



Trade and Poverty in South Africa: The Link between Trade and Poverty: the Case of Polymers

By
Ralitza Dobрева

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TRADE AND POVERTY IN SOUTH AFRICA THE LINK BETWEEN TRADE AND POVERTY: THE CASE OF POLYMERS

By **Ralitza Dobreva**

1. Introduction

This case study analyses the effects of trade barriers and market power on the pricing of polymers in South Africa, its impact through value chain linkages on the local plastics manufacturing industry and in turn on the final consumer. Polymers are the major material inputs into the production of semi-finished and finished plastic products. As intermediate goods, plastics then feed into a wide range of manufactures – from packaging to household appliances to plastic furniture to baths and basins and many more. Undoubtedly, plastics are at the heart of manufacturing and their pricing influences the cost of production of numerous kinds of goods. South African per capita consumption of plastics from local converters amounts to 22 kg/annum¹. Thus, through the links in the plastics value chain, the pricing of polymers indirectly affects poor households as final consumers.

The case study explains the pricing of polymers in terms of market power and limit pricing. Certainly, the substantial decline and simplification of tariffs on polymers appear to have lowered the mark-ups of domestic producers. However, the import-parity pricing of polymers in the presence of trade surpluses (as in polypropylene and, at times, PVC) still reflects the exercise of market power. Hence trade liberalisation will not necessarily force the upstream producers to price in line with the competitive benchmark of export parity. Lower tariffs are still an effective way to bring about lower prices, since polymer manufacturers price roughly in line with import parity.

Market power and its reflection in polymer pricing in turn shapes the seemingly paradoxical pattern of trade and competitiveness at different nodes along the South African plastics value chain. Upstream producers, who use capital-intensive techniques and who appear to have reduced their labour force in the last decade, are internationally competitive and continue to record consistently high export growth in certain polymer categories. Exports of polypropylene, for example, have risen by 20% per annum, on average, in the last 15 years. In contrast, the downstream sector, which uses mainly semi-skilled and unskilled labour and is likely to have increased employment since the late 1980's, serves mainly the South African market. Internationally, local producers of more beneficiated plastic goods compete in niches, on factors other than price. For example, the baths and basins sub-sector, which uses material imported from the UK, has increased exports by an average of 19% per annum from 1989 to 2005.

The paper focuses mainly on the influence of trade liberalisation, trade barriers and market structure on the pricing of some polymers and on the pricing of intermediate and final plastic goods in South Africa. Undoubtedly, the question regarding the impact on employment is worth further exploration. However, employment data disaggregated by manufacturing sector is scarce and its reliability is difficult to verify. The structure of the paper is as follows. After a brief overview of the polymers and plastics sectors in Section 2, a theoretical framework of import-parity pricing and value chain analysis is presented in Section 3. The market structure and pricing in the polymers and plastics industries are analysed in Section 4. The impact of international trade factors and market dominance on the pricing of polymers and plastics and the likely effects on poor households are discussed in Section 5. Section 6 concludes and outlines the policy implications.

2. Overview of the polymer and plastics industries

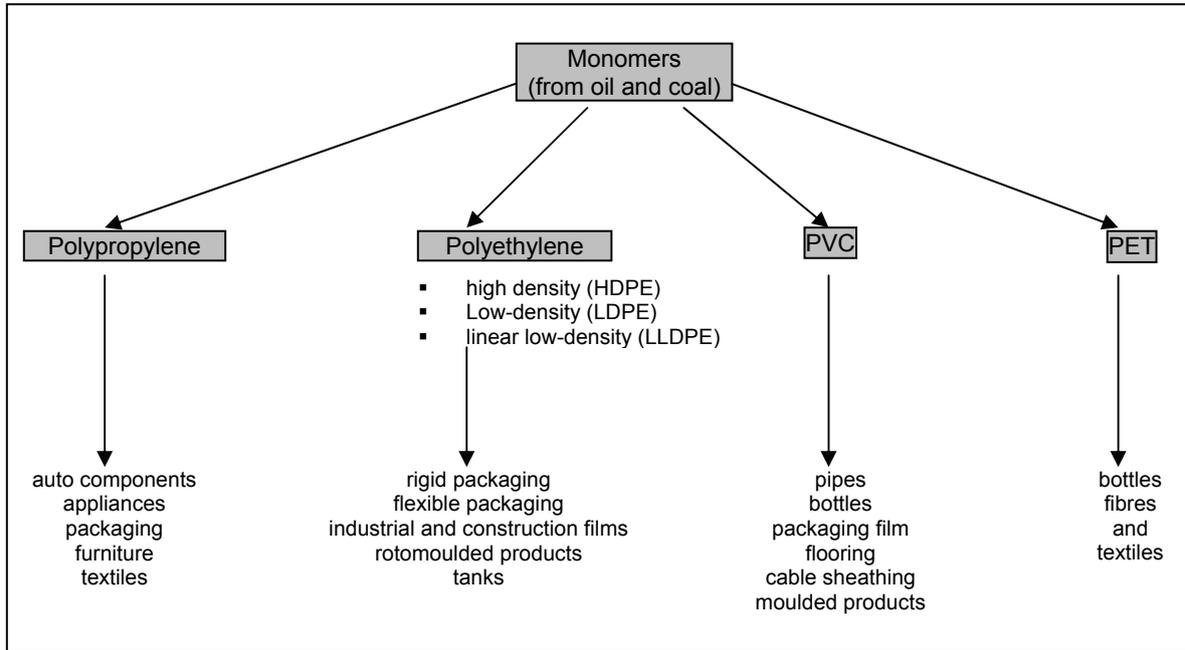
Based on the processing of oil, natural gas and coal, a number of distinct levels in the chemicals and plastics production chain can be distinguished (Figure 1). The chain starts from seven main organic

¹ According to the Plastics Federation of South Africa: www.plasfed.co.za.



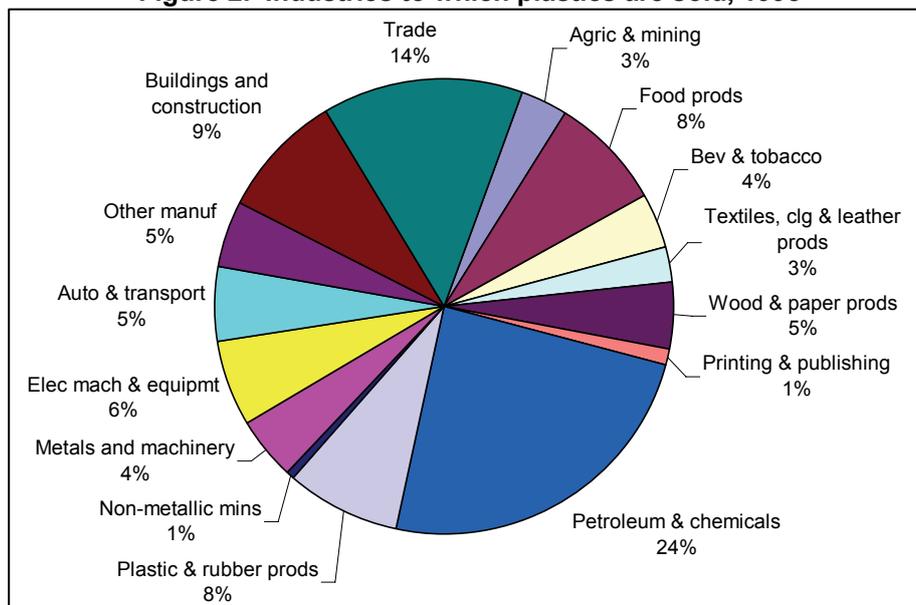
chemical groupings comprising the 'building blocks' (monomers) from which various polymers are produced. A few of these polymers then form the main inputs into manufactured plastics products, which can be separated into intermediate and final products².

Figure 1. The plastics production chain



As intermediate products, plastics feed into a wide range of sectors, effectively placing the industry at the heart of manufacturing (Figure 2). This reflects the importance of plastics as a material as well as the use of plastics for packaging. The intermediate nature of much of plastics output means that it is both a contributing factor to, and reliant on, the performance of manufacturing more broadly.

Figure 2. Industries to which plastics are sold, 1998



Source: Statistics South Africa, Final supply and use tables, 1998

² For a detailed account of the sector, see Crompton (1995).



The only local producer of monomers is Sasol. With regard to polymer production, the capital-intensive techniques, and hence increasing returns to scale, imply that there is either a single domestic producer or the local manufacturers are very few (Table 1).

Table 1. Local manufacturers of main polymers

Polymer	South African producer(s)
High-density polyethylene (HDPE)	Sasol and Dow Plastics
Low-density and linear low-density polyethylene (LDPE and LLDPE)	Sasol
Polypropylene (PP)	Sasol and Dow Plastics
Polyvinyl chloride (PVC)	Sasol
Polyethylene terephthalate (PET)	SANS and Hosaf

According to the Plastics Federation of South Africa (Plasfed), the downstream industry, in contrast, is characterised by 850 mainly small firms. The plastics industry as a whole (from polymer producers to converters to all other suppliers) employs approximately 35 000 people. Of this number, about 30 000 work in the downstream sector. This reflects the much more labour-intensive production technology employed in the manufacturing of plastic goods.

The small number of producers in the upstream industry is likely to imply to the presence and exercise of market power in the pricing of polymers, provided South Africa is a distinct market from the competitive world market. Polymer pricing in turn filters through into the cost of production of intermediate and final plastic goods. Before the questions of market definition, industry structure and hence pricing are examined, a theoretical framework for import-parity pricing is presented in the next section.

3. Theoretical framework

A firm has market power if it finds it profitable to raise prices above marginal cost. The extent to which a firm can raise prices above marginal cost depends on the availability of alternatives. It is useful to distinguish between supply-side and demand-side substitution. When several firms supply a homogenous product, supply-side substitution is possible. Demand-side substitution is applicable when products are differentiated (Church and Ware, 2000).

In the classic theory of monopoly, there is no possibility of supply-side substitution. The sole producer of a good prices above marginal cost, but the demand curve for its product acts as an upper limit to price increases. This is the simplest and most extreme example of limit pricing.

In the open economy context, often market power is restrained by the threat of imports. We present three trade models, which incorporate market power explicitly. Corden's (1967) model is an extension of Bhagwati's (1965) model and it captures the situation where a domestic monopolist faces a competitive international market. The static import-parity pricing model described is an extension of Corden's (1967) model. We briefly review the two earlier models, before adapting them to capture the import parity pricing practiced in the presence of a trade surplus.

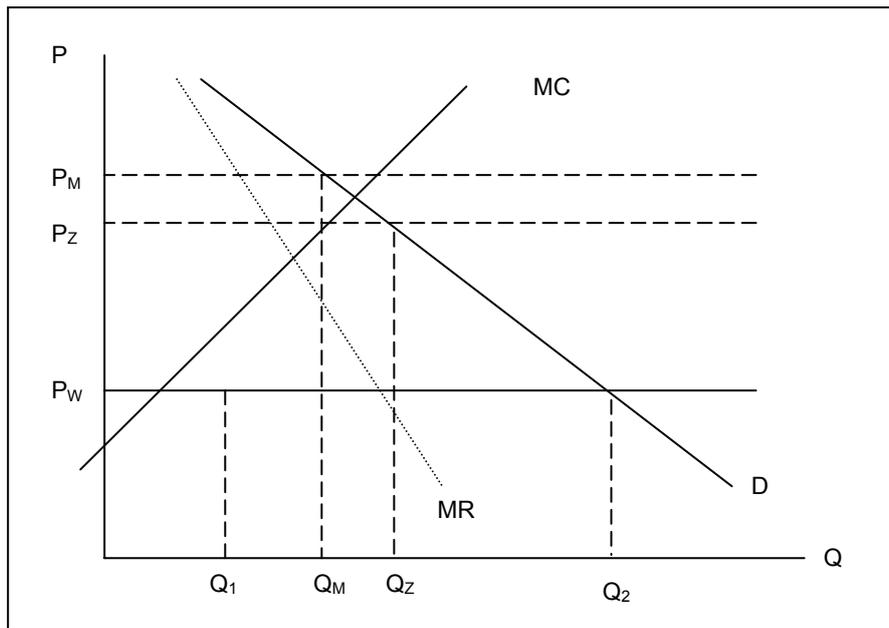
3.1. Bhagwati's (1965) model

Bhagwati's (1965) model describes a domestic monopolist, which faces competitive foreign suppliers. (That is, if it decides to export, the monopolist is assumed to be a price-taker on the international market.) The domestic monopolist's marginal cost curve is assumed to slope upward. Foreign supply is assumed to be perfectly elastic³.

³ In the original model, Bhagwati (1965) assumes an upward-sloping foreign supply curve but this does not alter the analysis fundamentally. The analysis here is based on Krugman's (1989) exposition of Bhagwati's (1965) model.



Figure 3. Bhagwati's (1965) model



Let D be the domestic demand curve, MR be the monopolist's marginal revenue curve, MC be the monopolist's marginal cost curve and P_W be the world price (Figure 3). Let P_M be the monopoly price in the absence of trade. In the case of free trade, the domestic firm has no monopoly power and cannot raise prices above P_W , so it produces Q_1 . Hence, the quantity of imports is Q_2 less Q_1 , and the country is a large net importer. P_Z is the price that would result if all domestic demand were supplied by a competitive domestic industry in the absence of trade.

If the government imposes a tariff, thus raising the domestic price of imports, this is likely to allow the domestic monopolist to increase its price too. If the tariff raises the domestic price to between P_W and P_Z , the domestic firm still acts as a price taker and prices at marginal cost. This forces it to expand domestic output to the corresponding quantity between Q_1 and Q_Z . However, the monopoly power of the domestic firm allows it to raise its own price above P_Z but below P_M , if the tariff were to push the import price to that level. Thus, the latter tariff would actually reduce domestic output.

Even if no imports occur at prices above P_Z , the threat of imports prevents the domestic firm from exercising its monopoly power to its full extent. This will be profitable for the domestic monopolist as long as the price inclusive of the tariff is below the monopoly price, P_M , which would prevail in the absence of trade. Tariffs that raise the domestic price above P_Z would reduce domestic output to a quantity between Q_Z and Q_M (Bhagwati, 1965).

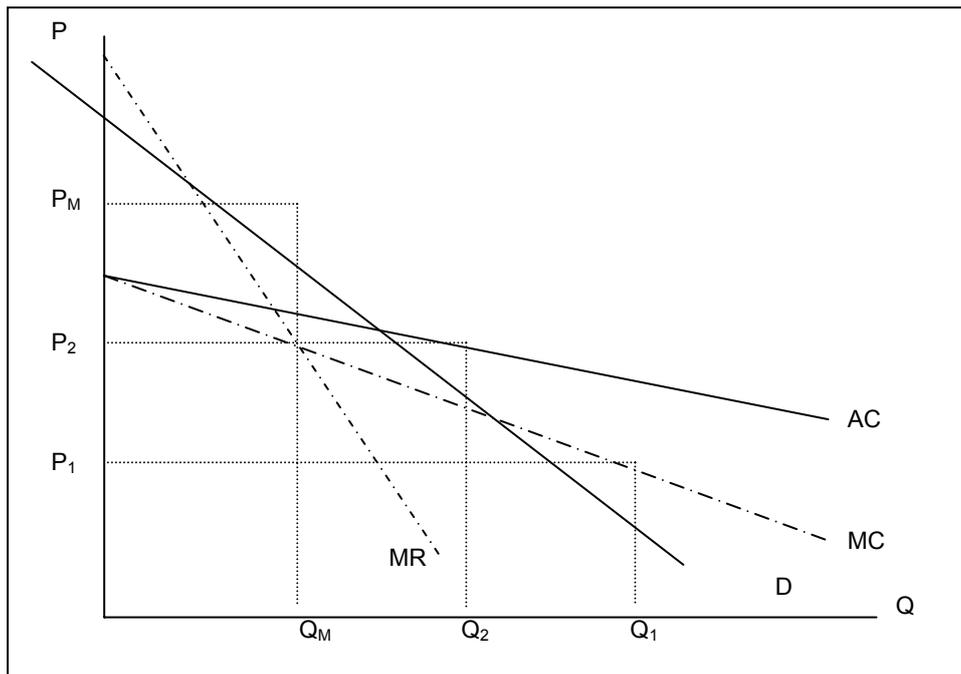
There are three important implications from this model for the purposes of our discussion. First, as long as $P_W(1+t) < P_M$, variations in tariffs have a perfect pass-through to domestic price. The second point is that monopoly power is only effective if $P_W(1+t) > P_Z$. The case where $P_W(1+t) < P_Z$ is the same as a import-competing perfectly competitive industry, which is under tariff protection. Third, tariff liberalisation, where the new tariff level is $t_{new} < t$, is ineffective if $P_W(1+t_{new})$ is equal to or exceeds P_M .

3.2. Corden's (1967) model

Corden (1967) extends Bhagwati's (1965) model by introducing a domestic monopolist whose technology is characterised by increasing returns to scale. Average costs fall over the relevant range of output, but they are not assumed to fall indefinitely (Figure 4).



Figure 4. Corden's model



In a closed economy, output would be Q_M , as the monopolist can exercise its market power to the full. The socially optimal (or competitive) outcome would be where the price is at marginal cost, namely, at P_1 . However, at the corresponding output Q_1 , the monopolist makes a loss, since average cost exceeds the price. At output Q_2 , the corresponding price P_2 is equal to average cost and the monopolist breaks even.

In the context of an open economy and free trade, assuming that foreign supply is perfectly elastic, the import price for the product would be the world market price plus transport costs. Corden (1967) assumes that the f.o.b. export price is not only below minimum average cost, but also below minimum marginal cost, which precludes the domestic firm from exporting.

If the economy is open, three possibilities arise. Firstly, if the import price is at or above P_M , openness makes no difference. Secondly, if the import price is below P_2 , then the domestic firm will incur losses and therefore go out of business. Thirdly, if the import price is above P_2 but below P_M , the monopoly will continue to operate but its price will be lower and its quantity greater than in the closed economy case. Thus international competition will reduce monopoly profits – it will discipline the monopoly's market power. A fourth possibility of an exporting domestic monopoly is ruled out by assumption.

If the government imposes a tariff in order to protect the domestic monopolist, three possible outcomes arise. Firstly, if the tariff results in a price of imports below P_2 , the domestic firm will be unprofitable and may not even come into existence. Secondly, if the tariff raises the price of imports to P_2 , the local firm would also charge P_2 and make normal profits. If the tariff raises the import price above P_2 but below P_M , this would enable the domestic monopolist to exercise its market power to some degree – the domestic price would rise and output decline.

Thirdly, if the tariff were high enough to raise the import price to the domestic monopoly price, the firm would be able to exploit its monopoly position to the full. In a nutshell, a tariff in the context of a natural monopoly is either ineffective (if the import price is already at or above P_M), or it increases the divergence between private and social benefit. Therefore, even in the case where the domestic price is equal to average cost (i.e. at P_2), the quantity produced would be Q_2 and not Q_1 . Corden (1967) terms Q_1 'the marginal optimum' and concludes that allowing imports at a price below P_2 could increase consumer surplus.

From a practical perspective, Corden (1967) suggests that an import subsidy may be more appropriate than a tariff in this context. Given an import price above P_2 , an import subsidy could



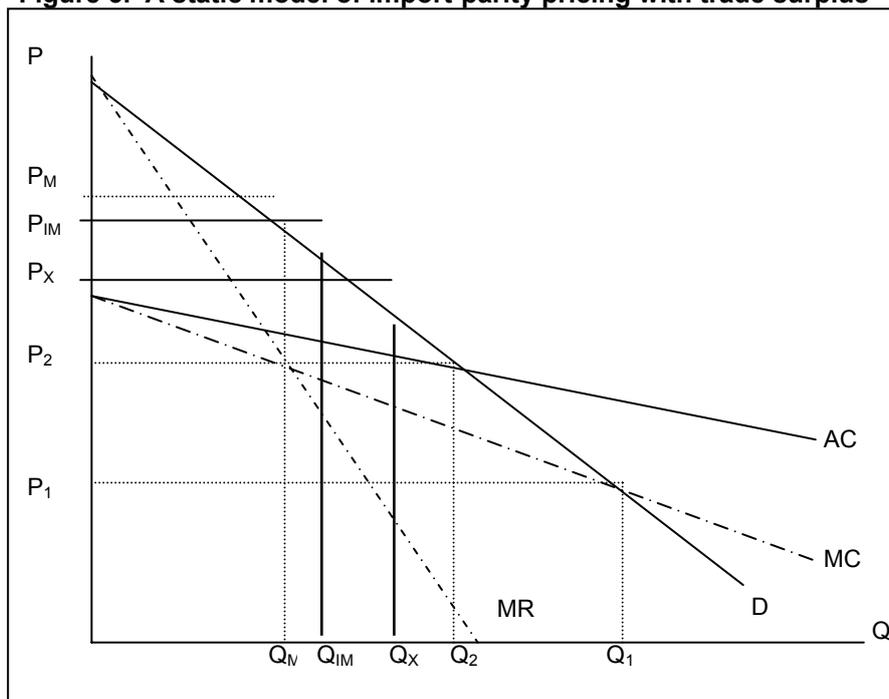
reduce the domestic price to P_2 , eliminate monopoly profits and induce the local firm to produce Q_2 . This is not the 'marginal optimum' but is a better outcome than the closed economy one or the case for tariffs under these conditions. For import prices at or above P_2 , the import subsidy is only a threat, since the domestic firm would reduce its price to P_2 and supply the whole domestic market. Thus the import subsidy would cost nothing and in fact would be a form of price control.

Corden's (1967) model is informative in its treatment of increasing returns in the presence of domestic tariffs and imports from competitive international firms. However, by assumption, Corden's (1967) model does not allow for the possibility of exports by the domestic monopolist. However, if world prices provide commercial return to the domestic monopolist, it has an incentive to export. Since Corden's (1967) model incorporates only some of the features of the South African polymer producers, a very similar but extended model, which includes the possibility of domestic exports, is presented below.

3.3. A static model of import-parity pricing

Provided the world price is not below the minimum average cost of the domestic monopolist, an open economy environment would allow it to take further advantage of the economies of scale in its production and expand output for export. In this case, the domestic monopoly would receive different prices for the same product sold into different markets (local and export). There are welfare losses from this, as it means under-consumption in the local market due to the demand response to the higher price (Figure 3).

Figure 5. A static model of import-parity pricing with trade surplus



In the absence of trade, the local price would be P_M . The product can be exported at the prevailing price in the competitive international market, P_X , which is assumed to cover the monopolist's average cost. If the domestic monopolist chooses to sell at the same price to the local and international markets, its domestic customers will buy Q_X . However, the monopolist is aware that in the local market it only faces competition from imports – it has no local competitors⁴. This allows the monopolist to price at import parity, which is at P_{IM} .

Import-parity pricing to local customers means that they are charged a price, which includes costs associated with importing – transport, tariff, port handling and storage costs as well as additional

⁴ This holds, provided the domestic market can be defined as a distinct/separate market. This point regarding the South African market is discussed in more detail in Section 4 below.



charges, imputed to the hassle of importing. These costs are notional (not actually incurred) for the domestic consumers. In other words, the monopolist's domestic customers pay the same price as they would have if they imported the product, and thus they consume Q_{IM} .

Under conditions of increasing returns, it pays for the monopolist to produce at full capacity and export the proportion of output not sold in the local market at P_X , but exercise market power through charging its domestic customers P_{IM} . The exercise of market power is reflected in the fact that the domestic economy would be a net exporter of the good in question, but the single local producer would still price at import-parity to local consumers, even though the opportunity cost of one less unit sold in the domestic market is the export price. Thus, exports are more than they would be if all customers were charged P_X , and local demand is lower (at Q_{IM} instead of Q_X). An important conclusion is that monopoly power is only effective if $P_w(1+t) > P_2$.

If import-parity pricing is practiced for an input into the production of a downstream industry, it has an impact on the downstream industry's performance and competitiveness, through increasing its cost of production. These effects can be examined using value-chain analysis. The main theoretical ideas, on which value-chain analysis is based, are now recounted briefly.

The value-chain approach to industry studies describes the full range of activities required to bring a product or service from conception through different levels of beneficiation to delivery to consumers and then final disposal after use. While traditional industry studies focus considerably on individual sectors and are constrained by sector boundaries, value-chain analysis explores the dynamic linkages between productive activities that go beyond the confines of a particular sector. Thus, the value chains approach reveals the dynamic flow of economic, organisational and coercive conduct between different producers in different sectors and even on a global scale (Morris and Kaplinsky, 2001). The application of import-parity pricing of polymers in practice and its impact on the plastics industry through value-chain linkages is discussed next in Section 4.

4. Market structure and pricing

With view to assess the effects of trade-related factors on prices, we now discuss the market definition and industry structure of the polymers sector and the plastics sector, their pricing practices and the role of value-chain linkages. Sections 4, 5 and 6 of the paper focuses on the polymers polypropylene (PP) and PVC as South Africa has been a consistent net exporter of PP since 1990 (with the exception of 2000) and of PVC in the period 1999 to 2003.

4.1. Market definition and barriers to entry

Pittman (undated) argues that both the product and geographic market definitions focus on the question: "What choices do customers have?" In that sense, both definitions centre on substitutability between products, and hence on the ability of dominant firms to exert market power.

In the case of the product market definition, substitutability can be thought of as the consumer's choices between similar products⁵. The product market definition is often related to examining demand-side substitutability between products, while the geographic market definition focuses on availability of alternative sellers, thus highlighting supply-side substitution. Thus, the two definitions are complementary. The two definitions are now examined in turn.

For goods to be (legally) deemed as belonging to the same market, the product market definition uses several criteria, which aim to establish the degree of demand-side substitutability between the products. High cross-price elasticity and evidence that producers base business decisions on the prospect of buyer substitution between products indicate that the products concerned are likely to belong to the same product market. The influence of downstream competition faced by buyers in their

⁵ Here the standard assumption is invoked – namely that similarity would be determined by the consumer's tastes; alternatively by suitability in production uses when intermediate goods are concerned.



output markets; and the timing and costs of switching between products also play a role in delimiting a product market (Church and Ware, 2000; US Department of Justice and the Federal Law Commission, 1997).

Pittman (undated) names three factors, which are specifically involved in the definition of the relevant geographic market – current shipment patterns, transportation costs, and international borders. Current shipment patterns shed light on alternative sources of supply. Transportation costs reflect whether there are significant differences in expense when buying the good from suppliers in different geographic locations. International borders (or other geographic borders) include the role of tariffs, quotas and “voluntary” export restraints, among others, in restricting the flow of goods between different locations. Other geographic factors, which would impact transport costs and delivery timing or reliability, would also constitute barriers to the flow of goods and thus limit the consumer’s choice.

The demarcation of the relevant market’s boundaries has a bearing on the extent to which a dominant firm can exert market power. In effect, it is the boundaries, imposed by demand-side and supply-side substitutability, that determine where the limit lies in limit-pricing behaviour. We now examine the product and geographic market definitions with respect to the markets for PP and PVC.

Some key features of the domestic polypropylene and PVC markets can be noted. South Africa’s distance from alternative suppliers of polymers, located in Europe and Asia, implies that there are significant transport and transaction costs associated with importing. For instance, the sea freight to South Africa alone amounts to 5% of the f.o.b. price of polypropylene. If further costs for the 10% tariff, insurance, landing, wharfage, agency and documentation fees, as well as inland transport to Gauteng are added, then this figure rises to 23% of the f.o.b. price⁶. Further, small downstream firms are deterred from importing by additional transaction costs. Factors, such as the necessity to secure financing for a shipment of polymers, the requirement of a storage facility and the uncertainty of the quality of the imported product, make domestic polymer suppliers more attractive sources of inputs.

Therefore, domestic polymer suppliers enjoy more ready access to South African markets for inputs into plastics production than international polymer manufacturers. Information regarding the size of the South African market as well as the volume of local production is presented in Table 2 below. It appears that between 2000 and 2002, on average 84% of local demand for polypropylene and of PVC was filled by domestic producers.

Table 2. Output and trade of polymers, by volume (tonnes)

	2000				2001				2002			
	Consumption	Production	Imports	Exports	Consumption	Production	Imports	Exports	Consumption	Production	Imports	Exports
PE-HD (Sasol, Dow Plastics)	140 000	154 100	17 500	31 600	142 000	122 000	20 100	21 100	155 000	123 000	35 700	13 000
PE-LD/LLD (Sasol)	222 000	193 500	43 000	14 500	266 000	178 000	89 300	1 300	260 000	200 000	65 500	18 000
PP (Sasol, Dow Plastics)	165 000	168 600	58 500	62 100	176 000	320 700	10 300	155 000	190 000	350 000	13 500	137 700
PVC (Sasol)	112 000	128 600	16 400	33 000	100 900	122 000	22 900	44 000	150 000	134 000	15 500	35 000

Source: Plastics Federation of South Africa

Note: The data on PVC for 2002 appear inconsistent as the consumption figures are given as larger than production implying a trade deficit. However, the trade data (consistent with trade data by value from SARS) record a significant surplus.

Polymers vary considerably with regard to their physical properties. Industry sources indicate that even different grades of the same polymer are used for different purposes and are therefore not

⁶ Author’s calculation from a Sasol information release on its pricing sent to its customers. This information is presented in Table 3 below.



substitutable in production. Hence, the geographical South African market is subdivided into many small product markets for the various polymers and grades thereof.

The barriers to entry into the South African markets for polypropylene and PVC are significant. The incumbent firms (Sasol and Dow Chemicals in the case of polypropylene and Sasol alone in the case of PVC) enjoy significant economies of scale due to large fixed costs. Undoubtedly, there are also considerable sunk costs in the capital-intensive production processes involved, where equipment cannot be used for other purposes and a resale market for this kind of capital goods is unlikely to exist.

This can be seen clearly by examining the production process for polypropylene, for example. This polymer is a co-product from steam crackers of higher (primary) olefins and of petroleum refineries. The important implications here are that the process is capital-intensive and that producers enjoy not only economies of scale but also some economies of scope. Having delineated the relevant markets, we now examine the industry structure in polymer production and in plastic goods manufacturing.

4.2. Market structure

Given that South Africa is a distinct geographic market, and the economies of scale in the production of polymers, the upstream industry has a significant degree of concentration, while the downstream industry is significantly more competitive (Table 3).

Table 1. Concentration indices according to output

	No. of firms	Relative contribution of:		Herfindahl-Hirschman Index
		Four largest	Ten largest	
Plastics in primary form and synthetic rubber	31	0.8265	0.9483	0.3224
Plastic products	1 027	0.16	0.29	0.0128

Source: Statistics South Africa, *Manufacturing Census, 1996*

However, these measures of concentration do not take product differentiation into account. In effect, only one or possibly two local firms produce the main polymers. This is understandable, given the significant economies of scale in these activities. In interviews, domestic plastics firms reveal that indeed the main polymer producers have been reducing the grades they manufacture locally in order to achieve better scale economies, and are importing grades they no longer produce in order to continue supplying the range demanded by customers.

As already mentioned, there are four polymer producers in South Africa (Table 1). The largest by far is Sasol Polymers, a division of Sasol Chemicals, followed by Dow Chemicals, a local subsidiary of the multinational Dow. Sasol Polymers is the largest manufacturer of polypropylene (PP) and is the sole producer of low-density polyethylene (LDPE), linear low-density polyethylene (LLDPE) and polyvinyl chloride (PVC) in South Africa. It operates plants in Sasolburg and Secunda. It also has partial ownership of two plants in Malaysia.

Since South Africa is a separate market for polymers from the competitive international market, Sasol is a domestic monopoly in PVC. With regard to polypropylene, downstream firms confirm in interviews that Sasol and Dow Plastics price on the same principle of import-parity and their prices are consistently in line, with the exception of occasional special offers. Thus, in essence, the implicitly coordinated behaviour of the two producers fits the monopoly assumption of the static model of import-parity pricing presented in Section 3.

In contrast with upstream polymer production, downstream plastics do not exhibit signs of imperfect competition, reflecting low economies of scale. The sector comprises of a very large number small or medium-sized firms, which use much more labour-intensive methods of production.

4.3. Pricing and production costs

Pricing of polymer inputs is the single most important factor in plastic products firms' cost competitiveness and far outweighs other costs such as wage rates. Polymer producers (through their



correspondence with customers) and their clients confirm that local pricing is on an import-parity basis. This means that prices are adjusted to be equivalent to the actual cost of importing polymers, even where there is a very large trade surplus, such as in polypropylene (Table 4).

Table 4. Sasol's own import-parity price calculation (Rands per tonne)

Polypropylene	July 2003
Ruling fob price in international market (Hong Kong)	5 473
Sea freight	299
RSA fob	5 772
Duty at 10% of fob	547
Insurance	6
Landing, wharfage, agency and documentation fees	221
Transport:	
- Inland (container turn-in and railage)	189
- Coast (container turn-in and cartage)	31
Landed cost (import quote)	
- Delivered inland	R6 735
- Delivered coast	R6 527
Indirect costs of importing	
- stock-holding, payment terms, de-stuffing, warehousing	304
Import-parity price	
- Delivered inland	R7 039
- Delivered coast	R6 831
Sasol implied added-value costs (technical services, bulk delivery, quality, complaint resolution etc)	
Inland price	R7 039
Coastal price	R6 831

Source: Sasol's own calculations sent in an information letter to a plastic sheeting manufacturer

Note: All prices in Rands, converted from international price at two-month forward exchange rate of R7.81/\$

In a competitive industry, where a trade surplus is present, pricing is on an export-parity basis. This is due to the fact that the opportunity cost of producing an extra unit of output is the price it would receive in international markets. Hence, import-parity pricing in polymers, in which South Africa has a surplus, reflects market distortions.

In addition, it is not directly related to the cost of production, but includes significant notional costs, associated with importing, while the polymers are delivered from a domestic production facility. International spot prices are likely to be a better reflection of costs, but undoubtedly provide a commercial rate of return, or else any output expansion for export purposes would be nonsensical. CMAI (a petrochemicals consulting firm)⁷ projects production cash costs for propylene in 2010 to be between \$430 and \$600 per tonne, depending on two factors: the nature of the production process (by-product versus on-purpose production, the latter being more expensive) and the price of feedstocks (as international polymer prices are closely influenced by crude oil prices).

Sasol produces propylene through cracking of higher olefins. Liquids cracker costs for Mideast propylene producers are projected to be about \$430/tonne, while those for US and European manufacturers at about \$520/tonne and \$550/tonne, respectively (Chemical Week, 2006). International f.o.b. prices have varied between \$455 and \$1200/tonne in the period 1996 – 2005, thus

⁷ Cited in Chemical Week (2006)



covering production costs the majority of the time. Hence domestic PP producers' exports are commercially viable on the international market and these firms make a higher margin on domestic sales, as predicted by the static import-parity pricing model in Section 3.

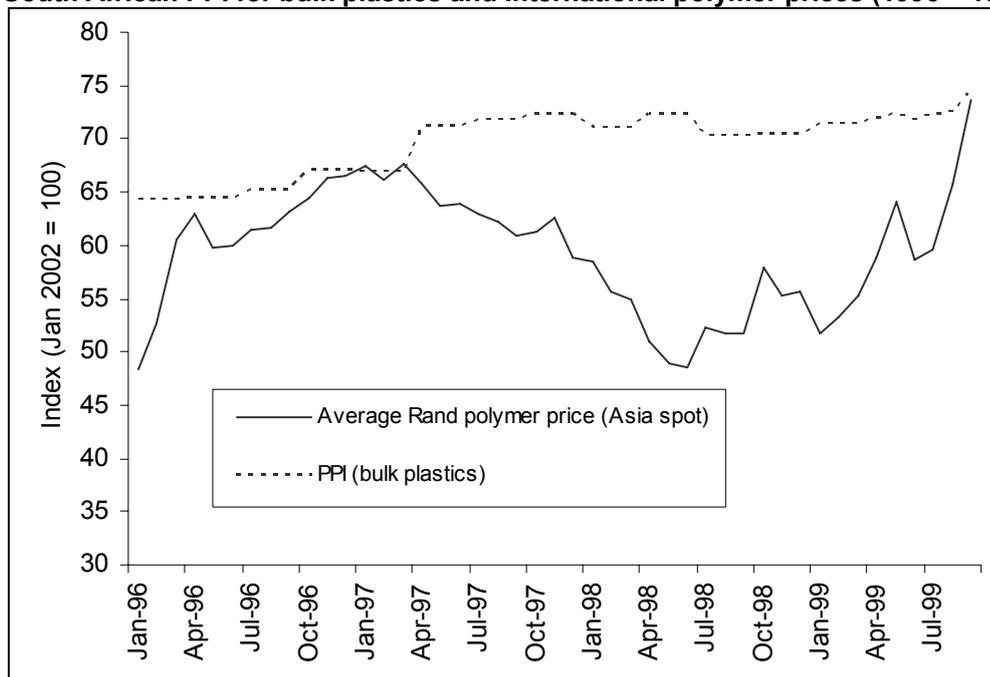
While the availability of South African suppliers is certainly advantageous to domestic downstream firms from a convenience and reliability point of view, their competitors in other countries in Africa, which do not impose tariffs on polymer imports, get cheaper material from the same South African suppliers. Industry sources suggest that plastics firms from European and other African countries are significantly more competitive in offering lower prices in international tenders. While industry sources point to a South African 'benchmark' mark-up of 27% above Asian f.o.b. prices, closer examination of domestic pricing patterns indicates that mark-ups have varied and hence often deviated from import-parity (Figure 6 and 7).

In constructing Figures 6 and 7, the international spot polymer prices (in US dollars) were converted into Rands, averaged across polymers and then indexed in order to compare the fluctuations in international prices to polymer input costs for domestic firms (represented by the South African producer price index for bulk plastics or polymers)⁸.

The variable mark-ups are likely to reflect lags in price adjustment as well as the exertion of market power. Prices are adjusted with a lag of 60-days, since this is the period it takes to procure a shipment of imported inputs to plastics production⁹.

It appears that the substantial lowering and simplification of tariffs on polymers from 1996 to 1999¹⁰ filtered through to domestic polymer prices only gradually, as the threat of imports became increasingly more imminent. The import-parity benchmark for pricing seems to have been followed more closely since 2001.

Figure 6. South African PPI for bulk plastics and international polymer prices (1996 – 1999)



Source: Bloomberg and Statistics South Africa

⁸ Unfortunately, there is a break in the data series for international polymer prices from October 1999 to January 2001 and hence the available data is presented in two charts.

⁹ According to a Sasol information letter sent to a plastic furniture manufacturer.

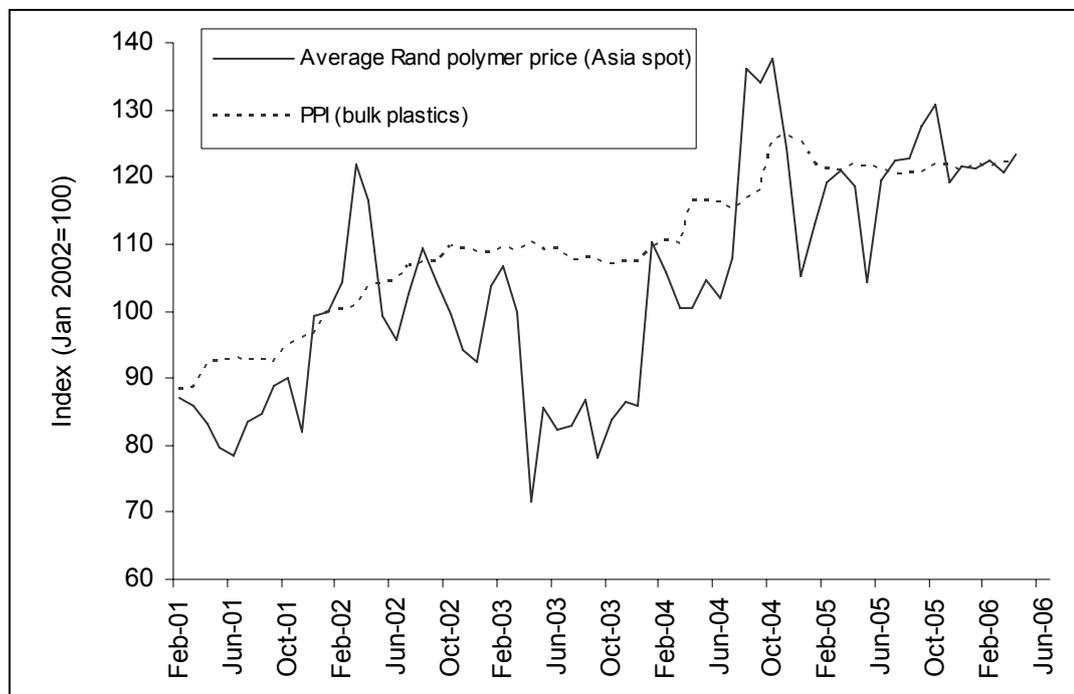
¹⁰ Tariffs fell from (10% + formula to the maximum level of 36%) in 1996 to 10% (without formula) in 1999 – see Table 5 in Section 5.2 below.



It is evident that while the increases in international prices (converted into Rands) were not priced into the local market immediately, South African polymer prices continued to increase in 2001 and 2002. Similarly, the effect of the sharp appreciation of the Rand in 2003 and 2004 was not felt through proportionately lower local prices for several months. It appears, however, that the strength of the local currency filtered through to domestic prices more noticeably in 2005. Notably, price increases have also been passed on to downstream firms with a lag.

Thus, upstream producers have engaged in exercising their market power through some degree of variability in the mark-up over international prices, but also in smoothing out the fluctuations of spot polymer prices (and hence import-parity prices). However, as the effects of trade liberalisation and increased competition have filtered through more noticeably over time, the import-parity pricing appears to have become a more closely and consistently followed benchmark by local producers (Figure 7). This is likely to have occurred as time has allowed for firms to obtain better information about international prices (for example through new consultancies¹¹) and also about import opportunities, thus making competition from imports more imminent for local polymer producers.

Figure 7. South African PPI for bulk plastics and international polymer prices (2001 – 2005)



Source: Bloomberg and Statistics South Africa

Hence the pricing of polymers reflects exertion of market power and can be said to have followed the import-parity benchmark loosely in the mid- to late 1990's and much more closely in recent years. In contrast, however, prices of downstream products are determined on a more competitive basis. The specifics depend on the product type and the structure of the particular sub-sector.

There are at least several local downstream firms producing each kind of good. Products with high value-to-mass ratio are more easily traded. For example, South Africa is a net importer of plastic plate, sheet and film products (HS3920), which are likely to be priced at import-parity as it has a growing trade deficit. In contrast, plastic tubes, pipes, hoses and fittings (HS3917) have a low value-to-mass ratio¹² and the local market is served mainly by the four domestic producers. This is evidenced by the relatively constant trade deficit value (in dollar terms) in these products since the

¹¹ For example, Plastrack Pricing Information services (www.plastrack.co.za) has been offering plastics converters information regarding benchmarking local prices against international prices since 2003.

¹² Because of the air spaces inside hoses and pipes, which increase the weight and volume, but add no extra value.

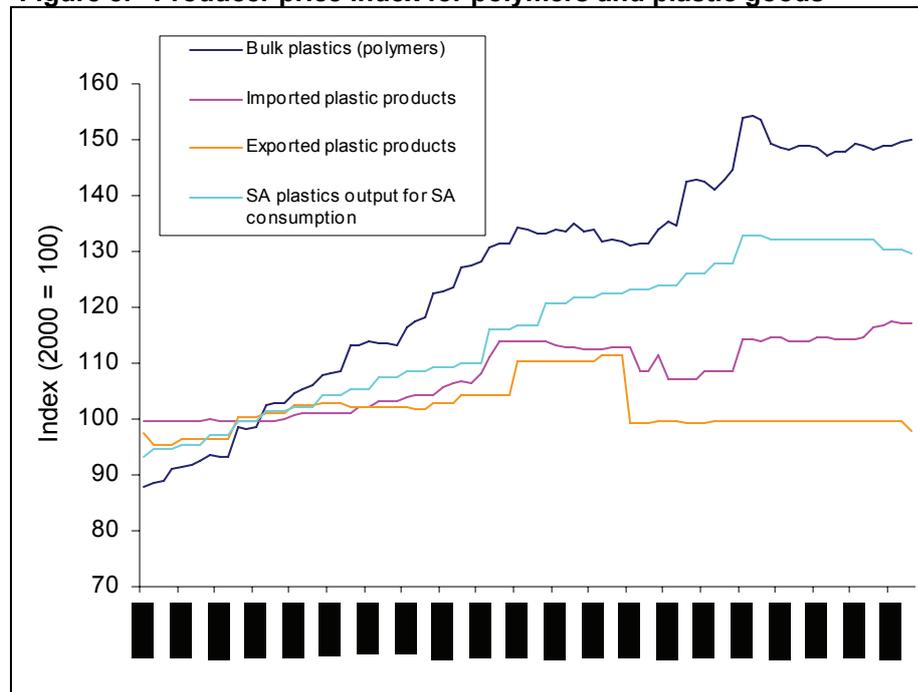


early 1990's. Because of the barrier of costly transport in relation to product value, this sub-sector is also less competitive and can be described as an oligopoly with relatively stable market shares¹³. Their prices are influenced to a lesser degree by those of traded products. On the other hand, the pricing in the builders' ware (HS3925) and baths and basins (HS3922) sub-sectors, which have recorded consistent trade surpluses, is likely to be close to export-parity.

The diversity of the downstream sector implies that pricing of more benefited products depends on the nature of the product and the number of firms manufacturing it in the local market. Even though the pricing of downstream goods as a whole bears no direct relation to import-parity or export-parity pricing, it is certainly on a more competitive basis than polymer pricing.

The effect on consumers is also linked to the trade liberalisation in final products and the level of international competition that downstream firms face. The tighter price squeeze on manufacturers of more benefited plastic goods due to competition from imports is shown in Figure 7.

Figure 8. Producer price index for polymers and plastic goods



Source: Statistics South Africa

Note: Data on PPI for imported and exported plastic goods is only available from June 1999

While polymer prices have continued on an upward trend, prices for domestically produced plastic goods for South African consumption have not kept pace. It is also evident that local downstream producers face price competition from imports, which have recorded slower price rises. Overall, final product prices have fallen much more rapidly than the decline in input costs (Figure 8). This is despite relatively high nominal protection levels from tariffs on intermediate and final goods. On the international market, South African plastics manufacturers face significant rivalry, as plastics exports prices have been relatively steady since 1999. We now examine the role of trade liberalisation and trade barriers in the upstream and downstream sectors in the price trends further.

5. Impact of Trade Liberalisation in Polymers and Plastics on Poverty

The impact of trade liberalisation in polymers on poverty occurs through the production chain of plastic goods. This section first discusses the input-output relationships between polymers and

¹³ The stability of market shares in the plastic pipe sub-sector was confirmed by industry players.



plastics before proceeding to the analysing the path of trade liberalisation and its effect on polymer prices and prices of intermediate and final plastics.

5.1. Value chain links

The inputs to the manufacture of plastics are dominated by primary forms of plastics (polymers), which account for about half of total input costs, and 30% of total output value (Table 4). The competitiveness of the downstream sector is therefore closely bound up with pricing of polymer inputs.

Table 4. Plastic products - sources of inputs and value added, 2000

Product grouping	R millions	% of total inputs	% of output value
Agriculture & mining	100	1.5	0.9
Textile products	80	1.2	0.7
Wood & paper products	237	3.6	2.1
Petroleum & basic chemicals	465	7.0	4.2
Primary plastics	3 362	50.9	30.3
Other chemicals	145	2.2	1.3
Plastic products	1095	16.7	9.9
Metal prods & mach	240	3.6	2.2
Other manufacturing	253	3.8	2.3
Electricity & water	28	0.4	0.3
Transport, communication, finance & other services	597	9.0	5.4
Total inputs at purchasers' prices	6 611	100	59.6
Total gross value added (GDP)	4 479		40.4
Compensation of employees	4 014		36.2
Taxes less subsidies	(18)		-0.2
Gross operating surplus / mixed income	456		4.1
Total output at basic prices	11 090		100

Source: Statistics South Africa, Final supply and use tables, 2000

The plastics industry includes a range of products, which are intermediate inputs into other sectors (82%), and finished products (11%), such as baths and basins, while the remainder is exported¹⁴. Major markets include packaging, builders-ware (such as pipes) and the auto sector. Hence the performance and pricing of plastics, which in turn is closely related to the pricing of polymers, plays a role in the pricing and competitiveness of a range of manufacturing sectors and ultimately the welfare of South African consumers.

The higher cost of inputs certainly raises the prices of plastic goods for the South African market. In interviews, a plastic furniture manufacturer, for example, points out that polypropylene and pigments cover about 60% of the total cost of plastic chairs production, with overhead costs comprising the rest. However, competition between the eight local producers of plastic chairs somewhat limits the ability to pass high production costs to consumers.

5.2. The extent of tariff liberalization

Tariffs on polymers, as well as on intermediate and final plastic products were reduced substantially in the 1994 – 1999 period (Table 5). More recent trade agreements with the EU have reduced the tariff for polymer imports from European countries further to 7.5% in 2006.

¹⁴ Statistics South Africa Supply and Use Tables (2000)



Table 5. Tariff policy since 1994

Product	Tariff in 1994	Initial schedule 1/95	Revised schedule			
			1/96	1/97	1/98	1/99
Basic Polymer (PP, PE, PVC)	10% + formula	45	10% + formula to the max level of: 36 27 18 10			
Monofilament (rods, sticks of PE, PP, PS)	30% + formula	27	24	21	18	15
Pipes, tubes, hoses (of PE, PP, PVC)	30% + formula	28	18	17	16	15
Floor coverings (of PVC, PE, PP, PS)	20/25/30%+ formula	20/24/28	18	17	16	15
Self-adhesive plates sheet, film (of PE, PVC)	25% + formula	24	18	17	16	15
Baths, basins & other plastic sanitary ware	30% (baths) 25% (basins)	30	20	20	20	20
Table ware, kitchenware	30%	30	28	25	22	20
Builders ware (tanks, doors, Venetian blinds)	30%	30	20	20	20	20

Source: DTI Chemicals Directorate document 'Summary of the Tariff Rationalisation Process as applicable to the Plastics Industry', 25 March 1997

In addition, the removal of formulae from the tariff regulations has reduced trade barriers substantially. Various downstream products have also experienced liberalisation, but the plastics sector remains protected by higher tariffs, between 15% and 20%.

Trade liberalisation, together with the presence of market power upstream has shaped the trade pattern characteristic to South Africa at the different levels of beneficiation – this is examined next.

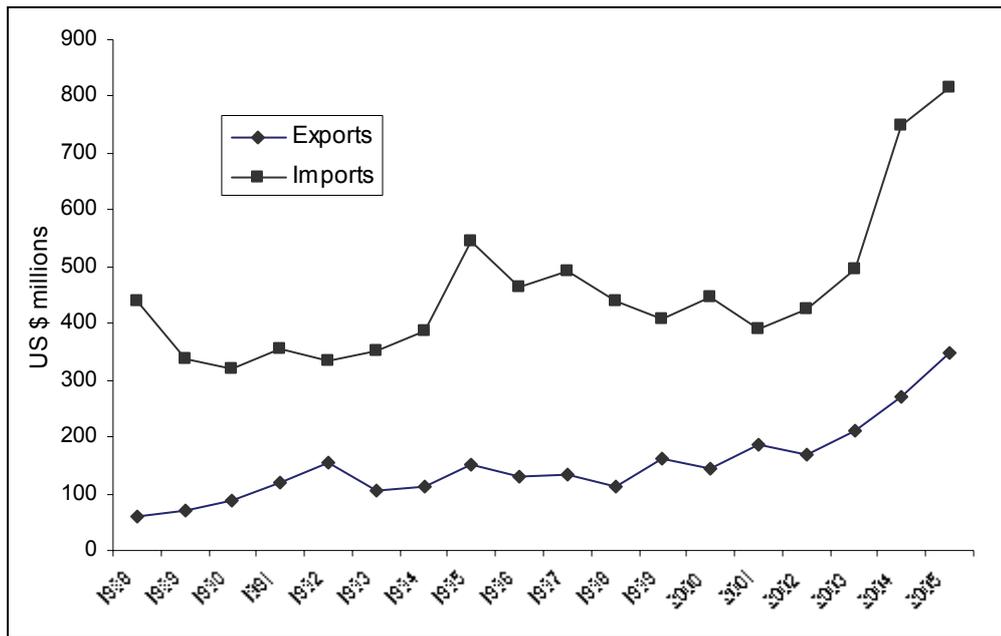
5.3. Pattern of trade at different levels of beneficiation

When market power is present upstream but not downstream, the pattern of trade and development characteristic to the South African plastics sector emerges. Sub-sectors that grow fast with regard to output and exports are niches, which compete on factors other than price: quality, specialisation, service to particular requirements. The sub-sectors that compete on price serve mainly the domestic market and in some cases face significant competition from imports, despite protection from high tariffs. This is confirmed by the pattern of trade presented below and the fact that imports of semi-finished and finished plastic goods have grown rapidly in recent years, despite the fact that tariffs have remained unchanged since 1999 and trade protection for these products appears to be relatively high.

As a whole, imports and exports in plastics at all levels of beneficiation have increased since the beginning of trade liberalisation, but different patterns of trade and competitiveness have emerged for various levels in the value chain (Figures 8, 9, 10).

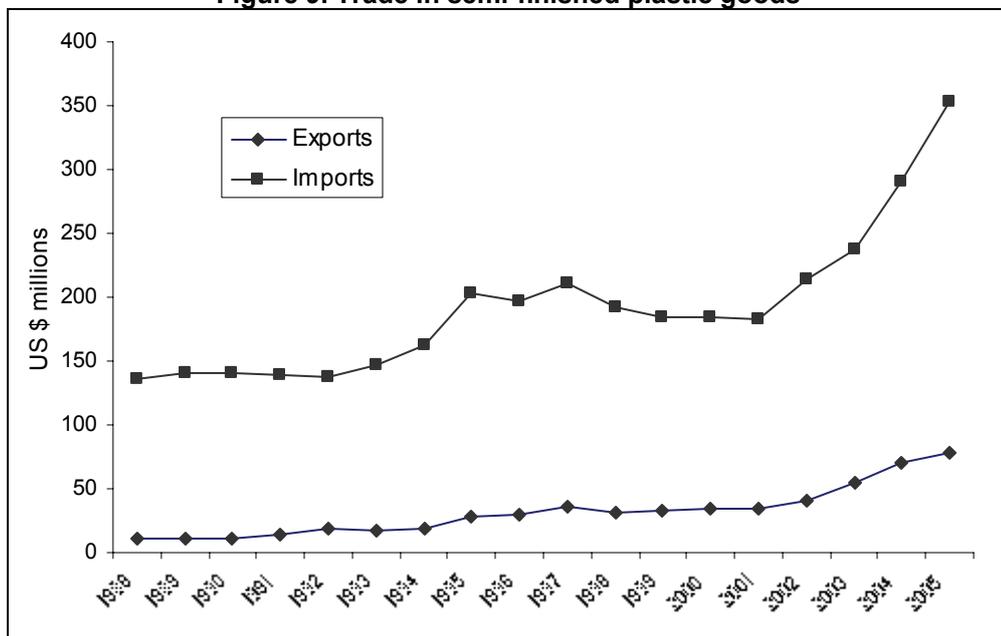


Figure 8. Trade in polymers



Source: TIPS Standardised Industrial Database
Note: Polymers are classified under HS 3901 – HS 3915

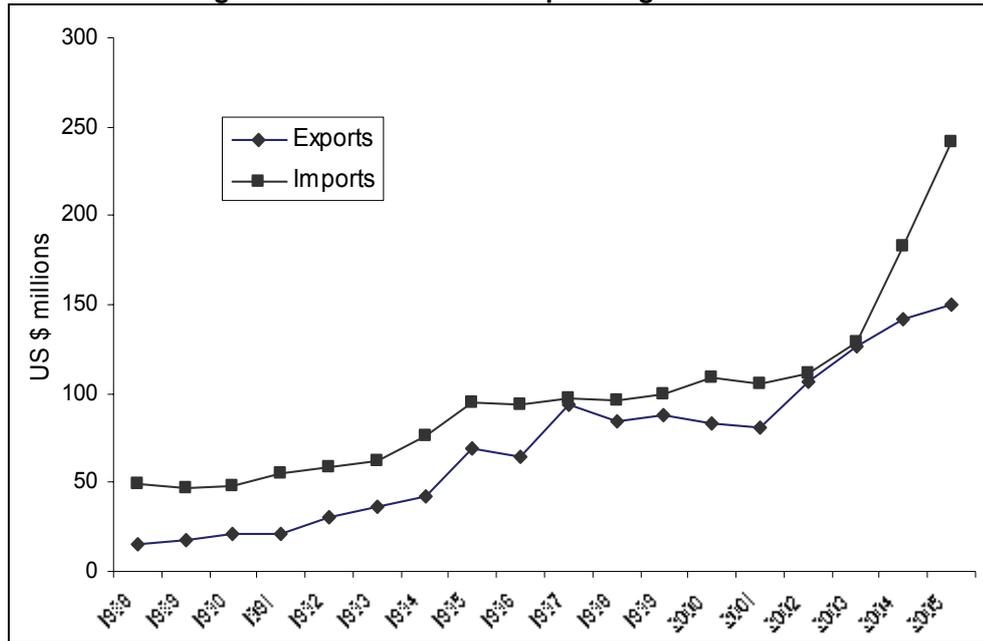
Figure 9. Trade in semi-finished plastic goods



Source: TIPS Standardised Industrial Database
Note: Semi-finished plastic goods are classified under HS 3916 – HS 3921



Figure 10. Trade in finished plastic goods



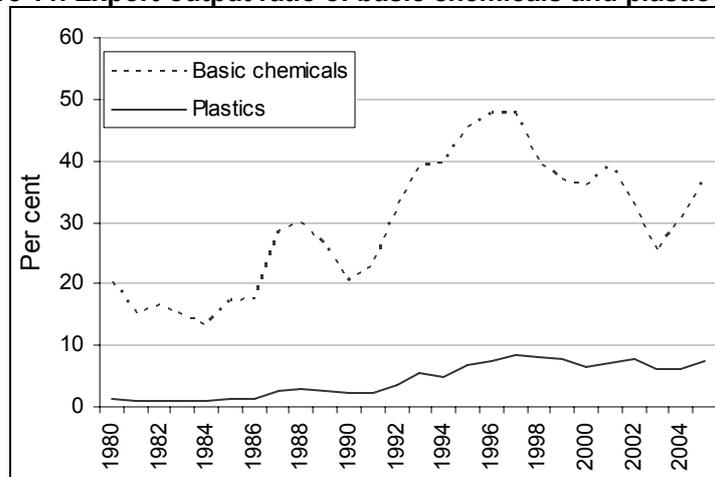
Source: TIPS Standardised Industrial Database

Note: Finished plastic goods are classified as HS 3922 – HS 3926

South Africa has a trade deficit in the category of polymers as a whole, but has recorded consistently large and growing trade surpluses in polypropylene, and surpluses in PVC between 1999 and 2003. This has driven the improved performance in South Africa's polymer exports. Exports of polypropylene grew by 29% in 2004 and 33% in 2005, despite the strengthening of the domestic currency. The domestic manufacturers have discontinued the production of some grades of polymers (especially of polyethylene) and downscaled the manufacturing of others, which largely explains the growth in imports. The Plastics Federation and other industry sources confirm the trends in trade data at the more disaggregated level, namely that there is relatively little intra-industry trade in polymers.

The disciplining effects of trade liberalisation have allowed both upstream producers and manufacturers of more beneficiated products to become more export-oriented (Figure 11). However, polymer producers export a higher and rapidly increasing proportion of their output. Sasol sold 51% of its 243 896 tonnes of polypropylene output in the export market in 2004. Its PVC expansion project increased production from 165 000 tonnes to 220 000 from the end of 2004. The company also projected that before the completion of its 2006 financial year, it would have doubled its polymer production capacity (Sasol, 2004).

Figure 11. Export-output ratio of basic chemicals and plastic goods



Source: TIPS Standardised Industrial Database

Note: 'Basic chemicals' is a broadly aggregated category, but a consistent data series for polymers only is unavailable.

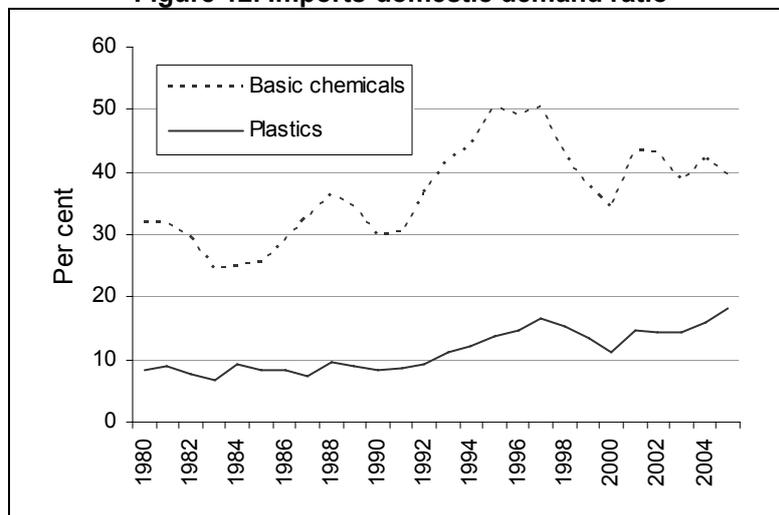


With regard to plastic goods with a higher level of beneficiation, the trade gap in semi-finished plastics, which include tubes, pipes, floor coverings, plates and sheets, has widened, compared to the trade deficit in finished goods. Since intermediate plastics require a lower level of processing, products in this category are heavily dependent on costs of input materials.

Exports of semi-finished and finished plastic products have increased over the 1995 – 2005 period, but this growth has been uneven. Finished plastic products appear more competitive with only a slight trade deficit. However, this observation is misleading for two reasons. Firstly, within the finished products category, a few niche products (such as baths & basins and builders ware) have dominated growth in exports. Between 1995 and 2005, exports of baths and basins, which are made from imported inputs and are directed mainly to the German market, grew by an average of 19% per annum¹⁵. Builders ware exports expanded by 27% on average in the same period.

Secondly, despite much higher tariffs for semi-finished and finished plastic products in comparison to polymers, the proportion of imports to domestic demand of downstream plastic goods have continued to rise (Figure 12). The imports-domestic demand ratio for upstream chemicals has stabilised around 40%, while that for plastic products has more than doubled (from 8% in 1980 to 18% in 2005) and continues to rise.

Figure 12. Imports-domestic demand ratio



Source: TIPS Standardised Industrial Database

Note: 'Basic chemicals' is a broadly aggregated category, but a consistent data series for polymers only is unavailable.

Nevertheless, the success stories in the downstream sector, which point to the fact the materials pricing is not the only source of competitiveness. The baths and basins and builders' ware sub-sectors have benefited from protection in the domestic market to the same degree as other sub-sectors. However, even though there has been no tariff reduction for these products since 1996, they have shown significant export orientation. These sub-sectors continue to perform well, despite currency fluctuations. This reflects the ability of South African manufacturers to find product niches and compete on factors other than cost.

In essence, domestic downstream producers have benefited from lower tariffs on polymers and polymer manufacturers' closer adherence to import-parity in recent years. Both upstream and downstream producers, however, have been faced with intensifying international competition due to the Rand appreciation since 2002. A further factor for semi-finished and finished goods producers, however, is likely to be the consequence of international producers having access to more competitively priced inputs, which allows them to price lower than domestic producers, despite high tariffs. Undoubtedly, this has benefited final consumers. Admittedly, the access to cheaper inputs by international producers and its relationship to their pricing needs further exploration. However, the

¹⁵ For more detail on the case of the baths and basins sector, see Roberts (2001).



scarcity or restrictions on availability of international data on pricing of intermediate and final products makes this a formidable task.

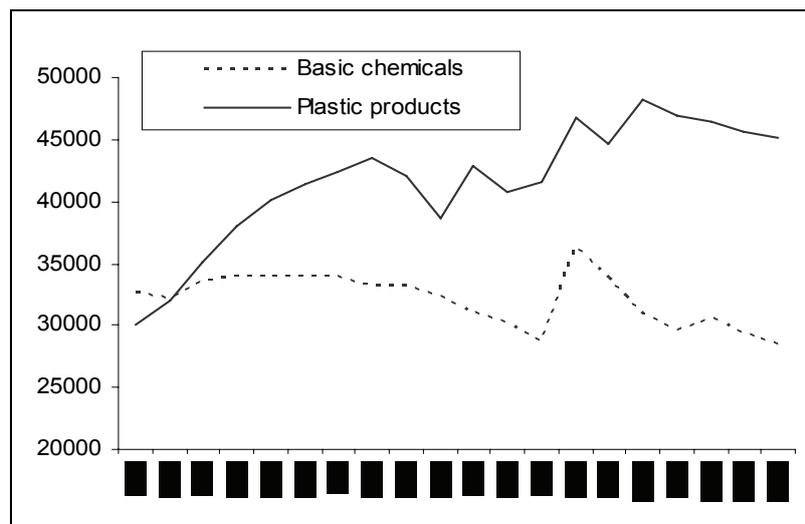
It appears that mainly the growth in domestic demand has supported South African plastics manufacturers and allowed them keep employment levels relatively stable, despite lower trade barriers and rising competition from imports. We now turn our attention to employment trends.

5.4. Impact on employment

The impact of trade liberalisation on employment in polymers and plastics has been difficult to track. It appears that some downstream producers remain competitive in their niches, especially in European markets (baths and basins) and African markets (builders ware) and have increased their employment levels, while domestically-oriented producers have benefit from the growing South African economy (Figure 5).

On the other hand, the capital intensive basic chemicals industry has shed jobs since the late 1990s. However, the reduction in employment in basic chemicals is unlikely to have been due only to the effects of trade liberalisation, but rather the shift to even more capital-intensive techniques, as well as likely upgrades in equipment. This is supported by the large investments undertaken by firms in the basic chemicals sector since the mid-1990s and the shift to employing a greater proportion of skilled and highly skilled workers.

Figure 1: Employment in the basic chemicals and plastic products industries (number of employees)



Source: TIPS Standardised Industrial Database

6. Conclusion and Policy Implications

Considerably lower tariffs and rising imports of polymers have disciplined the market power of domestic manufacturers. However, South African polymer producers' pricing to local downstream firms still reflects the exercise of market power. Plastics firms, which continue to purchase their inputs mainly from local suppliers, operate in more competitive downstream markets and also face increasing import competition. They have lower margins and thus are restricted in their ability to pass on the high input prices to their customers. Hence households are likely to have benefited from the combined effect of lower polymer prices due to the decrease in tariffs and more intensive import competition in downstream product markets.

The market power in the upstream links of the plastics value chain has brought about a lop-sided development pattern. Upstream sectors, which are capital intensive and employ a larger proportion of



skilled workers, are more competitive internationally and continue to enjoy significant levels of investment and output growth, while reducing employment. They also export a higher proportion of their output. Hence trade liberalisation and entry into the world market is not sufficient to force export-competing industries to price at export parity when they possess market power domestically. In these instances additional policies may be required – for example, the threat of an import subsidy (Corden, 1967).

While trade liberalisation during the 1990's has only had a moderate impact on the prices of final products and therefore consumers of plastic goods, the currency appreciation since 2002 has introduced intense competition from imports and hence lowered prices, which has benefited households. The lowering and simplification of tariffs has decreased input prices, but the producers of more beneficiated plastic goods, on the whole, they are not internationally competitive and hence growing and sustainable job creation has been limited. Downstream firms, which are labour intensive and employ a larger proportion of semi-skilled and unskilled workers, serve mainly the domestic market or compete internationally in product niches. Nevertheless, the better performing downstream sub-sectors have shown a marginal increase in employment, largely on the back of growing domestic demand.

The most glaring policy implication is that tariffs on polymers are explicitly part of the local price build-up. Trade liberalisation is still an important vehicle through which to lower prices of inputs produced in export-competing upstream industries with market power. Reducing tariffs will benefit the downstream industries directly, while the upstream producers will continue to enjoy relatively high margins due to significant transport costs and hassles associated with importing. As far as polymers in which South Africa has a deficit are concerned, the government stands to generate more revenue if trade barriers are abolished. At present, import-parity pricing means few imports, and so little tax revenue.

What is certain is that a more detailed understanding of domestic pricing practices and behaviour is needed in this market, since the prices of intermediate goods are more difficult to observe directly. Abolishing tariffs on polymers, establishing a collective buying group for these inputs and implementing improvements in logistical services to lower costs of supply are probably the most practical solutions in the interim, while government develops a deeper insight into the functioning of the domestic plastics value chain.

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