDP Monitoring Committee whose role is to keep track of performance data and report to the MIDC accordingly. The MIDC provides a forum for stakeholders to influence and guide automotive policy in South Africa.

Up to the early 2000, stakeholders concurred that the programme was the most successful industry support in the country. There were suggestions to replicate the same model of support in other industries. Industry was adamant to programme critics that claimed that the programme had an implicit cost to domestic consumers (Flatters, 2002; Bell and Maduna, 2003). Doubts on the programme's long-term success began to emerge after the mid-term review of the programme in 2002. The National Union of Metal Workers of South Africa expressed dissatisfaction on employment and vehicle price trends.

The questioning of the programme's compliance with World Trade Organisation (WTO) regulation by Australia has further exacerbated uncertainty on the programme. Yet, without the MIDP or comparable alternative support, the automotive industry in South Africa can collapse.

This paper presents findings of an investigation into the declining consensus that the MIDP can sustain and support future growth of the South Africa automotive industry. The structure of the paper is as follows. Section 1 presents the thinking behind the MIDP.

It discusses the assumptions of the MIDP mental model. Section 2 evaluates industry performance data (1995-2004) against the programme's objectives. Section 3 looks at the MIDP from a systems perspective. A qualitative system dynamics model of the MIDP is presented. The last section presents insights and conclusions of the investigation

2.0 MIDP Mental Model

The MIDP policy framework is guided by a uni-directional, static and non-interactive mental model. A mental model is a relatively enduring and accessible, but limited, internal conceptual representation of an external system whose structure maintains the perceived structure of that system (Doyle and Ford, 1998); a filter through which we interpret experiences, evaluate plans, and choose among possible courses of action (Sterman, 1991). A mental model contains ideas, opinion, assumptions, generalisations, etc. with respect to a policy problem and related issues (Vennix, 1990). The MIDP model presupposes that providing the automotive industry with Import Rebate Credit Certificates (IRCCs) and allowances to import inputs free of duty can positively influence industry competitiveness. Companies use IRCCs to offset import duty payable on vehicle and auto components over and above the duty free allowance. Figure 1 captures the thinking behind the MIDP design.

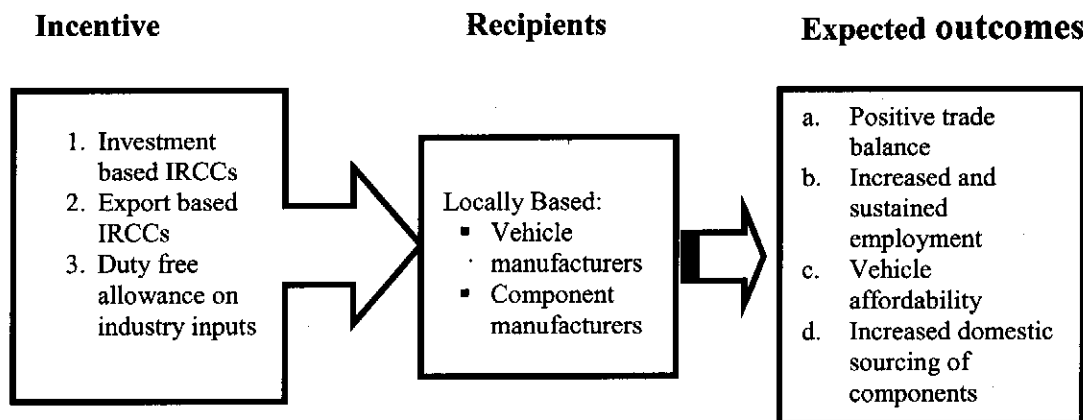


Figure 1: MIDP Incentives Mental Model

Under the MIDP, vehicle and component manufacturers earn IRCCs by either investing in productive assets or exporting auto products. The programme also allows import of industry inputs free of duty.

The Productive Assets Allowance (PAA) provides vehicle manufacturers in the Southern Africa Custom Union (SACU) rebates equal to 20% of the value of investment in new productive assets spread over a five-year period. The import-export complementation arrangement allows duty reduction on cars and light commercial vehicles imported based the value of exports. For every Completed Built Unit (CBU) exported, a percentage determined by the Value of Exports Performance (VEP) of CBUs can be imported free of duty. The Value for Export Performance started at 94% in 2003, reducing by 4% per annum (NAACAM, 2004). The duty free allowance (DFA) is a simple calculation of the wholesale value of the vehicle that may be imported free of duty.

The MIDP mental model reveals two conspicuous shortcomings; first, it does not capture the feedback effects between the model variables. The model assumes, implicitly, a positive relationship between the value of IRCCs earned and industry production levels, without taking into account that production levels may in turn affect the value IRCCs through the export variable. Increase in productions often has a positive effect on export levels through low average cost realisation, and subsequently on the value of export-based IRCCs. Second, the model assumes that MIDP objectives as captured by the expected outcomes matrix have no effect on each other. The model does not acknowledge possible trade-offs and complementation between programme outcomes.

Ignoring feedbacks and variable interrelations in the model leads to inaccurate and incomplete perceptions underlying a particular policy and leads to ineffective policy intervention (Sterman, 2000; Hall, 1984). Despite the MIDC forum, inputs on how to improve the programme have tended to take a partisan approach. Interest groups make recommendations that enhance their specific interest, without taking account of impact on the industry as a whole.

2.0 MIDP Performance: 1995 to 2004

2.1 Investment

Increased investment in the automotive industry, though not an explicit objective of the MIDP, was critical in the realisation of the programme's overall success. Economic theory is unfortunately ambiguous on the relationship between liberalisation and investment. Depending on market conditions, the opening up of a previously protected market may increase investment. International economics uses the theory of 'jumping' tariff barrier to explain the probable effects of industry liberalisation. Firms that face significant barriers to enter a particular market opt to create subsidiaries to produce within a protected market as way of avoiding trade barriers. Liberalisation of an industry decreases the cost of trade and can reduce inward investment (UNCTAD, 2003).

At the commencement of the MIDP in 1995, despite a protected regime, seven global vehicle manufacturers – BMW, Daimler Chrysler, Volkswagen, Toyota, Fiat, Ford and Nissan had already invested in the country. The highly protected South African automotive industry had been successful in attracting global investment. It was important that the liberalisation of the industry should not lead to less investment. OEMs could potentially fall back to producing at cheaper locations and simply import products into South Africa under the relaxed trade regime. Investment in the industry was an important variable to keep track of as the industry opened up. Figure 2 presents industry investment by the domestically based vehicle manufacturers from 1990 to 2004.

From 1990 to 1995, investment by OEMs was below R100 million with a record low of only R400 million in 1993. Since 1995, investment has been on increase. The noticeable down swing in 1994 and 2003 correspond to uncertainty during the country's transition to democracy and the severe currency depreciation respectively. By 2004, investment had increased more than four folds compared the level at the commencement of the MIDP. Industry analysts project that total capital expenditure by new vehicle manufacturers will

rise to R5.9 billion in 2005 and industry capital expenditure will grow by R15 billion in the next five years (Cokayne, 2005). Toyota is completing the construction of a R1.2 billion paint shop, Ford is to spend R1 billion on the Ford Focus export programme and General motors plans to spend R439 million on the export-oriented Hummer project (Robertson, 2006). The programme has been successful in reversing the low levels of investment in the industry.

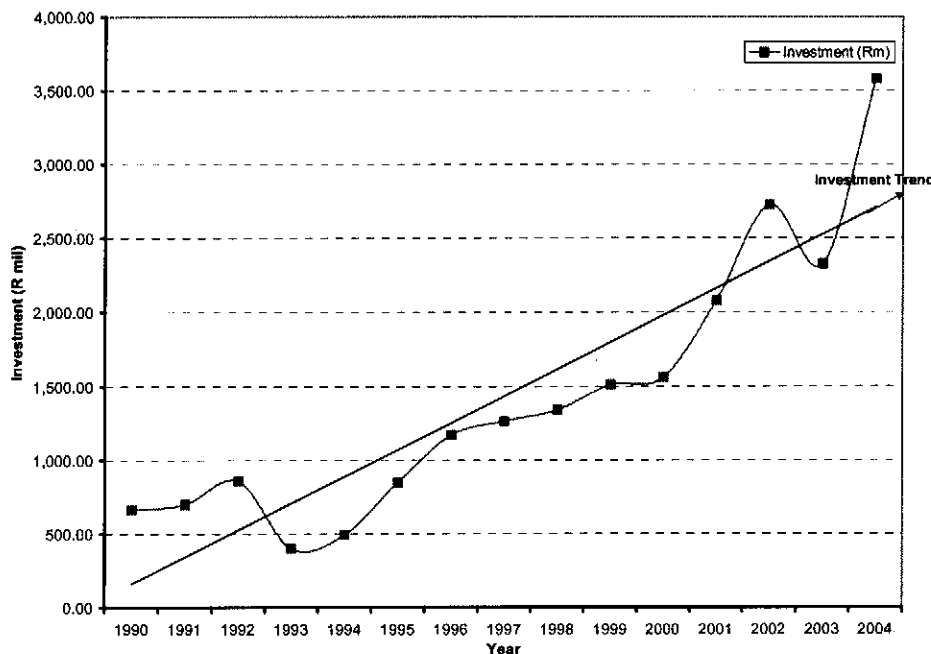


Figure 2: Investment Expenditure by Vehicle Manufacturers

¹ 1995 Real Prices

Source: The Department of Trade and Industry (thedti) and South African Revenue Services (SARS), NAAMSA Annual Report 2001

2.2 Production

Although investment was to be the driving factor for the industry's growth, it had to do so through increased production levels. Unlike investment, which shot up after the inception of the MIDP, the level of production did not pick up immediately. On average, production (units of vehicles produced) decreased by 1.4 percent per year between 1995 and 2000. Units produced in 2000 were 8.4 percent lower than at the inception of the MIDP. After 2000, production levels were increasing but disproportional to investment. From 2001 to 2004, production levels were constant while the investment was progressively increasing (Figure 3). The decline in investment in 2003 corresponds with the severe current depreciation at the time.

It is evident that the impact of investment on production in terms units produced is low. MIDP policy makers have to deal with the weak link between investment and production. The programme seems effective in stimulating investment but increased investment is not effectively translating into higher production. The link between investment and production is an important element to the programme's success. Employment, local

component sourcing, economies of scale and subsequent competitiveness, to a reasonable extent, depend on production volumes.

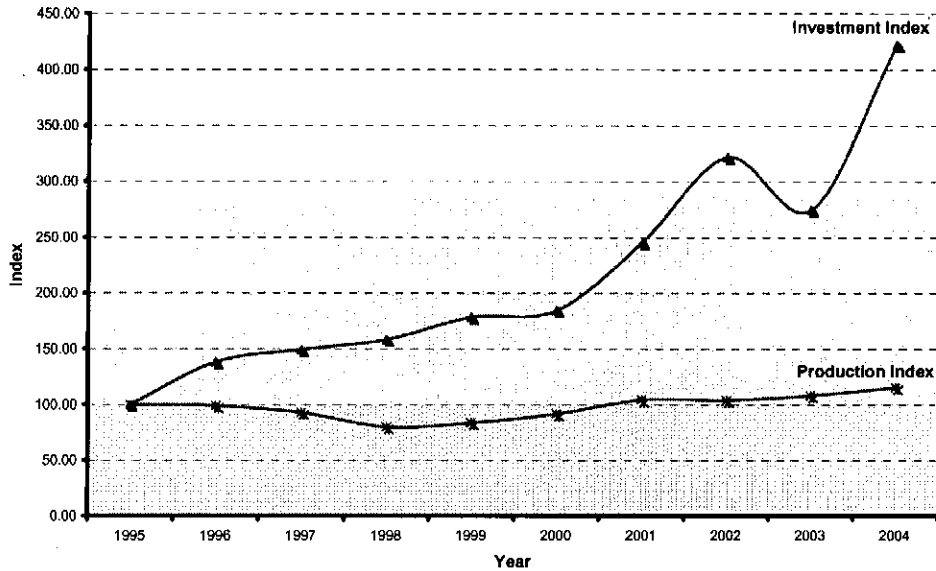


Figure 3: Production and Investment Index – South Africa Automotive Industry
Source: NAAMSA data 2005

2.3 Employment

Employment is an important factor in judging performance of an industry, particularly, in developing countries. Despite the rather contradictory objective of production efficiency on one hand and sustaining jobs on the other, the success of the MIDP cannot be divorced from employment created. It is important to take note that an automotive industry on a growth path may not create jobs. Using the case of Argentine automotive industry, Miozzo (2000) showed that growth of the automotive industry could result into job loss.

In stating MIDP objectives, government and the industry agreed on a compromise to tone down on the employment objective. The program was to stabilise rather than create employment. MIDP Review Report of 2003 mentioned that the programme had achieved the employment stabilisation object despite head count decrease from 38,600 to 32,300 between 1995 and 2000 in the assembly plant, and from 47,000 to 38,500 in the component sector.

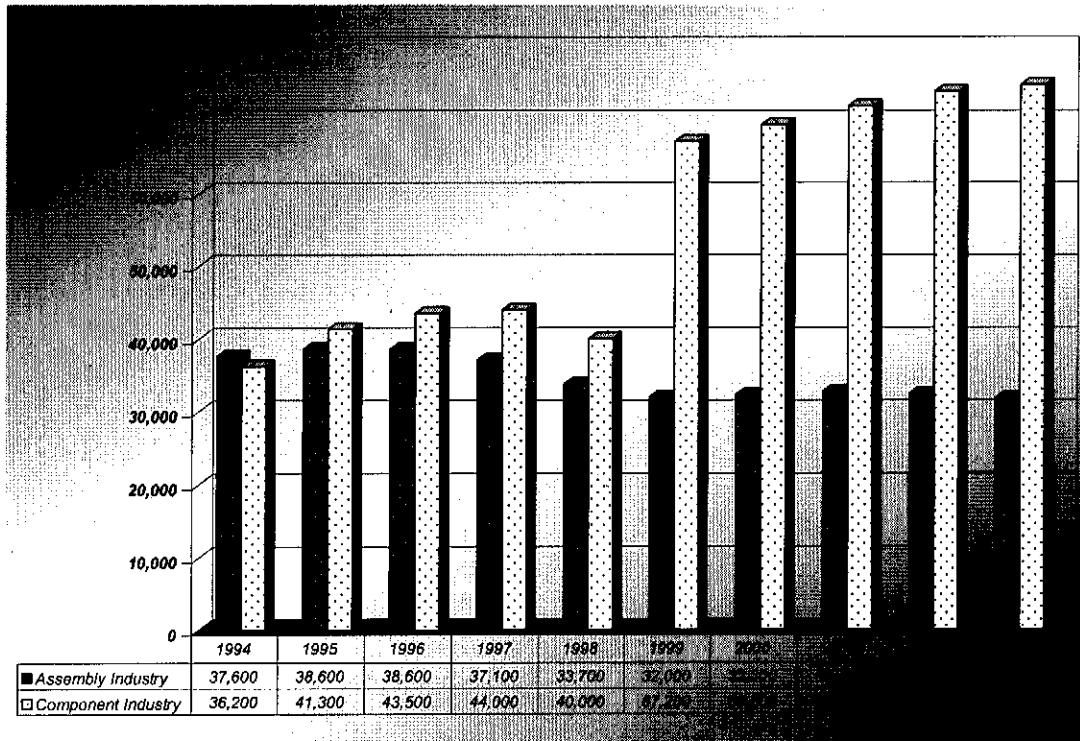


Figure 4: Employment in the South African Automotive Industry, 1995 to 2005

Source: FRIDGE Study on Employment on SA Automotive Employment 2005

According to the FRIDGE commissioned study on automotive employment, direct employment in the industry had dropped by 1.7 percent from 1996 to 2000. Over the 10 years of the MIDP, vehicle manufacturers' employment has been on the decline. The marginal increase in industry employment emanated from the component sector (Figure 4).

There are divergent views on whether the MIDP has been successful in achieving the employment objective. What is not disputable is that vehicle manufacturers have had declining employment levels since the inception of the MIDP despite increasing their investment levels over the same period.

2.4 Trade Balance

Prior to 1995, the automotive industry in South Africa had been producing too many models at low and inefficient scale. The opening up of the industry led to competition between domestically produced and imported automotive products. Against the background of low economies of scale, vehicle imports increased drastically in the first four years of the MIDP. By 1997, vehicle imports to South Africa had increased to 74,666 units from 22,305 units in 1995. Within the same period, vehicle exports were increasing but at a lesser rate than imports. The trend changed in 2000 when for the first time export levels surpassed vehicle imports; 66, 413 units were imported compared to 68,038 units exported. Viewed independently, vehicle export increased from 25,896 units in 1998 to 59,716 units in 1999 reaching 68,031 units in 2000.

In terms the value of value of import vis-à-vis export value, the period 1996 to 2003 was characterised by an improvement in trade balance; industry trade deficit was on a decline. Trade deficit worsened in 2004 to almost R20 billion deficit and there indication that it may become worse as the pool of IRCCs continue to increase (Figure 5).

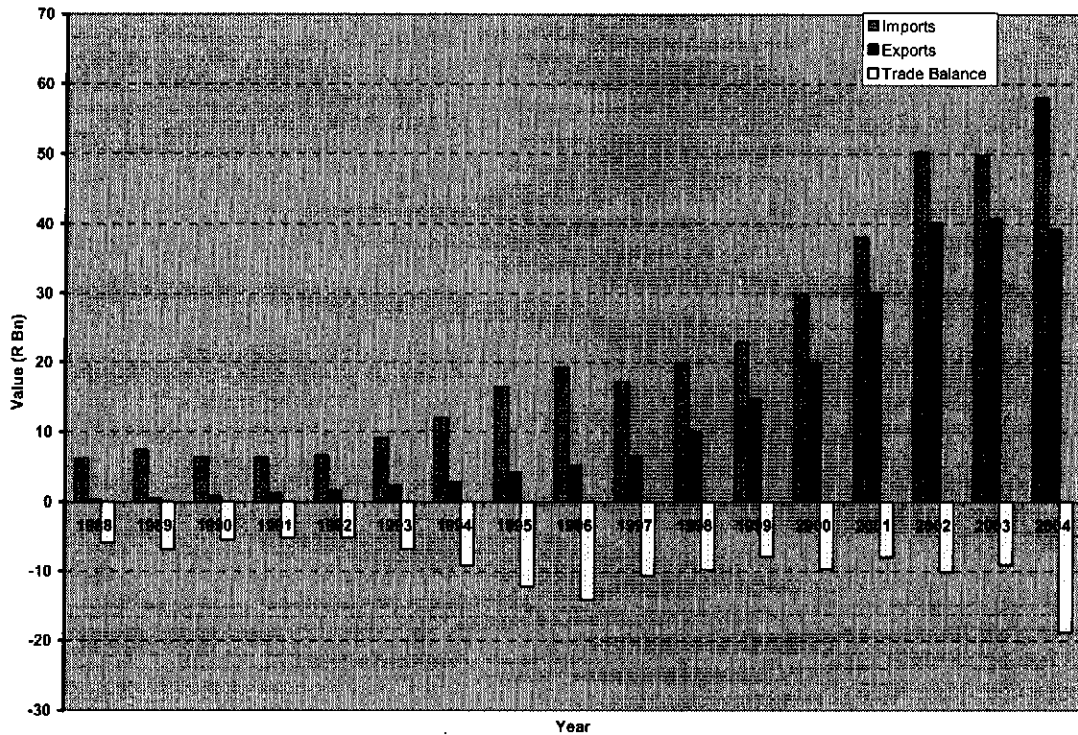


Figure 5: SA Automotive Trade Balance

Though exports have recorded a significant increase, their positive contribution to the industry trade balance is off set by increasing level of imports. The South African automotive industry remains a net user of foreign exchange. The impact of the stronger rand in 2004 widened the trade deficit significantly in 2004 (NAAMSA Annual Report 2005). Overall, industry trade balance has not improved under the programme as envisaged.

2.5 Supplier Development

The MIDP was supposed to facilitate integration of domestic component manufacturers into the global automotive value chain. Through support of OEMs to supply to international markets, domestic suppliers would be in a better position to participate in the global automotive business. The pre-MIDP period was characterised by low production levels that could not adequately support a vibrant component sector. The import-export complementation scheme was intended, in part, to assist component suppliers generate volumes that would make them more efficient. The component sector often has a bigger potential to create jobs and to stimulate domestic technological capabilities through spillovers effects (Humphrey and Memedovic, 2003).

The extent to which supplier development has taken place under the MIDP is an elusive aspect. Neither government nor Industry keeps explicit data on the issue. The use of proxies is the only viable way to assess local supplier development. This study makes use of local content use and domestic component sourcing as proxies for supplier development.

The share of locally sourced components used in domestic vehicle assembly was on decline from 1992 to 1994. It remained low but stable between 1994 and 1995 (Bell, 2003). There was substantial reduction in the share of locally sourced components as a proportion of total component usage from 40.1% in 1996 to 33.8% in 2000 (Table 2).

Table 2: Imported and locally sourced components as proportion of total component usage, and as proportion of wholesale vehicle turnover, and local content including non-material content as proportion of wholesale vehicle turnover: 1996 – 2000 (%)

Year	Imported components/Total components	Local components/Total components	Imported components/WVT ^a	Local components/WVT	Total Local Content/WVT
1996	59.9	40.1	41.9	28.1	58.1
1997	61.2	38.8	42.8	27.2	57.2
1998	58.3	41.7	40.8	29.3	59.2
1999	60.0	40.0	42.0	28.0	58.0
2000	66.2	33.8	46.3	23.7	53.7

Notes: a- WVT stands for wholesale vehicle sale turn over; OE – Original equipments

- 1) Total OE component usage relate to CBUs assembled for the domestic and export market.
- 2) The last three columns were derived on assumption that the non-material portion of local content (labour, cost, overheads, etc. was 30% of wholesale turnover.

Source: Derived from data from Trade and Investment South Africa (TISA) presented in Bell and Madula (2003)

Local component manufacturers were benefiting less from each domestically built vehicle. If the proportions of local components per each manufactured CBU were to continue on the same declining trend of 1996, it would mean the MIDP would become less and less effective in supporting local component manufacturers despite of industry growth that had started to pick up in 2000.

Total local content – both material and non-material was on a downswing between 1996 and 2000. Total local content (material and non-material) declined at average annual rate of 1.9 percent between 1996 and 2000, while material local content decline rate was 3.8 percent per annum. The trend in local content use seemed to indicate that local OEMs were systematically reducing components sourced from local manufacturers. Bell and Madula (2003) claimed that even after accounting for foreign exchange biases on the valuation of imported OE, the decline in local content and sourcing of domestic OE was evident across the board.

Post 2000 data was not available but given the trade deficit that has characterised the industry, the expectation is that the participation of local component sector in the industry value added activities has not improve much. A rapidly emerging new group of mainly

foreign-owned firms (Black, 2001; Miozzo, 2000) was, however, responsible for the bulk of expansion in auto component export realised under the MIDP.

Supplier development is yet another deliverable on which the MIDP has not been entirely successful.

Vehicle Prices

From 1995 through to 1998, new vehicle price increases remained well below the domestic inflation rate measured in terms of the consumer price index. The years in question were characterised by a relatively stable exchange rate, significant reductions in levels of protection and increased competition through advent of new importers and distributors in the industry (Current Developments in SA Automotive Industry, 2005). The trend did not persist; from 1999, car price increases were above the domestic inflation.

According the NAAMSA 2005 Annual Report, vehicle affordability in 2004 and 2005 had improved substantially by the virtue of the fact that manufacturers have not increased prices of new vehicles in real terms. However, the Competition Commission Report on Vehicle Prices (2005) insists that vehicles in South Africa are more expensive in compared to other countries across board (Business Report, 2005).

One major limitation in assessing the MIDP's success based on vehicle prices is the fact that car prices are a function of a number of factors: interest rates, financing options and packages, insurance premiums, and disposable incomes. The MIDP can only influence vehicle prices through OEMs, the direct beneficiaries of the programme. According to the report by Delta Motor Corporation (2003), OEMs in South Africa were responsible for 55% of the vehicle cost, 27% was attributable to Banks, 5% to Vehicle Dealers and 13 percent to the Insurance Industry. The MIDP as a stand-alone undertaking is a weak tool in influencing vehicle prices.

The MIDP is a well-intentioned programme intended to usher a previously protected industry into a competitive global environment. The programme has been instrumental in integrating the domestic industry into the global value chain, through export facilitation. However much of the benefit has been skewed in favour of vehicle manufacturers and a few first-tier component manufacturers with historical and strategic relationships with the vehicle manufacturers. It is not easy to make a qualified statement on the overall success of the MIDP. Of all the set out objectives of the programme, it is only on the exports and investment that the success of the programme is undisputable. Improvement of industry trade balance, stabilisation of employment, domestic supplier development and affordability of vehicles still hang in balance. The uneven success of the programme is causing strains among stakeholders. Some stakeholders believe that the programme is not adequately catering for their interests.

Achieving real competitiveness, ensuring linkages between success on one objective with others and a clear understanding of cause and effects of policy action on major industry variables remain major challenges confronting policy architects of the programme. In

mapping the way forward for the industry, policy makers have to devise means of how to avoid skewed benefits of the MIDP. This calls for a holistic approach to considering the MIDP policy framework.

The MIDP as Systems Problem

The MIDP seems like a simple concept, but its ramifications on company strategy and industry dynamics can be vast and contorted (Nacaam Directorate, 2004). The working of the MIDP shows interrelationships between sectors and industry variables without explicit cause and effects. The interconnectedness of the industry variables and outcomes creates a complex system.

Under the programme, government has two major policy tools to influence industry performance – the stock of IRCCs and duty free import allowance. Thereafter, what transpires within the industry and subsequent outcomes are determined by industry structure and triggered dynamics. In order to have insight into the likely outcomes of its intervention, it is pertinent that government understands the structure and dynamics at play within the industry. A qualitative system dynamics model provides a useful starting point in this regard. The following section presents three high-level causal loop diagrams at the centre of the MIDP functioning and therefore useful in demonstrating the MIDP as a systems problem.

4.1 Industry investment multiplier

Increase in automotive investment as a means towards attaining international competitiveness is one of the objectives of the MIDP. It is presupposed that potential investors in the industry will increase investment based on the level of investment incentives obtainable. The level of investment incentives receivable under the MIDP, therefore, moves in the same direction as industry investment, holding other factors constant. As investment increases, investment incentives obtainable increase too, further reinforcing the motivation to invest since incentives are a constant portion of the value of investment. The investment multiplier loop in Figure 6 captures this reinforcing process between industry investment and value of the investment incentives.

In reality, the exponential increase in investment is not feasible. The variable desired-investment is introduced to capture constraining elements of the perpetual increase in industry investment. The decision to invest depends on the desire to invest which is a function of a number of industry strategic factors. Three desired-investment-level determining factors, relevant to the automotive industry, are captured in figure 6 – market potential, model change interval and depreciation.

Hypothetically, there is an optimal level of investment to produce specific output level. Based on the famous Cobb Douglas production function that stipulates that output is a function of capital and labour, investors in the automotive industry can crudely estimate required investment to produce particular outputs. Planned output will then determine the desired level of investment. Therefore, although the investment-investment incentive loop is supposed to be reinforcing, this may not happen. One may have to look at factors

that affect desired investment in the automotive industry to explain the effectiveness of the investment incentives in stimulating industry investment.

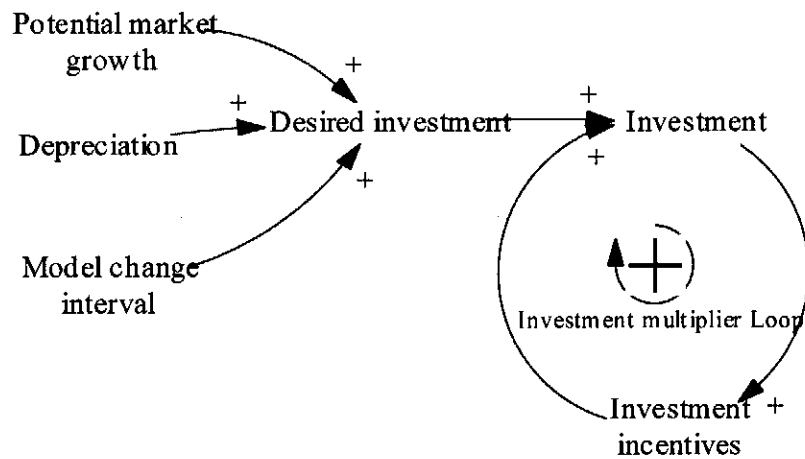


Figure 6: MIDP investment casual loop diagram

4.2 Import-export complementation

Another important element and source of industry dynamics relate to the functioning of the import-export complementation arrangement. Under the arrangement, companies exporting automotive products receive IRCCs based on the local content value exported. The arrangement is based on the premises that realisation of economies of scale will lead to reduction in factory prices. Subsequent competitiveness will encourage exports. Exports increase the value of IRCCs receivable by the industry. Since companies can only benefit from the IRCCs received through offsetting duties payable on imports, the value of available IRCCs increases industry propensity to import. The level of duty free allowance further augments the propensity to import since IRCCs are used to pay import duty net of the duty free allowance. This process of import-export complementation is presented in a high-level casual flow diagram Figure 7 below.

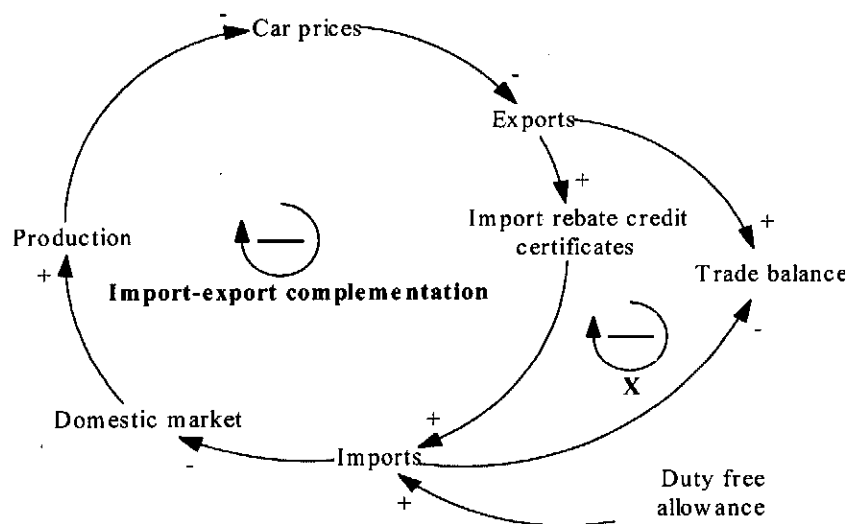


Figure 7: Import-export complementation casual loop diagram

To the extent that local market growth does not keep pace with imported automotive products, the domestic market share for locally produced products will decrease. Unless the increase in export is significant enough to offset reduction in domestic production share of locally produced automotive products, domestic production will fall in the long run. Decrease in domestic production will decrease the value of IRCCs relievable, mitigation against the perpetual decrease in local production. The import-export complementation loop is therefore a counter balancing.

Exports improve industry trade balance, yet on the other hand, exports increase propensity to imports via export-based IRCCs. The resultant effect is another counter-balancing trade balance loop X in figure 7.

4.3 Employment-local component sourcing

Two other desirable outcomes of the MIDP, at least from the government side, are industry employment and support of the domestic auto component sector through increased local component sourcing. A strong assumption that increase in production creates more employment opportunities and the level of employment will in turn positively influence production is made. This reinforcing process is captured by loop E in Figure 8. This assumption suffers from practical limitations relating particularly to production and technology choices made by the industry. Production being a function of capital, labour and technology, production levels can be increased by adjusting capital and technology, while keeping employment constant.

The local component sourcing loop (S) is based on industry performance data that shows a positive correlation between domestic production and sourcing local components, and the high propensity of the component sector to create jobs in the industry. Holding other factors constant, production will increase sourcing of components from domestic manufacturers, industry employment will increase and this will positively affect production. Thus, Loop S being reinforcing.

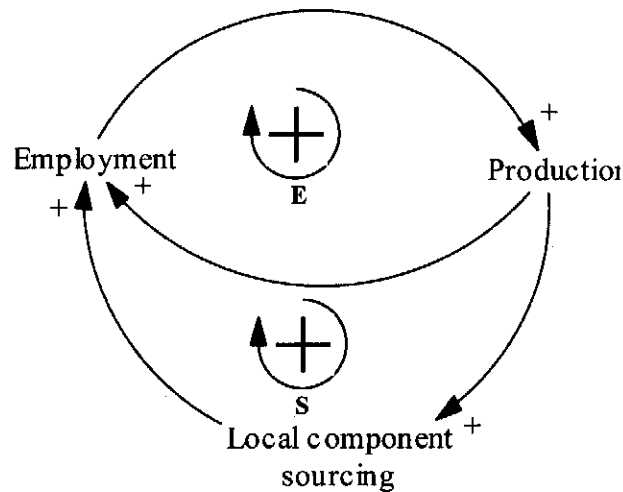


Figure 8: Employment-Local component sourcing casual loop diagram

Figure 6, 7 and 8 are high-level casual loop diagrams capturing specific aspects of the MIDP but are also interlinked through the production and investment parameters. The human mind cannot fully comprehend and anticipate outcomes of the combined interrelationships presented. Indications of likely are outcomes are only possible through the quantification of the model and simulation of scenarios.

Despite limitations of any qualitative system dynamic model, articulation of the MIDP model from a systems perspective brings to the fore complexities and interdependencies of different stakeholders' interests. This realisation is important for consensus building among stakeholders regarding the future of the MIDP.

Insights and Conclusion

A qualitative system dynamics model of the MIDP brings new insights, regarding industry performance under the programme that have thus far received little attention from stakeholders:

- Investment incentives may have limited effect on industry investment unless if supported by factors that cause an upward shift in the level of desired investment. In this respect, economic performance and vehicle manufacturers' company strategies become important.
- The import-export complementation arrangement can motivate increase in industry exports but the positive impact of increased export to local production may be lessened by increase in industry's propensity to import.
- Increase in industry employment and local component sourcing as a consequence of industry growth are probabilistic aspects. The two depend, to a reasonable extent, on production-technology decisions that vehicle manufacturers decide to adopt.

Inspite of the participatory formulation and implementation of the programme, MIDP benefits have not been equalised across the industry. The programme, to some extent, shows characteristics of policy resistance. The MIDC, as a consensus-building forum,

needs to come up with innovative means to grow the industry in a balanced manner. The introduction of systems dynamics approach to the MIDP policy analysis can be useful in highlighting relationships, feedbacks and industry dynamics over time. Stakeholders, including government, can then be in position to plan and evaluate policy action based on possible effects to the industry as a whole. The approach enhances synergies between interests of different stakeholders and assists in creating consensus on the way forward as regards the future of the MIDP.

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