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Manufacturing competitiveness and industrial policy

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ABSTRACT

The government's Integrated Manufacturing Strategy identifies competitiveness as its primary focus, and value-matrices as the framework within which to assess manufacturing performance. This paper addresses these issues through two main components. The first is a review of interpretations of competitiveness and its determinants. The second is an assessment of South African manufacturing performance in a comparative context. This makes reference to recent studies of manufacturing sub-sectors, and draws comparisons with the performance of other developing countries. Drawing on the analysis, implications are discussed for the government's industrial policy framework and the use of a value matrix methodology.

1. INTRODUCTION

The new industrial policy framework outlined by government in the DTI document titled *Accelerating growth and development: the contribution of an Integrated Manufacturing Strategy* provides the basis for ‘a collective government position...[to] co-ordinate a set of actions across government’. It is primarily focused on improving competitiveness. A range of factors are identified as important for firms’ competitiveness, including the prices of inputs, infrastructure price and provision, technology and innovation, skills, and effective regulation. Integration with the international economy and increased knowledge-intensity in production are key features of the new competitiveness approach of the DTI, as opposed to the natural resource and unskilled-labour bases of earlier phases of industrialisation.

The policy thrusts during the 1990s of trade liberalisation coupled with ‘functional’ supply-side measures brought about significant restructuring of manufacturing. Overall performance has been poor, although the DTI has claimed policy successes on the grounds that manufacturing was broadly uncompetitive and at risk of major collapse. In this context, weak output growth is portrayed as a success. But, investment rates have been low and decreasing and formal employment has been contracting.

The *Integrated Manufacturing Strategy* (IMS) proposes a value-matrix framework to understand vertical and horizontal relationships affecting production. In this paper we examine some of the debates around competitiveness (in section 2) before drawing on recent studies of five manufacturing sub-sectors: basic iron & steel, metal products, basic chemicals, other chemicals, and plastic products. These sub-sectors cover several stages in the production and processing of steel and chemicals through to finished products. The analysis is used to suggest implications for the value-matrix approach and industrial policy.

2. INTERNATIONAL COMPETITIVENESS AND FRAMEWORKS FOR INDUSTRIAL POLICY

‘Competitiveness’ has become a catchword in economic policy circles. *The Global Competitiveness Report* of the World Economic Forum ranks countries, and is widely reported. Yet, competitiveness can mean very different things and economists are often wary of it, especially when it is applied to countries.

2.1 Competitiveness – sense or nonsense?

While the competitiveness of firms is relatively straightforward, to do with their ability to produce and sell their output in markets in contestation with competing firms, Krugman (1994) has forcefully argued that ‘competitiveness is a meaningless word when applied to national economies. And the obsession with competitiveness is both wrong and dangerous’. For him, it wrongly implies that trade is a conflictual relationship between countries, representing a fundamental misunderstanding of comparative advantage.

In one sense (though not in the popular usage of the term) competitiveness is an exchange rate issue. Sustained and unwelcome current account deficits signify a lack of competitiveness which would require adjustment, usually via a mix of depreciation and deflation (Boltho, 1996). Where growth is constrained by a tendency for the current account to go into deficit as imports increase without a matching rise in exports, the balance of payments could be said to constrain sustained rises in living standards. But, this depends on a range of factors such as the distribution of incomes and the relationship of domestic demand to imports and domestic industrial structure.

Many analysts of national 'competitiveness', however, focus on the underlying determinants of countries long-term economic performance such as education, skill development, and innovation. In a general equilibrium framework, where markets clear, this reduces to a 'poetic way of saying productivity' (Krugman, 1996). Shorter-term measures also highlight indicators such as relative unit labour costs between countries. But, empirical results have indicated that countries achieving faster growth rates and stronger export performance tend to have more rapidly rising unit labour costs as well (see Fagerberg, 1988, for a more detailed discussion).

In these terms, competitiveness is therefore about the changing nature of production capabilities and of a country's export and import basket. Much of the evolution of comparative advantage is to do with relationships between firms and decisions within them around issues such as the adoption and adaptation of different technologies. This recognises that countries with higher growth rates have also grown exports, but that countries which have grown exports have not necessarily achieved higher growth rates (Rodrik, 1999; UNCTAD, 2002). Similarly, while an over-valued exchange rate supported by high levels of protection is certainly detrimental to economic growth, the trade liberalisation that has been widely pursued has not brought the higher growth rates which were expected (see, for example, Greenaway et al., 1997).¹

The outcomes rely on firms' responses to changed incentives in terms of investment, including in product development and skills of the workforce. This relates to what Kaldor termed the 'creative' functions of markets which include the signalling, response and mobility components transmitting incentives to changed decisions (Arndt, 1988). While problems in these areas may be framed in terms of static market failures, such as in financial markets and informational imperfections, they also relate to the organisation of production and how firms develop and implement strategies. Moreover, as emphasised in much of the literature on technology, issues which are characterised as 'failures' instead often represent intrinsic elements of the organisation of production (Sawyer, 1991). For example, while exports may be linked with learning (about better work methods, marketing or technological processes), learning is also an impediment to exporting as found in recent studies of South African clothing firms (Gibbon, 2002; Moodley and Velia, 2002). To limit understanding of such issues to information imperfections seems to miss a good deal of the picture.

¹ This maybe partly due to the slow pace of liberalisation by developed countries in products in which developing countries have a comparative advantage. Orthodox trade theory, however, supports unilateral tariff liberalisation.

2.2 Technology, linkages and production

Following Lall and Teubal (1998), firms deal with the demands of technological changes by developing organizational and managerial routines. It takes time and effort to learn to use technologies, and there is a range of related activities which are subsumed under innovation. Market failures are pervasive and learning and technical change involve ongoing incremental and path dependent processes, as detailed in a wide range of studies examining the relationships between technological change, growth and economic development (for a review see Dosi *et al.*, 1994; Fagerberg, 1994).

Detailed understanding of the firm, its institutional structure and organisational routines is therefore at the centre of understanding technical change. Firms can be understood in terms of their productive resources, capabilities and competencies, which explain differences in firms competitiveness and the evolution of 'business-enterprise systems' (Penrose, 1995; Chandler *et al.* 1997 and 1998). However, the evolution of firms' capabilities are not necessarily the outcome of 'efficient' institutional arrangements, but rather to do with their strategic choices and orientation (Teece and Pisano, 1998). The capabilities of a firm cannot be readily assembled through markets but are based on the dynamic generation of firm-specific assets and organizational routines in an essentially non-market domain of economic activity (Fujimoto, 1998). The resource allocation process within firms is therefore developmental, organisational and strategic (O'Sullivan, 2000).

This approach has drawn from contributions in economic history, such as those by Chandler, that have found the types of organisation required to successfully exploit technologies to be a major part of explaining countries' different industrial growth performance (Chandler, 1990; Chandler *et al.* 1997). Amsden has particularly highlighted the importance of organisational characteristics in late industrialisers where the main challenge is to do with adopting and adapting technologies from industrialised nations (Amsden, 1997). She argues that this explains the development of diversified conglomerates in South Korea – the key is their transferable organisational capabilities for managing large capital-intensive investments across different sectors (see, also, Amsden and Hikino, 1994). Capabilities for foreign technology acquisition are also very important in this.

In a recent book Best develops a framework for the competitive advantage of firms and industries (Best, 2001). Three main dimensions of Best's 'productivity triad' are identified as production systems, business models and skills formation. In turn, three principles of the organisation of production are developed based on case studies. These are:

- 'interchangeability' – linked to product engineering and standardisation as part of productivity in relatively low technology and labour-intensive mass production systems;
- 'flow' – relating to the synchronisation of production processes along the production line to achieve the scale economies and speed necessary in both materials-intensive and more complex assembly-based industries; and
- 'systems integration' – describing the linking of different disciplines, firms and institutions in new product development crucial for knowledge-intensive

sectors. This includes the development of open systems networks where firms in conjunction with research institutions share technological developments, enabling ongoing processes of innovation and the effective integration of design with manufacturing.

In this framework, instead of a dichotomy being drawn between firms and markets, firms both create and shape markets, and the dynamic of market opportunities in turn shape firms' activities. The development of production systems relates directly to the local business environment, the historical orientation of firms and the inter-linkages with international production networks. For example, it implies that passive and subordinate positioning in transnational corporations' networks will mean remaining in the more commodified activities. The learning-by-doing only happens if one is meaningfully engaged in the 'doing', but TNCs tend to locate research, design and marketing strategies in their home base.

The value-chain approach grapples with similar issues although developed from different elements including Gereffi's work on global commodity chains, and the French *filière* literature on agricultural products. At the simplest level the approach understands the performance of firms in terms of the full range of activities involved in producing a final product, from the production of various inputs and intermediate goods, through to the marketing, branding and retail of the end product (see, for example, Kaplinsky, 2000; Kaplinsky and Morris, 2001). Production capabilities depend on all of the aspects and their effective co-ordination through the value-chain.

The interplay between the nature of activities (marketing, production, design) at different stages of the chain and the governance of the chain as a whole is also emphasised. This interplay determines which party reaps the majority of the returns in the value chain. For example, in buyer-driven chains, such as in clothing, the manufacturers are largely dependent on the brands and large retailers for their markets. Much of the returns are therefore appropriated by these firms rather than the manufacturers. In the auto industry, the assemblers ('original equipment manufacturers') run the value chains, although in order for them to compete with other assemblers they must ensure that the chain operates effectively in terms of product development and upgrading rather than just minimising the costs of production (Barnes, 2000). There is therefore particular emphasis on the ownership and control of technologies. Component assemblers are increasingly being required to have a controlling ownership stake held by the OEM or the preferred original equipment supplier. The value chain approach also incorporates international dimensions. The outcomes of trade are dependent on the relationships and control exerted through chains. For example, it is common for technology licensing arrangements to be on condition that only certain markets can be supplied.

The DTI manufacturing strategy goes one stage further in referring to 'value-matrices'. What these are is not fleshed out in any detail, but presumably it places emphasis on horizontal and ancillary linkages (such as with telecommunications and logistics services) as well as the vertical ones from one level of processing to another. As such, it could incorporate a framework similar to that of Best. After the assessment of manufacturing performance I return to discuss possible ways in which the idea of value-matrices can be taken forward in industrial policy.

3. SOUTH AFRICAN MANUFACTURING PERFORMANCE

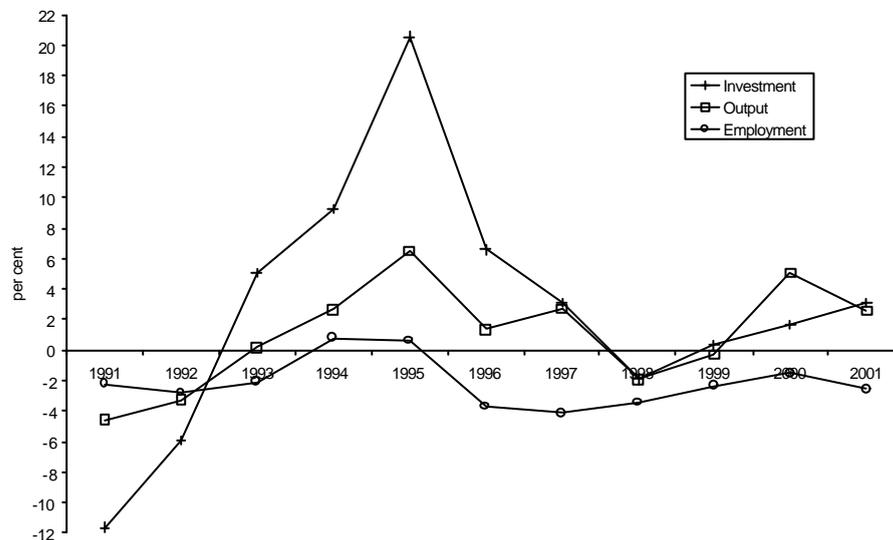
South African manufacturing performance from 1990 to 1991 is assessed, drawing mainly from sector studies recently carried out. These studies include both upstream and downstream sectors, such as basic iron & steel and metal products, and provide insights into differential effects along the value-chain. They include relatively more successful sectors such as plastics and other chemicals. Comparison of the outcomes in the broad groupings of chemicals and metals suggests different influences on industrial performance.

The sector studies are situated within an overview of manufacturing performance overall and a comparison of South African performance with similar developing countries.

3.1 Overview of manufacturing performance

Manufacturing performance improved significantly in the mid-1990s with growth in output of around six per cent and in investment of 20 per cent in 1995. Following the tightening of monetary and fiscal policy in 1996, performance worsened significantly. There are now signs of recovery, with positive investment and output growth in 2000 and 2001, albeit still at relatively low levels. Employment has, however, contracted in every year over the period except 1994 and 1995.

Figure 1: Manufacturing performance (% annual growth)



Source: Calculated from South African Reserve Bank data

The weak performance in 1998 and 1999 follows the Asian crisis which placed pressure on South African industry through increased competition from Asian products. But, South Africa has not performed well even by comparison with other developing countries (Table 1). Of the comparator countries, only Brazil has grown more slowly since 1995. The performance of South African industry, and

manufacturing in particular, appears even poorer, at an average growth of value-added of just 1 per cent. Poor growth is consistent with the low investment rates in South Africa, as reflected in the average ratio of gross fixed capital formation to GDP remaining stubbornly low at an average level of 16.5 per cent. South African export growth has similarly been poorer than the comparator countries. Levels of research and development expenditures have also been poor and worsening (DACST, 2002).

Table 1: Economic performance of selected countries, 1995-2000

	Hungary	Poland	Turkey	S Africa	Brazil	Chile	Korea	Malaysia	Middle income
Income p.c. 2000 \$PPP	11 990	9 000	7 030	9 160	7 300	9 100	17 300	4 540	3 660
Avg gr in GDP	4.0	5.1	3.8	2.5	2.3	4.5	4.8	4.7	3.9
Avg GFCF:GDP	21.2	30.8	25.1	16.5	20.5	29.9	32.0	39.5	25.0
Avg gr in ind VA	7.3	6.4	3.3	1.0	2.2	4.5	5.6	6.6	4.8
Ind VA:GDP, 2000	33.4	44.2	28.8	29.5	30.9	31.6	44.8	47.4	37.9
Avg gr in manuf VA	9.3	..	3.7	1.1	..	2.1	8.0	9.1	6.0
Manuf VA:GDP, 2000	26.6	..	19.8	18.1	19.3	14.5	34.2	33.4	25.5
Avg gr in Exports	17.1	8.2	10.8	5.2	6.1	8.3	16.8	10.2	8.9
Exports:GDP, 2000	58.5	46.3	29.8	26.3	9.3	43.0	51.9	125.5	32.7

Source: Calculated from World Bank Global Development Indicators, via TIPS

Notes: ¹ All calculations are from constant local currency series, expressed as percentages, except for income per capita.

² Income per capita is for 2000.

³ Manufacturing VA:GDP for Brazil is calculated for 1999.

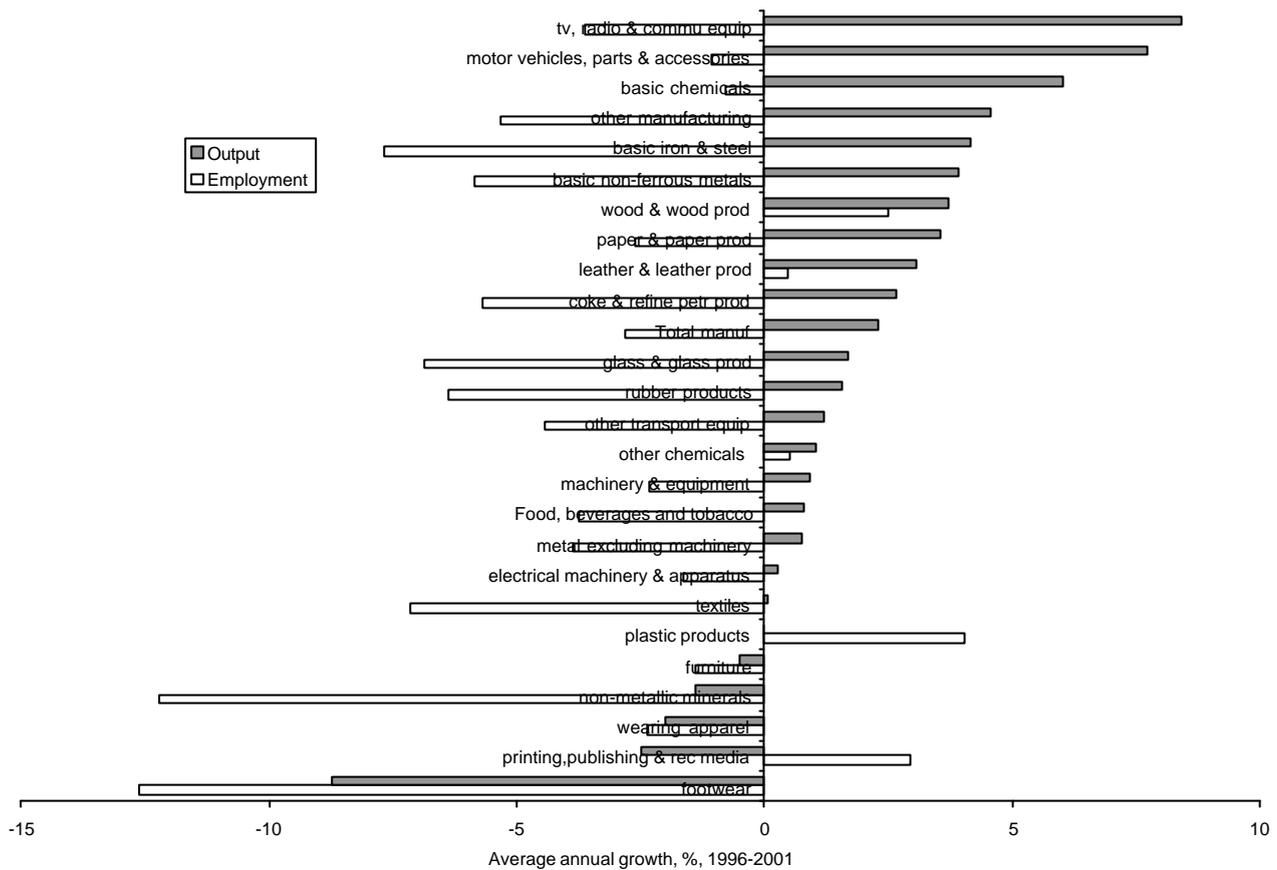
⁴ Exports are measured in gross output terms, while GDP is based on value-added, hence the possibility for Export:GDP ratios in excess of 100%, as for Malaysia.

It is therefore difficult to sustain an argument that South African industry has performed relatively well under the circumstances, such as the Asian financial crisis. Instead, a closer look at what has underpinned manufacturing performance is merited, based on country-specific factors in different sectors of manufacturing.

The aggregates for South African manufacturing hide very different experiences at the sector level. For example, the TV, radio and communications equipment sector has recorded very high rates of growth in output, followed by the motor vehicle sector (Figure 2). Plastics products has grown employment at an average annual rate close to five per cent. At the other end of the spectrum, output in footwear has contracted dramatically, as has employment. Other sectors such as non-metallic minerals, textiles and basic iron & steel have also recorded extremely large contractions in employment. It is therefore very important to distinguish between macroeconomic effects which impact on the aggregate performance and the reorientation of manufacturing at industry level. It is changing patterns of the latter type which are examined to understand the elements identified above as forming part of competitiveness.

These patterns reflect a range of influences including trade liberalisation, a shift away from support for upstream heavy industries, and relatively weak domestic demand placing pressure on consumption goods.

Figure 2: Average annual growth of output and employment (1996-2001)



Source: TIPS South African Standardised Database

3.2 Analysis of sub-sectors of manufacturing

Across the two broad industrial groupings examined here of iron & steel and metal products, and chemicals, there are immediate similarities (Table 2). The upstream components (basic iron & steel and basic chemicals) are relatively capital intensive, have experienced job losses and export a large proportion of their output, consistent with the importance of reaping economies of scale. They also have higher investment rates and higher average wages. But, the chemicals and plastics grouping has performed much better than the others, with strong growth in value-added and stable or increased employment.

Table 2: Sector indicators of performance

	Avge empl gr 96-01	Avge VA gr 96-01	Avge Inv rate ¹ 96-01	K:L (Rth)	VA:Lab	% GOS:V A	% Mark-up (GOS/inputs)	% Exports /Output	Avge ann wage	Avge ann wage gr %	% semi&un-skilled lab
Basic iron & steel	-7.7	-0.2	7.3	1 334	264 611	59.3	18.5	49.8	107 657	3.8	54.4
Metal products	-3.9	2.6	3.1	65	95 097	33.2	11.4	16.0	63 531	5.6	64.0
Basic	-0.8	5.0	10.9	824	280 151	55.8	17.9	45.8	123 955	7.8	54.4

chemicals												
Other	0.5	5.8	3.0	197	193 630	50.7	25.9	17.3	95 455	3.1	52.9	
chemicals												
Plastics	4.0	13.2	4.8	59	116 641	39.8	24.1	7.3	70 362	9.2	68.3	

Source: TIPS South African Standardised Database

Notes: ¹ Investment expenditure in machinery and buildings & construction as a percentage of output

² Average wages, export:output, % unskilled lab, GOS:VA, K:L, mark-up, VA:Lab are all for 2001.

Drawing on sectoral studies, the main features of the recent development of these groupings are reviewed. While the sectoral analyses enable value-chain issues to be explored, it must be remembered that there are a myriad of value-chains in each. For example, basic chemical products are inputs into many different industries of which plastics is only one. Each sector is also quite diverse.

3.1.1 Chemicals and plastics

The chemicals and plastics grouping of industries covers a wide range of products at different levels of processing from basic chemicals through to consumer goods such as soaps and plastic baths (see May, 2002, and Dobрева, 2002, for more detailed analysis). Overall, these industries have performed relatively well (Table 3). The basis for increased value-added has, however, been quite different in basic chemicals as compared with the other chemicals and plastics groupings. While basic chemicals has maintained relatively high investment rates in excess of 40 per cent of value-added in some years, increased output in plastics and other chemicals has relied on increased employment. Coupled with the very low investment rates, the other chemicals sector has not increased in capital-intensity, while the plastics sector actually became progressively less capital-intensive over much of the 1990s.

Table 3: Performance of chemicals and plastics sectors

	<i>Basic chemicals:</i>					<i>Other chemicals:</i>					<i>Plastic products:</i>				
	Value-added	Employment	GDFI	Exports, % outpt	Imports, % cons	Value-added	Employment	GDFI	Exports, % outpt	Imports, % cons	Value-added	Employment	GDFI	Exports, % outpt	Imports, % cons
1996	4594	28855	1521	49	51	6943	65544	659	10	25	2459	46803	189	5	10
1997	4665	27472	2127	46	48	7537	62717	460	11	24	2561	48289	129	6	12
1998	5086	34604	1980	40	46	7682	67352	821	12	25	3028	55045	251	6	13
1999	5373	32048	1228	39	44	7824	65339	1013	12	26	3374	53106	624	7	13
2000	5313	29092	2170	40	44	9031	73625	746	15	26	3755	57932	724	7	11
2001	5852	27737	3367	41	43	9209	67241	841	15	26	4575	57070	1047	8	11

Source: TIPS South African Standardised Database

Note: Value-added and GDFI are in constant 1995 Rand millions.

Basic chemicals are also highly traded and production is very concentrated. Together these reflect significant economies of scale such that the minimum efficient scale exceeds the demand in the domestic market. Imports are of products and grades which are not produced domestically. Liberalisation of protection has increased pressures for further rationalisation, with the average tariff on basic chemicals being reduced to just one per cent. Rather than producing many different product grades as required by the local market, the large chemicals companies have increasingly specialised enabling them to increase production runs while they import the products no longer produced in order to continue maintaining a full supply to their customers.

Improved trade performance is, however, also due to lower levels of imports in plastics and basic chemicals. This suggests that there have been competitive gains from the real exchange rate depreciation over recent years. Exports to other African countries have also been very important in the improved export performance of all the sectors. This has been particularly so for products such as soaps, cosmetics, plastic tubes & pipes and packaging in which exports have been growing strongly. It is notable that moderate tariff protection has also been maintained for much of the plastics sector.

The competitiveness of the upstream activities is based on a combination of access to international technology, research and development, and investment in large-scale production facilities. Sasol (by far the largest company in basic chemicals) stands out in terms of its ongoing R&D programme as well as continued international linkages governing technology (DACST, 2002). It has also made large new investments, with IDC support. Downstream activities such as plastics are dependent largely on imported technology, and international links have been found to be important for firms' performance (Roberts, 2001). Labour productivity levels have also improved across the sectors, alongside higher employment levels in the other chemicals and the plastics sectors. The costs of inputs, largely upstream chemicals products, are also very important for their cost competitiveness but these products are generally priced on import-parity terms.

International comparisons are hampered by problems of classification for some of the countries, especially South Africa, necessitating the grouping together of chemicals.² The comparison reveals that these are very dynamic sectors with high average annual levels of growth and employment, especially in Chile and Malaysia (Table 4). The historical upstream orientation of South Africa is also emphasised, as the chemicals industry is very large compared with Chile and Malaysia, but the plastics industry is not. The relative performance and the low value-added per employee in South Africa indicates really how poor levels of investment have been in South Africa. High investment rates in such dynamic sectors would mean more regular upgrading of machinery and equipment and introduction of new production methods. As Chile and Malaysia demonstrate the overall expansion is consistent with increased employment. While average wages in South Africa are relatively low, especially if one considers exchange rate changes since 1999, the low investment rates and growth of value-added in South Africa imply significantly higher unit labour costs.

Table 4. Comparative performance of chemicals and plastics, 1990-1999

	<i>Chemicals (industrial and other):</i>				<i>Plastic products:</i>			
	S. Africa	Chile	Korea	Malaysia	S. Africa	Chile	Korea	Malaysia
VA, US\$mn, 1999	12 181	2 191	18 310	2 174	547	505	4 230	1 150
Avg ann. VA growth	0.0	10.9	8.1	9.3	-0.3	12.3	5.0	17.9
Avg ann. empl gr.	-0.7	3.7	0.8	5.2	-0.8	6.1	-0.1	8.4
VA/employee (\$th)	23.2	78.1	132.7	62.3	13.4	27.6	42.6	15.5
Avg wage (\$th)	12.7	13.9	17.5	7.9	5.9	8.6	11.9	5.2

Source: UNIDO (sourced from TIPS), at ISIC 3 digit level

Note: Growth in value-added is calculated from current US\$ figures for 1990 to 1999.

² The South African data for the plastics sector differ somewhat from those of *Statistics South Africa*.

The differential performance may also reflect the different composition of the sectors across countries with South Africa being historically focused on products linking into mining and agriculture such as explosives, fertilisers and pesticides. This only serves to highlight the potential in more consumer oriented areas such as paints, soaps, cosmetics and various plastics products. Industry has reported major growth in these areas already in the past year.

However, the historical upstream orientation, supported by government policy and lending by the IDC, is still evident. There are also indications of weak linkages along the value-chain. For example, one of the most successful plastics sub-groupings relies on imported material, suggesting that upstream production capabilities are not translating into downstream competitive advantages. Aside from Sasol, many companies have apparently been reducing research expenditures and in the pharmaceuticals sub-sector it has been reported that firms have been closing production activities and converting premises into warehousing and distribution operations for imported product.

3.1.2 Iron & steel and metal products

South Africa is well endowed with the raw material inputs to iron & steel production, principally iron ore and energy. Iron & steel are themselves the main inputs in the manufacture of metal products, accounting for more than a third of the inputs of structural and fabricated metal products. These are used in a wide variety of activities including construction and automotive manufacture. The nature of the upstream and downstream parts of the value chain are, however, quite different. The basic iron & steel industry is capital intensive with large economies of scale. Metal products by comparison are relatively labour intensive (see Table 2).

Both sectors have shed labour over the decade and output growth has been negative in iron and steel and low in metal products. As outlined in Taka (2002) and Phelane (2002), the main influences on their performance are not the same.

The iron & steel industry is dominated by Iscor which produced 71% of South African consumption of steel in 2001 (excluding stainless steel). Since being privatised in 1989 it has undergone a process of transition spurred by reduction of the tariff from 30 per cent in 1994 to 5 per cent in 1996. This involved rationalisation of production, a huge reduction in the numbers of grades and product types being produced and, in the last year, the purchase of almost 35 per cent of Iscor's equity by the world's second largest steel company, LNM, under a strategic business assistance agreement that provides for the option to acquire a further 10 per cent. Delivery time and quality have also both improved dramatically. For example, Iscor itself admitted to fewer than 40 per cent of deliveries being met on time in the mid 1990s. This has now improved to close to 80 per cent. The rationalisation programme also involved large reductions in employment.

Table 5: Performance of Basic iron & steel and metal products sectors

Basic iron & steel:					Metal products:				
Value-added	Employment	GDFI	Exports % outpt	Imports % cons	Value-added	Employment	GDFI	Exports % outpt	Imports % cons

1996	7949	59105	5116	50.7	14	6972	125327	1082	13.8	13
1997	8651	55283	7663	51.4	11	7087	122464	673	12.6	12
1998	7889	48301	4882	52.3	12	6826	115732	764	11.3	13
1999	7376	42131	3878	51.0	11	6453	105538	658	14.0	14
2000	8632	36950	2080	46.6	8	7085	102914	859	16.4	10
2001	7851	39591	2188	37.6	8	7946	102790	767	12.9	10

Source: TIPS South African Standardised Database

Note: Value-added and GDFI are in constant 1995 Rand millions.

The metal products sector consists of differentiated products, according to the various markets into which firms sell. Despite positive growth in output, investment has been very poor. It is heavily dependent on capital expenditure on physical infrastructure in the domestic economy, with products such as tubes and pipes, structural metal products, tanks & containers and screws & nuts accounting for a large proportion of output.

Both sectors are internationally competitive in so far as they have maintained trade surpluses. The South African iron & steel industry is in fact highly trade dependent with an export-propensity of 50 per cent in 2001. This is unusually high when compared with other countries and is a legacy of large investments and the need to maintain capacity utilisation given the large proportion of fixed (and sunk) costs. But, while exports may cover marginal production costs, financial performance depends on the local market where import-parity pricing commonly means prices around 30 per cent higher than on products for export.

In metal products, South Africa has a positive net export ratio in several major products groupings led by steel structures, tanks, tubes and pipes and sanitary-ware. These are mainly exported to other African countries, to which there has been growth in recent years. However, there are trade deficits in more beneficiated and higher value products such as pipe-fittings, screws and bolts, springs, and household and hardware articles. With tariffs being very low at just 6 per cent, transport costs do not offer the same degree of protection for these higher value-to-mass products. While exports are mainly to African countries, imports are sourced from Asia, suggesting a 'ladder' of comparative advantage.

International comparisons reveal that the iron & steel and metals sectors in South Africa are both relatively large, and poorly performing (Table 6). Given South Africa's level of development, metal products would be expected to be growing. There is a range of possible explanations. The weak growth in demand for metal products given the very low levels of infrastructure investment in the past decade in turn meant low levels of investment by metal products firms. This itself would partly underpin low productivity levels. For example, in 1990 Malaysia had much lower levels of value-added per employee than South Africa, but growth has been accompanied by improved productivity. The Chilean example also demonstrates that higher wages can accompany higher growth. Chilean wages were below South Africa's in 1990, but higher growth rates and investment have brought higher wages, increased employment and higher productivity over the decade. Expansion enables new investment which means plant and equipment are upgraded more rapidly than under the stagnant conditions that have existed in South Africa. Weak investment means that competitive improvements depend on the downward adjustment of wage

rates, which is a slow and painful process, albeit aided by the exchange rate depreciation. In US\$ terms, South African metal wages declined significantly over the 1990s and have fallen further since. As already discussed, access to low cost inputs underpins the competitiveness of iron & steel in South Africa, but these competitive advantages are not necessarily passed on to metal products firms.

Table 6: Comparative performance of iron & steel and metals, 1990-1999

	<i>Iron & steel:</i>				<i>Metal products:</i>			
	S. Africa	Chile	Korea	Malaysia	S. Africa	Chile	Korea	Malaysia
VA, US\$m, 1999	2 207	351	8 978	592	1 391	593	7 257	838
Avg ann. VA growth	-0.7	2.4	4.2	8.4	-2.2	5.5	3.9	11.4
Avg ann. empl gr.	-2.8	-5.0	-1.5	7.7	-1.2	0.7	-1.5	6.8
VA/employee (\$th)	35.5	70.3	116.5	22.1	11.3	26.1	47.3	14.1
Avg wage (\$th)	13.0	17.5	17.5	5.1	7.2	8.5	12.7	4.8

Source: UNIDO (sourced from TIPS)

Note: Growth in value-added is calculated from current US\$ figures for 1990 to 1999.

The value-chain describes the interdependence between firms in terms of being sources of inputs and markets for output. But, interdependence has not brought co-operation or co-ordination in this industrial grouping. Major investment decisions in iron & steel have been made as part of industrial policy oriented to resource exploitation. The high levels of investment in 1996, 1997 and 1998 were due to very large investments in Saldanha Steel and Columbus (stainless steel). Both were based on primary minerals beneficiation and South Africa's very low cost energy, almost wholly for export. These projects were heavily supported by the IDC and also accounted for much of the increase in manufacturing investment in the mid-1990s. They have turned out to be poorly judged, due to a slump in the global steel market and difficulties in managing the advanced technologies in these plants.

The local market is subject to import-parity pricing. This means that despite the large trade surplus, market power on the part of upstream producers enables pricing up to the equivalent import prices (after transport and related costs have been taken into account). Recently, major producer such as Iscor have moved to giving export-parity price rebates where downstream producers are exporting their product. This means that in effect local consumers are being taxed to support the exports of both upstream and downstream producers. This is discussed in more detail below.

4. IMPLICATIONS FOR AN 'INTEGRATED MANUFACTURING STRATEGY'?

The DTI's Integrated Manufacturing Strategy (IMS) proceeds from the government's Microeconomic Reform Strategy which sets out a vision for 'a restructured and adaptive economy characterised by growth, employment equity, built on the full potential of all persons, communities and geographic areas.' The Strategy specifies that this requires:

- A geographic spread of social and productive investment
- An integrated manufacturing economy capable of high degrees of value added

- An extensive ICT and logistics system capable of speed and flexibility
- A high degree of knowledge and technology capacity
- Greater diversity of enterprise type and size
- Skilled, informed and adaptable citizens
- An efficient, strong and responsive state structure

The IMS cites a dictionary definition of strategy as ‘a long term plan for future success or development’. At present, however, the IMS is more of a vision articulating an approach rather than specific steps and actions in concrete terms. There is also no identification of the roles of different institutions which fall within the DTI sphere. The ongoing development of the IMS which is underway presumably involves putting together such a co-ordinated framework.

The IMS identifies five focus sectors:

- Agriculture and food production
- Tourism
- Information and Communication Technologies
- Cultural industries
- Export sectors (within which different manufacturing activities are identified).

In other words, manufacturing sectors are not identified in their own right, but only in so far as they have export potential. However, under the DTI’s development of customised programmes eight sectors are identified including clothing & textiles, metals and minerals, automotive & transport, and chemical and biotechnology.

It therefore appears as if exporting is prioritised, but unless a huge trade surplus is being anticipated then competitiveness needs to be understood in terms of changing patterns of comparative advantage. As is evident from the above analysis of the broad metals and chemicals groupings, the major exports remain in upstream activities, despite improved trade performance of downstream activities. The production of basic chemicals and iron & steel are subject to sizeable economies of scale and large-scale investment in production capacity has been supported by previous state intervention. In fact, the increased manufacturing investment in 1996 and 1997 was due to just these two sectors. Investment in other sectors contracted sharply after 1995.

Rather than exports in themselves being the focus, it is the relationship with changing production capabilities within value-chains which is important. Rapid growth in developing country exports, even of hi-tech products, has not been accompanied by higher economic growth in many countries precisely because the production activities are often limited to assembly operations, with multinationals being attracted by incentives and low production costs (UNCTAD, 2002). It is also not clear that sectors in South Africa with improved export performance have necessarily been the best performers in terms of employment and output growth. The key issues of knowledge intensity, beneficiation and integrated value-matrices identified in the IMS therefore cut across the role of exports and the understanding of altered competitiveness. These are now discussed in more detail.



4.1 Knowledge intensity, and information and communication technologies (ICT)

Knowledge-intensive services are identified as a separate area for DTI's attention under customised programmes. Yet, it is not clear that there is a common understanding of what is meant by knowledge-intensity. Two dimensions can be identified. The first is the application of knowledge to production by firms. In this sense it is therefore about the decisions of firms regarding their technological capabilities, work organisation and skills development of the workforce. The second is to do with the availability and usage of methods through which information is managed and transferred. This includes the application of ICT.

Production technologies are embodied in machinery and therefore require investment. The low rates of investment in manufacturing are a cause for concern in this regard. In sectors such as textiles, investment has been undertaken to modernise machinery and equipment partly as a defensive measure forced by increased openness rather than as a constructive strategy to build competitiveness (Roberts and Thoburn, 2002). Even in the better performing plastics sector, investment rates have only recently returned to the levels at the beginning of the 1990s. The productivity differentials between South Africa and the comparator countries reinforce this concern.

The declining research and development expenditures of firms identified by DACST in their 1997 and 2001 surveys of business has been linked by DACST with the importance of public institutions in supporting research activities. This role for the public sector is also highlighted by Best (2001) as one of the important features of developing production systems and more dynamic business models. In this regard, positive externalities related to research and technology and failures in the 'creative' functions of markets indicate the need for a clear orientation to guide the activities of supporting institutions. Such an orientation also influences firms' decision-making given the long-term nature of investments in research and development programmes. In the past, apartheid industrial objectives provided the orientation and, as Sasol bears witness, created significant technological capabilities in the targeted areas.

At the same time the observed 'hollowing-out' of research activities by South African firms has been linked with international acquisitions and the transfer of research capabilities to the new parent company's home base. This need not be the case. International technology linkages are very important in firms developing their own capabilities (see, for example, Roberts, 2001). What is clearly at issue is the way in which South African production capabilities draw on international relationships, and the strategies of firms which govern this, as highlighted by the governance dimension of the value-chain literature.

In terms of access to telecommunications, it is now evident that given the high levels of inequality in South Africa affordability is a key constraint. Increased competition is unlikely to change this, at least in fixed-line services, as rate 'rebalancing' by Telkom has led to sharply increased costs of local calls and corresponding disconnections (Makhaya and Roberts, 2002). Despite roll-out targets it appears as if fixed line provision has actually fallen in recent years while according to the World Bank's Global Development Indicators, South Africa has the most expensive local

calls of all of the countries except one identified in Table 1 above. This is not the result of a lack of competition – entrants to the market are very unlikely to compete vigorously in the market for local calls. Internationally, local call cost reductions have instead relied on effective government action in the form of regulation.

4.2 Beneficiation

The industry groupings analysed above reinforce the bias in South African manufacturing towards upstream, resource-based industry. This reflects the historical minerals and energy orientation of the economy (Fine and Rustomjee, 1996; Altman, 2001). Despite evidence of growth in the downstream sectors in recent years, the ongoing influence of the inherited industrial structure is reflected in the investment patterns already noted.

The impact of the disproportionate power of the upstream firms is also clearly highlighted in the import-parity pricing practices in the supply of steel. While liberalisation has translated into rationalisation of production operations and improved quality and delivery times by upstream firms, in iron and steel an 80% on-time delivery record still suggests major room for improvement. It is also significant that the most successful downstream plastics sub-sector in terms of exports (predominantly to industrialised country markets) utilises imported input not manufactured locally. Issues of linkages and the governance of vertical supply relations are discussed in more detail as they relate to value chains.

4.3 Value matrices

At one level the value-chain approach is a descriptive tool for understanding the different value-added generated by all the different activities in the production and retail of a final product. In this way, it has been built from numerous case studies but does not constitute a theory or an analytical framework. Instead the interpretation of the information on a particular case relies on theories which the researcher deems appropriate including theories of linkages, transactions costs, market power and vertical integration. Kaplinsky (2000) argues that for the approach to constitute an analytical framework, the key pillar is governance over the chain. The governance relations determine the division of rents from the operation of the chain as a whole as well as the dynamic evolution of the chain through new product development.

The use of the term ‘value-matrices’ suggests a broadening of the dimensions relating to production activities. While this broadening could be extended to meaningless lengths such that everything in the economy is related to everything else, at a descriptive level, it suggests incorporating information and communication services, transport, logistics, and the institutional framework for research & development and skills. Analytically, I argue that two related aspects are required for it to be meaningful. First, in line with Best’s ‘new competitiveness’ production decisions and firm strategies must be incorporated. This relates to the previously developed capabilities of the firm, its resources (physical, organisational and political) and its strategic orientation. This enables interpretation of issues such as the impact of changing ownership of the South African auto assemblers (to be controlled by the multinational parent once more) or the influence that a particular multinational owner

is likely to have on South African steel production. Second, value-matrices must take account of differences across economies in terms of economic structure and political economy. The effective pursuit of the wide ranging economic transformation objectives of DTI would appear to require these two analytical components.

What this implies for taking an integrated manufacturing strategy forward is a different matter. One approach is to provide a supporting environment in response to the demands of firms. But, this does not constitute a strategy or plan for change as defined in the IMS. The analysis here suggests:

- Co-ordination of the priorities and activities of institutions such as the IDC, CSIR, competition authorities, and Sector Education and Training Authorities. Detailed information and understanding is built by these institutions through their immediate contact with firms which can flow into strategy formulation, while clear goals enable effective integration of their actions. In this way, 'systems integration' for knowledge-intensive production can be practically built at the industry level.
- The ability to evolve and adapt policy tools based on independent analysis. Support measures create constituencies which lobby to retain the measures. Moreover, these constituencies will inevitably tend to be dominated by the more powerful industry interests (as also happened to an extent with the cluster process where in plastics, for example, smaller downstream producers' interests were less well represented).

By way of illustration, the evolution of policy in relation to iron and steel provides an interesting case. Developments in the last ten years can be roughly placed into three stages. First, liberalisation forced productivity improvements onto the main steel mills (primarily Iscor) against their vehement opposition. Now, they acknowledge that it ultimately worked in their own longer-term interests (see Iscor, 2001). Second, unbundling of the mining and steel operations of Iscor was pursued along with mechanisms to improve technological capabilities (which will be necessary for, among other things, the next generation of motor vehicles). Sale of a significant stake to a leading TNC with an accompanying strategic assistance agreement was identified to achieve this. The measure of the success of government's objectives is that Iscor is now one of the world's lowest cost producers, with prospects of greatly increased profits, especially as its cost-base is predominantly in locally priced inputs (electricity and iron ore). The next step could be to realise these achievements in terms of the downstream steel-using sectors. One of the important disciplining effects of competition is as a stimulus to improved productivity and innovation and to ensure that, over time, these are passed on to purchasers through inter-firm rivalry. Even although a growing metal products industry would bring significant dynamic gains to Iscor in terms of increased local demand for steel, Iscor's short-term interests (and those of its shareholders) is to exert its price setting power to maximise profits, as is clear from the following statement in Iscor's revised listing particulars of 29 October 2001:

‘Iscor’s steel pricing policy in the domestic market is based on import-parity principles as its main competition in most of its product ranges is represented by imports. The exceptions to this principle are:

- in the case of products where local competition exists and where over capacity results in prices that are lower than import parity, as it is in the case with certain lower quality long products...’

(as cited in the Competition Tribunal report on the large merger of Iscor and Saldanha Steel, 4 April, 2002, p. 11).

If a strong domestic steel industry is a public policy objective, then the effective taxing of domestic steel purchasers through import-parity pricing to achieve this is not necessarily the best mechanism and certainly impacts negatively on the evolution of competitive advantages in manufacturing industry.

In summary, the leadership role that DTI sets out in the IMS is desperately needed. The analysis here suggests that realising the integration and co-ordination of the activities of different governmental bodies could bring significant gains in terms of the growth of downstream manufacturing industry. The experiences of other industrialising countries highlight the potential for South Africa, given the already developed industrial base.

REFERENCES

- Amsden, A. (1997) 'South Korea: Enterprising groups and entrepreneurial government', in Chandler, A. *et al.* (eds.)
- Amsden, A. and Hikino, T. (1994) 'Project Execution Capability, Organizational Know-how and Conglomerate Growth in Late Industrialization', *Industrial and Corporate Change*, 3(1), 111-147.
- Arndt, H. (1988) "'Market failure" and underdevelopment' *World Development*, 16(2), 219-230.
- Barnes, J. (2000) 'Changing lanes: the political economy of the South African automotive value chain', *Development Southern Africa*, 17(3), 401-415.
- Best, M. (2001) *The New Competitive Advantage*. Oxford: Oxford University Press.
- Black, A. (2001) 'Globalization and Restructuring in the South African Automotive Industry', *Journal of International Development*, 13(6), 779-796.
- Boltho, A. (1996) 'The Assessment: International Competitiveness', *Oxford Review of Economic Policy*, 12(3), 1-16.
- Chandler, A. Jr. (1990) *Scale and Scope: The Dynamics of Industrial Capitalism*. Cambridge, Mass.: Harvard University Press.
- Chandler, A. Jr., F. Amatori, T. Hikino (eds.) (1997) *Big business and the wealth of nations*. Cambridge: Cambridge University Press
- Chandler, A. Jr., P. Hagström and Örjan Sölvell (eds.) (1998) *The Dynamic Firm*. Oxford: Oxford University Press
- Chesbrough, H. (1999) 'The Organizational Impact of Technological Change', *Industrial and Corporate Change*, 8(3), 447-485.
- Crompton, R. (1995) *An Industrial Strategy for the Commodity Plastics Sector*. Cape Town: UCT Press.
- Department of Arts, Culture, Science and Technology (2002) 'Presentation at Public Hearings on Industrial Policy', 25 April 2002.
- Dobreva, R. (2002) 'A preliminary analysis of the performance of the plastics sector', research paper commissioned by TIPS.
- Dosi, G. (1997) 'Organizational competencies, firm size, and the wealth of nations: Some comments from a comparative perspective', in Chandler, A. *et al.* (eds.)

Dosi, G., C. Freeman and S. Fabiani (1994) 'The Process of Economic Development: Introducing Some Stylized Facts and Theories on Technologies, Firms and Institutions', *Industrial and Corporate Change*, 3(1), 1-45.

Dosi, G., D.J. Teece and J. Chytry (eds.) (1998) *Technology, Organization, and Competitiveness – Perspectives on Industrial and Corporate Change*, Oxford: Oxford University Press

Fagerberg, J. (1988) 'International competitiveness', *The Economic Journal*, 98, 355-374

Fagerberg, J. (1994) 'Technology and growth rates', *Journal of Economic Literature*, XXXII, 1147-1175.

Fine, B. and Z. Rustomjee (1996) *The Political Economy of South Africa- from Minerals-Energy Complex to Industrialisation* London: Hurst

Fujimoto, T. (1998) 'Reinterpreting the Resource-Capability View of the Firm: A Case of the Development-Production Systems of the Japanese Auto-Makers', in Chandler *et al.* (eds.)

Gibbon, P. (2002) 'South Africa and the Global Commodity Chain for Clothing: Export Performance and Constraints', Centre for Development Research Working Paper 02.7.

Greenaway, D., W. Morgan and P. Wright (1997) 'Trade Liberalization and Growth in Developing Countries: Some New Evidence', *World Development*, 25(11), 1885-1892

Iscor (2001) 'Unlocking shareholder value' 26 September 2001. Downloaded from www.iscor.co.za.

Kaplinsky, R. (2000) 'Globalisation and Unequalisation: What can be learned from value chain analysis?' *Journal of Development Studies*, 37(2): 117-146.

Kaplinsky, R. and M. Morris (2001) 'A Handbook for Value-chain research'

Krugman, P. (1994) *Peddling Prosperity*.

Lall, S. and M. Teubal (1998) "'Market-Stimulating" Technology Policies in Developing Countries: A Framework with Examples from East Asia', *World Development*, 26(8), 1369-1385.

Machaka, J. (2002) 'A preliminary analysis of the performance of the textile sector', research paper commissioned by TIPS.

Makhaya, G. and S. Roberts (2002) 'Telecommunications in developing countries: reflections from the South African experience', *Telecommunications Policy*, forthcoming.

Malikane, C., Roberts, S. and Sikhweni, N., (2000) *Competition and Market Structure in the Plastics Sector: A Preliminary Analysis*. Trade and Industrial Policy Secretariat Working Paper No.1-2000, Johannesburg, South Africa.

May, C. (2002) 'A preliminary analysis of the performance of the basic chemicals and other chemicals sectors', research paper commissioned by TIPS.

Moodley, S. and M. Velia (2002) 'An Analysis of the Recent Exporting Trajectory of the South African Clothing Value Chain: Upgrading or Downgrading?', Presented at TIPS conference of Globalisation, Production and Poverty in South Africa, Johannesburg, 24 June 2002.

O'Sullivan, M. (2000) 'The innovative enterprise and corporate governance', *Cambridge Journal of Economics*, 24, 393-416.

Penrose, E. (1995) *The Theory of the Growth of the Firm*, 3rd edition. Oxford and New York: Oxford University Press.

Phelane, P. (2002) 'A preliminary analysis of the performance of the metal products sector', research paper commissioned by TIPS.

Roberts, S. (2000) 'Understanding the effects of trade policy reform: the case of South Africa', *South African Journal of Economics*, 68 (4), 607-638.

Roberts, S. (2001) 'Globalisation, industrial development and the plastics industry in South Africa', *Journal of International Development*, 13, 797-810.

Roberts, S. and J. Thoburn (2002) 'Adjusting to trade liberalisation: the case of firms in the South African textile sector', *Journal of African Economies*, forthcoming.

Rodrik, D. (1999). *The New Global Economy and Developing Countries: Making Openness Work*. Washington: Overseas Development Council.

Sawyer, M. (1991) 'The economics of shortage: a post-Kaleckian approach' in Michie, J. (ed.) *The Economics of Restructuring and Intervention*, Aldershot: Edward Elgar

Taka, M. (2002) 'A preliminary analysis of the performance of the iron and steel sector', research paper commissioned by TIPS.

Teece, D. J. and G. Pisano (1998) 'The Dynamic Capabilities of Firms: An Introduction', in Dosi, G., D.J. Teece and J. Chytry (eds.)

UNCTAD (2002) *Trade and Development Report 2002*