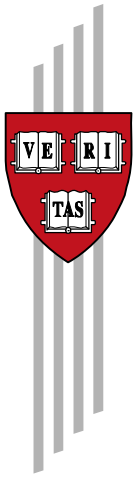
South African Trade Policy Matters: Trade Performance & Trade Policy

South African Trade Policy Matters: Trade Performance & Trade Policy

Lawrence Edwards and Robert Lawrence

CID Working Paper No. 135
October 2006



Working Papers

Center for International Development
at Harvard University

South African Trade Policy Matters: Trade Performance & Trade Policy

Lawrence Edwards[1] & Robert Lawrence[2]

DRAFT: October 2006

Abstract.: South African trade policy has exerted a major influence on the composition and aggregate growth of trade. In the Apartheid period, trade protection seriously impeded both exports and imports, and the economy depended on favorable global commodity price trends to avoid running into an external constraint. South Africa developed a comparative advantage in capital-intensive primary and manufactured commodities partly because of its natural resource endowments but also because the pattern of protection was particularly detrimental to exports of non-commodity manufactured goods. High and opaque tariffs seriously impeded export growth. When global commodity markets were weak, in combination with declining gold exports, this seriously constrained aggregate growth and dulled the response of exports to the weaker rand in the late 1980s. On the other hand, surcharges were effective in reducing imports. By contrast, trade liberalization in the 1990s not only increased imports but, by reducing both input costs and the relative profitability of domestic sales, also boosted exports. The growth in non-commodity manufactured sectoral exports as a result of liberalization was actually faster than sectoral imports. This evidence suggests that additional trade liberalization could well be part of the strategy to enhance export diversification. It points to the importance of policies that afford South African firms with access to inputs at world prices as well as a competitive real exchange rate.

Keywords: South Africa, trade policy, trade performance

JEL: F10, F13, F14

This paper is part of the South Africa Growth Initiative. The Center for International Development has convened an international panel of economists and international experts from Harvard University, the Massachusetts Institute of Technology, the University of Michigan, and other institutions to work with South African economists to study that country's constraints to and opportunities for accelerated growth. This project is an initiative of the National Treasury of the Republic of South Africa within the government's Accelerated and Shared Growth Initiative (ASGI-SA), which seeks to consolidate the gains of post-transition economic stability and accelerate growth in order to create employment and improve the livelihoods of all South Africans.

1) University of Cape Town
2) Kennedy School of Government and Center for International Development, Harvard University

The authors thank Zhou Liu, Iza Lejarraga, Alfie Ulloa, Bongani Johnny and Yash Ramkolowan for research assistance.

Index

South African Trade Policy Matters: Trade Performance & Trade Policy

Introduction

The Accelerated and Shared Growth Initiative of South Africa (ASGI-SA) seeks to accelerate South African economic growth and make it more equitable. The approach is to identify key constraints and then to adopt a number of policies to eliminate them. The six constraints that have been identified are (a) currency volatility; (b) infrastructure; (c) skilled labor and settlement patterns; (d) barriers to entry and the regulatory environment; and (e) deficiencies in state organization. These constraints are to be tackled though several major policies initiatives. They include macroeconomic policies; infrastructure projects; sector investment and promotion strategies; education and skills interventions, second economy interventions, and governance and institutional issues.

An external constraint? It is striking that trade performance per se is not mentioned as a major constraint on growth, although it is implicit in the concern voiced about the volatility of the exchange rate and the sector investment and promotion strategies devoted to export diversification[1] It is also striking that trade policy is not given a key role as a policy instrument, although there are policies to improve the process through which trade and industrial policies are coordinated.

Yet an overview of current and past trends suggests that an external constraint may well inhibit economic growth. Over the past decade, the South African economy has managed growth of three percent and experienced a small real depreciation of the rand. Yet despite the robust performance of commodities prices recently, over the same period

[1] The ASGI-SA document indicates that the purpose of these strategies is to "help diversify an economy dependent on commodity exports." The idea is to be "modest in the number of industry focus areas" in order to be bold in the development and implementation of strategies". (There are three priority sectors BPO, Tourism, Bio-fuels) There is recognition of the need for linking trade and industry policy in the document but the emphasis is on process rather than prescriptions of particular policies: (strengthened intelligence and negotiation machinery, stronger consultative frameworks). In part as a complement to ASGI-SA there is also an industrial policy strategy developed by the DTI which in part overlaps and in part extends these approaches

the balance on goods and services has shifted from a surplus of 0.7 percent of GDP in 1995 to a deficit of 1.5 percent in 2005.

Table 1: An external constraint? (average annual growth)

	Export volume	Import volume	GDP	Terms of Trade	Real Exchange Rate
1960-1970	4.5	7.8	5.7	-0.7	
1971-1980	0.9	1.9	3.4	4.9	1.4
1981-1990	1.4	0.3	1.5	-1.7	-1.2
1991-2000	5.3	6	1.9	-0.9	-1.5
2001-2004	1.1	6.6	3.2	2	3.4

Moreover, South Africa's history could suggest that concern is in order. As reported in Table 1, which provides decade averages, the last time South Africa managed about six percent real economic growth – the 1960s – the economy basically ran out of export steam as import volumes, (averaging 7.8 percent annual growth) far outpaced exports (averaging 4.5 percent.). In combination with declining terms of trade, the current account moved steadily into deficit over that decade. Though South Africa experienced commodity booms in the 1970s in which the terms of trade improved by a total annual average rate of 4.9 percent and the Rand appreciated in real terms, the GDP growth performance was a tepid 3.4 percent and South Africa's share in global commodity exports actually declined. The economic stagnation of the 1980s -- with annual growth at just 1.5 percent -- was in no small measure due to an externally imposed constraint that also made clear the degree to which the economy depended on trade. [2]

Perhaps, though, such fears are misguided. The current account deficit could reflect a temporary spending boom that will reverse on its own. In addition, the past may be a poor guide to the future. Political factors played a major role in South Africa's previous economic difficulties and these are no longer present. In particular, the Soweto uprisings contributed significantly to problems in the 70s, and sanctions in the 1980s thwarted responses to the weaker rand. Some now believe that with the rapid growth in

[2] For a detailed review of the external constraint on South Africa's growth see Bell, Farrel and Cassim (1999).

China and India, the world is again entering a long commodities "super cycle" in which robust commodities prices should ensure adequate export revenues. In the 1970s when there was such a super-cycle, aggregate export volumes were depressed by declining gold production, but gold now accounts for just 6 percent of exports. Thus if South African non-gold export volumes could match the 4.8 annual volume growth over the 1970s and the terms of trade improve by the 4.9 percent during that decade – concerns about an external constraint could well be misplaced.

But even a commodity super-cycle is no panacea. While it may remove the external constraint, and boost the real exchange rate, by strengthening the Rand, a commodity super cycle will make it even more difficult to achieve the export diversification sought in ASGI-SA program. Commodity prices are very volatile, and excessive dependence on such products subjects the economy to considerable instability. Moreover, since primary and manufactured natural-resource based exports are highly capital – intensive, dependence on commodities means employment growth will have to come from other sectors. On the other hand, the cycle could well be considerably weaker than it was in the 70s. In this case the economy could sustain high growth for a period by borrowing from abroad, but eventually other adjustments would be required. A weaker real exchange rate would reduce imports and stimulate exports and it could be part of the response. But a lower rand is inflationary, and if the reserve bank sticks to its inflation targets, and if real wages are insufficiently flexible, the adjustment could be painful.

These dilemmas lead naturally to a search for other policy instruments that could be used to stimulate production and growth. In this context, industrial and trade policies merit consideration. Trade policy is also of interest because by studying responses to changes in trade policy, we can learn how South African firms will respond to incentives generally and lower input costs in particular.

For this reason, in this paper we try to understand how South African trade performance has responded to trade policy in the past. We do this by a detailed examination of how trade policies have affected both the volume and composition of trade. If there is one main conclusion we will offer here, it is that trade policy matters.

We will present evidence that to a significant degree, South Africa's weak trade performance has been a self-inflicted wound. In particular, the import substitution policies of the 1970s and 1980s not only effectively blocked imports, but also discouraged exports and the anti-export bias was particularly large for non-commodity exports. We will also show that the more recent liberalization in the 1990s played a very important role in stimulating exports in general and non-commodity exports in particular and that, at a sectoral level, the impact of lower tariffs in making exporting more attractive was stronger the impact in stimulating imports. The impact of liberalization on import growth is obvious, but its role in export growth is less appreciated and more controversial. To be sure trade theorists have long recognized Lerner's symmetry theorem (Lerner 1936) that a tax on imports is a tax on exports but this key proposition is often forgotten in discussions of trade policy. Our analysis therefore leads us to place particular emphasis on policies that can assist exporters by reducing their costs, not only through further tariff reductions but also through other policies that focus in key input prices.

We should make clear that by saying that trade policy matters, we do not mean to imply that it alone matters or that in the future, South Africa should avoid other policies and rely on trade policy (liberalization) *alone* in its efforts to achieve faster growth or increased employment. But our evidence does suggest that additional trade liberalization could contribute to providing South Africa with a more diversified and sustainable export sector.

The views we will present here are not uncontroversial. Others have reached quite different conclusions, which may explain why trade policy has not been given a central role in the ASGI-SA programs. One view discounts the impact of protection on exports. According to Bell, Farrell and Cassim (1999) for example "The growth of South Africa's exports has not been limited primarily by the lack of an 'export culture' or the 'anti-export bias created by protection or by an inherently uncompetitive manufacturing

sector." [3] While we agree with these authors that South African manufacturers are not inherently uncompetitive and that the exchange rate (and its interactions with commodity prices) has been an important part of the story, we disagree that the anti-export bias due to protection deserves no role in the explanation. In fact, we will present evidence it has been very important in stimulating export growth.

Another view is that protection contributes to a more diversified industrial base. But diversification achieved in this manner is inefficient and may lead to firms that are permanently dependent on government assistance and protection and can only operate in the local market. By contrast, firms that become globally competitive enjoy the unlimited potential of the world market. Further, we also present evidence that liberalization has helped diversify exports and through this the industrial base.

Outline: Section I of the paper reviews South African trade performance and highlights differences before and after the mid 1980s. In particular it notes the sluggishness in both imports and non-commodity exports prior to 1985 and the rapid growth thereafter. A constant-market shares analysis for the two periods is also undertaken and it shows that South African competitiveness declined in the first period. In the second period, judged by its global market shares in the goods it exports, South African has been competitive. However, its dependence on commodities has led to its recent declining share of world trade.

Section II considers import performance. Econometric estimation is used to distinguish the various sources of import growth. In particular, we find that trade policy was especially important in suppressing import demand in the 80s and causing it to accelerate in the 90s. While we find an import elasticity of slightly less than unity for Gross Domestic Expenditures in general, growth in the stock of fixed capital has up to twice that intensity. This suggests that import growth could be particularly rapid under ASGI-SA as investment rises to move the economy to a more rapid growth path.

[3] And while they argue that South Africa's trade regime has been biased against non-commodity exports, Jenkins, Bleaney and Holden (1996) conclude that the impacts of the trade liberalization programs in the 1990s were small

Section III considers export performance. It presents visual evidence that the relationship between exports and the real exchange rate and export profitability have not been constant over time and indeed linking these causally for the period as a whole in a single equation is problematic. We also estimate export functions for aggregate non-gold merchandise exports, manufacturing exports as well as exports of non-commodity and commodity manufacturing. We find that exports respond to real depreciations, but nominal exchange rate shocks have a small effect on exports in the long-run, as domestic price increases erode the improved profitability of export supply. We also find that lower tariffs reduce domestic producer prices and through this improve export performance.

Section IV investigates the relationship between tariff liberalization and export performance using disaggregated industry data. There is clearly a very strong relationship between non-commodity export volumes and measures of trade policy such as tariff revenue collections and (implicit) export taxes. The estimated export taxes measures indicate that trade policy has been particularly biased against non-commodity exports. In 1989, for example, the implicit taxes on non-commodity exports were 52 percent, compared with 26 percent on manufactured commodities and 18 percent for goods overall. Drawing on a panel of 44 manufacturing sectors for the period since 1990, we find that non-commodity exports are more responsive to changes in real exchange rates and relative costs than other exports. They are also more responsive to shifts in export taxes and other determinants of anti-export bias than commodity exports. This suggests that prior to 1990 the impact of the trade regime was particularly constraining on these exports. By contrast, the combination of greater responsiveness with the relatively larger reductions in anti-export bias on non-commodities exports helps explain their more rapid growth in the 1990s.

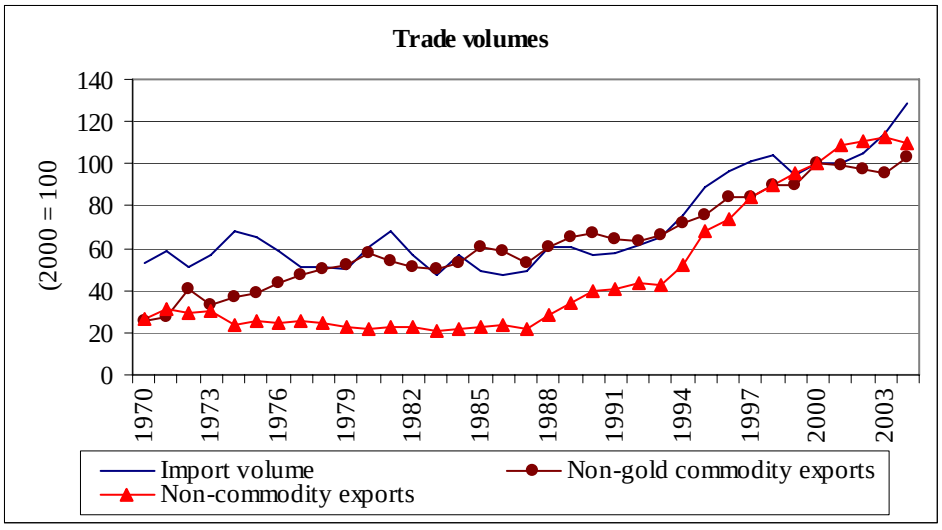
Section V considers the impact of trade liberalization on trade balances at the sectoral level. Higher surcharges, which were imposed during balance of payments crises, were effective in boosting these. More generally however, the results indicate that in sectors producing non-commodity manufactured goods, the impact of lower tariffs in

stimulating faster export growth is greater than the impact in stimulating faster import growth. Further liberalization is therefore not likely to substantially worsen the trade balance leading to a foreign exchange constraint to growth.

Section I: South African Trade Performance.--A tale of two periods.

Consider the picture of South African trade performance, illustrated in Figure 1 below. We show an aggregate series of the volume of imports of goods and services but on the export side we distinguish goods and services according to dependence on primary commodities. Given South Africa's dependence on commodity-based manufactures such as iron, steel and non-ferrous metals, for this purpose the conventional separation of primary and manufactured goods does not suffice. Accordingly, we have included manufactured goods that have a high share of primary commodity inputs in their value in the commodities classification. [4] Thus the category "non-gold commodities" includes both primary commodities and manufactured goods with a relatively high share of primary commodity inputs in final sales. "Non-commodities" refers to exports of services and other manufactured products. We also at times refer only to "non-commodity manufactures".

Figure 1: Export and import volumes



[4] As reported in Table A1, the manufacturing sectors have been arranged according to the share of primary commodity inputs in final sales. The industries are coke and refined petroleum, food, tobacco, iron and steel, other manufacturing, non-metallic minerals, wood and wood products, basic chemicals, and basic nonferrous metals

There is some truly remarkable behavior depicted in the Chart on trade volumes. In the first part of the period what stands out is the stagnant trade behavior. *In 1991, for example, the volume of goods and services imports was actually no higher than it was twenty years earlier and the volume of non-commodity exports was just eleven percent higher.* By contrast there is a slow but clear upward trend in the growth of non-gold commodity exports although it is more sluggish in the 80s than the 70s. Since over the entire period, gold export volumes declined, these non-gold commodities were basically the only source of export growth. The growth was sufficient, however, only to raise the aggregate volume of exports of goods and services in 1991 to twenty percent above its levels in 1971. Real GDP had increased by 54 percent over the two decades and the real exchange rate was at a similar level in both years. So in fact the economy had become significantly more closed for reasons that are not attributable to either the exchange rate or economic growth. Considering that over the same period, according to the WTO, the volume of world trade and world GDP had increased by 90 and 70 percent respectively, it seems fair to say that something else caused South Africa to miss out on two decades of globalization.[5]

Table 2: Average annual growth in export volumes (percent)

	1970-2005	**1970-80**	**1980-90**	**1990-2000**	**2000-2005**
Total	2.43	1.1	1.3	5.1	2.7
Gold	-3.44	-4.2	-2.3	-1.5	-9.7
Total, non-gold	4.36	4.8	2.5	6.4	4
Commodities, non-gold	4.3	8.5	1.7	3.9	2.5
Non-gold mining	4.85	14.2	1.6	1	2
Commodity manufactures	4.11	4.9	1.2	6.9	3.6
Non-commodities	4.43	-2.1	4.9	10.8	5.8
Non-commodity manufactures	5.8	0.7	4.7	13.7	4.2
Services	3.11	-4.4	5.2	7	8.6
Addendum					
Manufacturing	4.79	3.6	2.2	9.5	3.9
Autos	12.48	0.5	13.2	24	18.1
Non-auto manufactures	4.06	0.7	3.9	11.3	-3.3

Source: Quantec (2005) Data Base

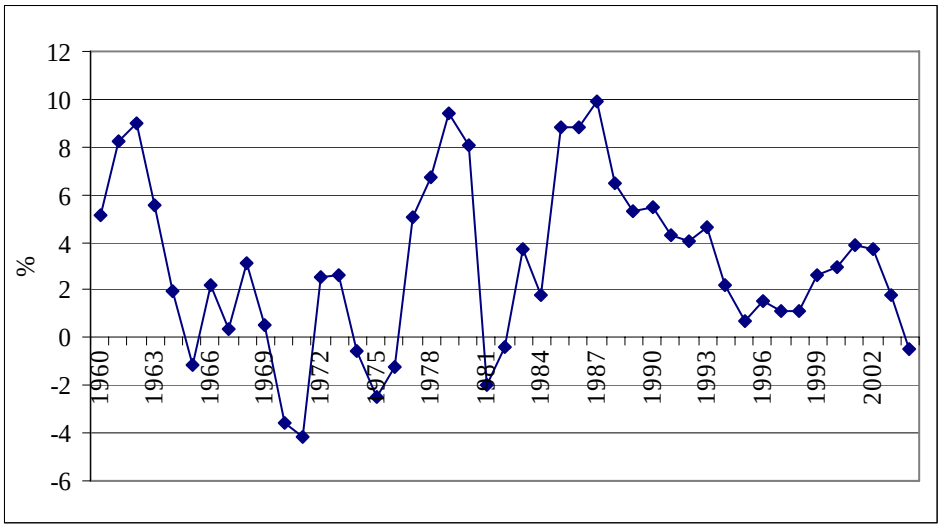
[5] Source: http://www.wto.org/english/res_e/statis_e/its2005_e/its05_longterm_e.htm

But starting in 1987, the picture changed. All three of the series have markedly upward trends. Between 1991 and 2001, for example, the volumes of imports and exports of goods and services increased by 73 and 70 percent respectively. While gold export volumes had continued to decline – they dropped 30 percent over the decade – exports of other commodities were up fifty percent and non-commodity exports by an astounding 200 percent.

The more recent behavior of trade volumes is also very striking. Between 2000 and 2005 import volumes have again grown extremely rapidly – averaging 7.6 percent per year – almost twice the growth rate in GDP over the period. This import growth has been particularly concentrated in durables – with auto imports averaging 23.5 percent annual growth over the five year period and commodities imports growing at 8.1 percent per year. By contrast export volume growth has been very sluggish, averaging just 2.7 percent annually (Table 2). While non-commodity exports have managed an annual growth rate of 4.2 percent, this is mainly due to autos. It is also striking that until recently, commodity export volumes have grown slowly with gold export volumes declining precipitously and other commodities managing just 2.5 percent growth. The bright part of the export picture is actually hidden in these aggregates. It is services exports which have grown by 8.6 percent annually.

The trade balance reflects price behavior as well as volumes. Measured in US dollars in 2005, export prices were up by sixty eight percent over their 2000 levels but the improvement in South Africa's terms of trade was surprisingly modest – only nine percent –because dollar import prices also increased rapidly. All told therefore the trade balance in goods and services has declined from a surplus of 3.9 percent of GDP in 2001 to a deficit of 1.5 percent in 2005.

Figure 2: Balance in goods and services as share GDP



Constant Market Shares Analysis: more clues.

A second and complementary perspective on South African trade can be obtained by considering its share in the world market. We have used UN COMTRADE data to explore the performance in market shares between 1970 and 1983 and then between 1985 and 2000. Trade flows are classified by export market and commodity and the analysis is applied to decompose changes in export performance due to each factor and a residual. The decomposition is presented in Table 3.

In the first period, had South Africa simply held its market shares its exports would have increased by 9.9 billion dollars. Instead they rose by just 6.4 billion, a substantial shortfall. The analysis suggests that only a small part of the shortfall was due to the fact that world trade in commodities rose more slowly than world trade elsewhere and a much greater reason to the poor geographic distribution of its export markets. But almost a third is not explained by these considerations and is attributed to “declining competitiveness.”

Table 3: Constant market shares analysis

	Value (US$ mill)	Percent
1970 – 1983		
South African exports in 1983	8,485	
South African exports in 1970	2,067	
Change in exports, 1970-1983	6,417	
1. Due to increase in world trade:	9,880	154.0
2. Due to commodity composition:	-18	-4.2
3. Due to market distribution:	-2,355	-32.7
4. Due to increased competitiveness:	-1,089	-17.0
	Value (US$ mill)	**Percent**
1985 – 2000		
South African exports in 2000	34,241	
South African exports in 1985	11,579	
Change in exports, 1985-2000	22,663	
1. Due to increase in world trade:	30,579	134.9
2. Due to commodity composition:	-11,051	-48.8
3. Due to market distribution:	-6,151	-27.1
4. Due to increased competitiveness:	9,286	41.0

Source: Own calculations based on UN Comtrade data.

The more recent period, 1985 - 2000 is an interesting contrast. South Africa once again lost global market shares, but in fact over this period the major problem was the commodity composition of South African trade in particular South Africa's dependence on primary commodities. In fact, the more recent period is actually a period in which judged by its world market shares in the commodities it exported, South African competitiveness actually improved.

The improved performance of South African exports, particularly non-gold exports, in the 1990s is also shown in Table 4. When gold is excluded, South African exports grew 5.7 percent grew between 1990 and 2000, which is close to the global and Australian rates. Moreover, the 7.8 percent annual growth in manufacturing exports actually outpaced Australia and the world as a whole (6.9 percent) although lagging far behind Malaysia. Performance in medium-tech manufacturing was actually very strong and double the world pace and in large part reflects the growth in auto exports.

Table 4: Average annual average growth rates of exports (current US$) for selected countries and regions

	1980-2000			
	South Africa	Malaysia	Australia	World
Total Trade	0.6%	10.7%	5.3%	6.2%
Total Trade excl gold	3.8%	10.7%	5.3%	6.3%
Gold	-6.3%	6.6%	28.9%	-3.4%
Primary, excl gold	2.9%	1.8%	5.4%	2.9%
Total Manufacturing	4.7%	13.9%	5.1%	7.5%
Resource-based	2.1%	4.2%	3.6%	4.5%
Low technology	6.4%	15.9%	6.8%	7.3%
Medium technology	9.3%	18.4%	7.5%	6.9%
High technology	2.0%	20.8%	12.8%	12.1%

	1980-90			
	South Africa	Malaysia	Australia	World
Total Trade	-1.6%	8.1%	4.8%	5.9%
Total Trade excl gold	1.9%	8.1%	4.7%	5.9%
Gold	-5.9%	-15.6%	66.8%	-3.9%
Primary, excl gold	2.0%	1.0%	5.6%	0.6%
Total Manufacturing	1.8%	12.3%	3.2%	8.0%
Resource-based	0.0%	5.3%	1.1%	4.4%
Low technology	3.2%	20.9%	6.1%	8.7%
Medium technology	7.0%	23.9%	7.4%	8.1%
High technology	-3.6%	18.0%	14.3%	12.8%

	1990-2000			
	South Africa	Malaysia	Australia	World
Total Trade	2.8%	13.4%	5.9%	6.6%
Total Trade excl gold	5.7%	13.4%	5.9%	6.6%
Gold	-6.6%	34.7%	-0.3%	-2.8%
Primary, excl gold	3.8%	2.5%	5.3%	5.2%
Total Manufacturing	7.8%	15.5%	7.1%	6.9%
Resource-based	4.2%	3.1%	6.1%	4.7%
Low technology	9.6%	11.1%	7.4%	5.9%
Medium technology	11.6%	13.2%	7.7%	5.8%
High technology	8.0%	23.7%	11.3%	11.5%

Note: Own calculations using UN Comtrade data adjusted for gold exports which are obtained from the South African Reserve Bank. Exports are classified according to Lall's (2000) technology classification.

In sum, the tale of two distinct periods that emerged from looking at South African data is reinforced by considering its global export performance. There is an early period in which its competitiveness was a problem and the more recent period, in which it has been more constrained by its patterns of specialization.

What explains these trade performance patterns? Is it simply a story of external forces such as trade sanctions, commodity price fluctuations and exchange rate movements that have driven South African trade or have trade policies played an important role? In what follows we will show that South African trade policy has made an important contribution to these outcomes and we will do this by looking first at imports and then exports.

Section II: Explaining Imports.

Consider Figure 3 depicting annual growth in import volumes and GDP. The first noteworthy feature of import behavior is its highly cyclical and volatile behavior. Moreover, the relationship to GDP growth is by no means constant. While there is clearly a correlation, particularly during the 1990s, the relationship does not always appear to be proportional and there are periods in which the changes in the variables move in opposite directions. Yet as the next chart shows, there is much greater stability in the long run relationship.

Figure 3: Annual growth in import volumes and GDP

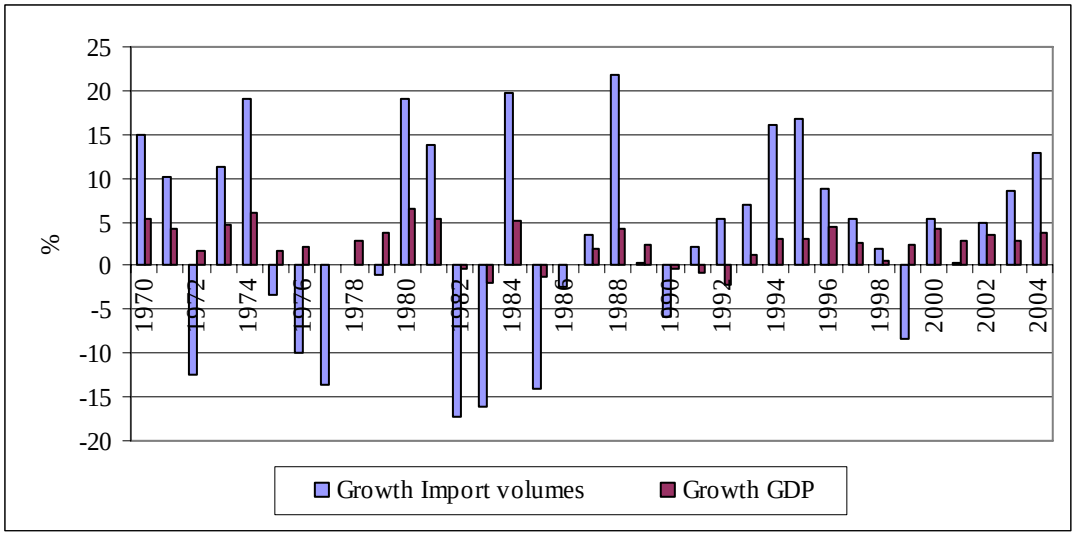
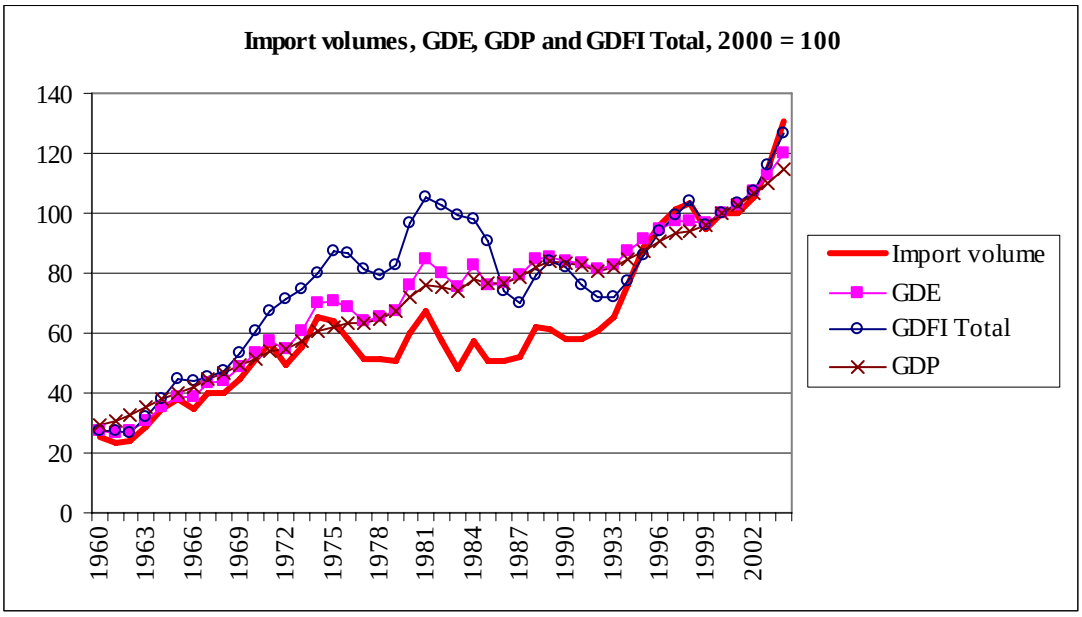


Figure 4 shows the volume of imports, Real Gross Domestic Expenditure (GDE), Real GDP (GDP), and Gross domestic fixed capital formation (GDFI). It indicates that over the long run import volumes have basically grown in line with GDP. There is however, an interesting deviation in behavior in the 1970s and 1980s which demonstrates the power of the import-substitution policies applied by South Africa as well as reflecting the decline in investment during this period.

Figure 4: Import volumes, GDE, GDP and GDFI



In the 1960s, import volumes move in line with GDP but in the 1970s and early 1980s they flatten out. The initial decline in imports from the mid 1970s corresponds with declining investment associated with the tightening of fiscal and monetary policy in response to the Balance of Payment crisis arising from the political unrest in 1976. The imposition of surcharges in April 1977 (see figure below) further dampened import demand during this period. Import demand recovered during the late 1970s in response to the gold price-led recovery in investment and GDP, but this improvement was short lived. The collapse in the gold price in the early 1980s, the debt crisis in the mid 1980s and the considerable decline in investment (public, parastatal and private) lowered import demand during the 1980s. It is only from the early 1990s that import demand recovered, led in part by a recovery in investment and GDP growth.

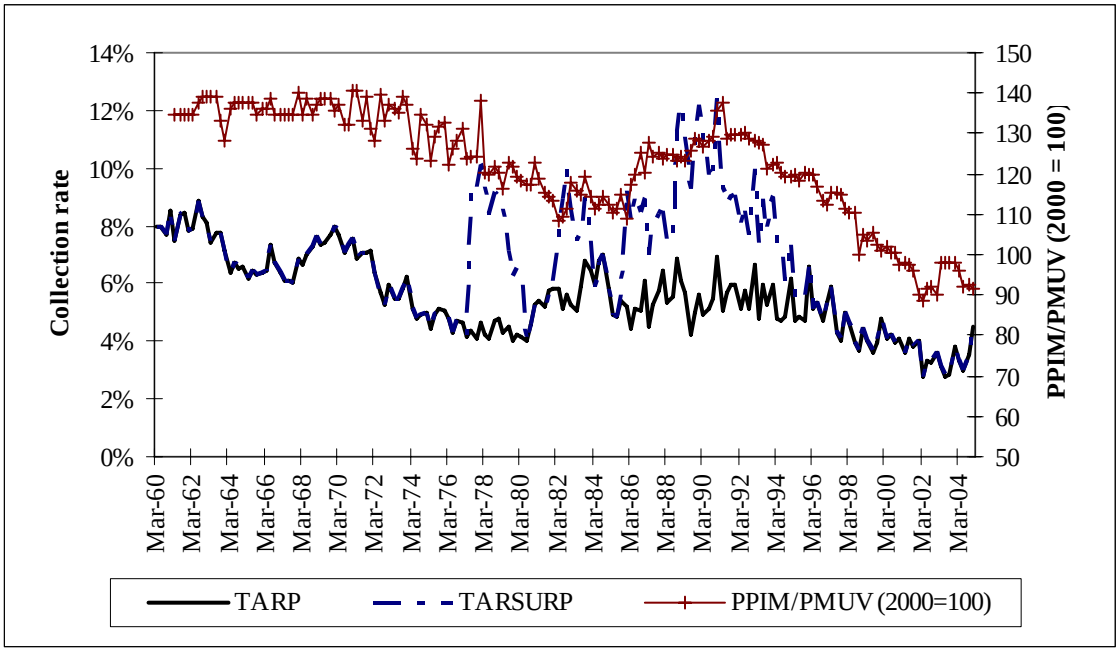
A graphical analysis also reveals the sensitivity of import demand to relative prices, including price shocks from changes in tariff protection. Trade policy in the analysis is captured by the ratio of tariff revenue collections (including surcharges) to the value of imports (TARSURP). The series is not ideal for our purposes for both conceptual and statistical reasons, but it is the most readily available. First, it fails to capture the impact of non-tariff barriers, second it will be sensitive the changes in import

composition and third the effects of trade protection and trade liberalization will be understated because the import mix will itself be influenced by tariff changes. For example, no revenues will be collected when tariffs are prohibitive. An alternative measure of protection is the difference between the import producer price index (PPIM) and the import unit value index (PMUV). [6] Import Unit values are problematic because they fail to account for quality changes and sectors where tariffs are prohibitive, but, since they exclude import duties, they afford an opportunity to obtain separate estimates of the impact of trade policy on prices and import behavior. The PPI measures of import prices, by contrast have the virtue that, in addition to the import prices charged by foreigners, they capture the influence of both tariff and non-tariff trade barriers on import prices.

To evaluate changes in protection over the period, the following chart presents an index (2000 = 100) of the ratio of imported PPI to import unit values (PPIM/PMUV) as well as the collection rates excluding surcharges (TARP) and including surcharges (TARSURP). What is interesting is that all series suggest policy was very volatile although moving towards liberalization in the 70s, then in the mid to late 1980s there was a strong shift towards protection through the use of surcharges followed by an almost continuous shift towards liberalization until very recently. These trends are somewhat at odds with those (e.g. Bell, Farrell and Cassim, 1999) who argue there was significant liberalization between 1985 and 1990 and Jenkins et al. (1996) who emphasize the liberalization after 1995 but downplay the shifts due to the removal of surcharges in the first half of the decade.

[6] Both import price series are sourced from the South African Reserve Bank.

Figure 5: Comparison of collection rates and PPIM/PMUV



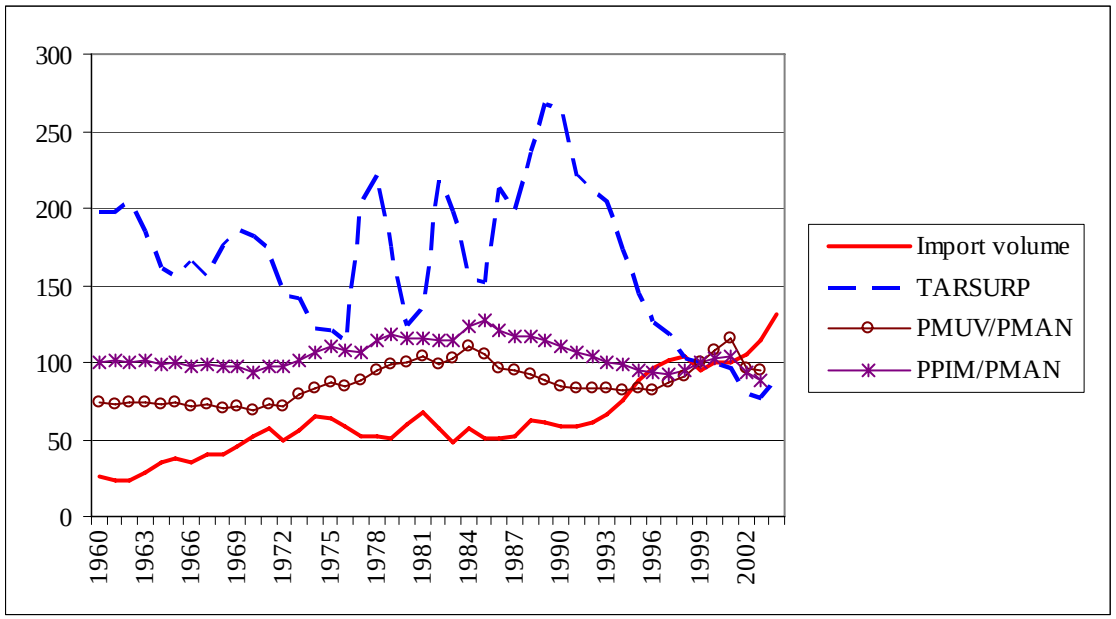
To evaluate the effect of relative prices on import volumes, the following charge plots import volumes against the ratio of tariff revenue collections (including surcharges) to the value of imports (TARSURP) and two measures of the ratio of import prices to domestic manufactured good producer prices. The first measure, PPIM/PMAN, measures the ratio of the domestic producer price of imported goods to domestic manufactured good prices and the second, PMUV/PMAN, measures the ratio of import unit values to domestic manufactured goods prices.

The relative price series behave in a striking fashion: While they remain fairly constant through the 1960s they then rise steadily through 1986, partly in response to rising oil prices, but also the depreciation of the currency in the 1980s. The decline in import demand in the 1970s and 1980s is consistent with these trends in relative prices. The rise in import demand during the 1960s is also consistent with the gradual reduction in collection rates during this period.[7] Relative prices then fall steadily through the mid

[7] There was also an important shift in the 1960s and 1970s towards capital intensive imports in response to the import substitution policies that reduced the demand for imported consumer goods. In contrast to consumer goods, imports of capital goods rose sharply during the 1970s in response to the large capital-

1990s and then rise again over the late 1990s in response to the depreciation. There is also a noteworthy convergence in the two relative price series in the 1990s which is what we would expect with liberalization. Between 1986 and 1992 the rand appreciated and helps explain the price movement, but the rand depreciated from 1992 to 1996 and during this period trade liberalization is probably the reason for declining import producer prices as well as some of the recovery in import demand during this period. Finally, the slow down in import demand around 1999 to 2001 is well explained by the depreciation of the rand which raised the relative price of imports.

Figure 6: Import volumes, tariffs and relative prices (2000 = 100)



Overall, there appears to be a consistent relationship between import volumes and GDP, investment, protection and relative prices. In what follows we report on a number of quarterly regressions we have used to account for the behavior of import volumes. We also pay attention to differences in the import content of various components of expenditure, particularly investment expenditure. Given that faster South African growth will require an increase in investment, the average expenditure elasticity could underestimate the import needs if ASGI-SA is to be successful.

---

intensive investment made in iron & steel and industrial chemicals (Fallon and Pereira de Silva, 1994). The decline in collection rates during the 1960s and early 1970s may therefore reflect a composition effect, rather than a reduction in protection.

Econometric Estimation of Import Functions

We have estimated a conventional import demand equation:

$$LM = \delta_0 + \delta_1 L(Pm/Pdom) + \delta_3 LGDE + \delta_4 Ltariff \; (\delta_1 < 0, \delta_3 > 0, \delta_4 < 0) \quad (1)$$

where *Pm*, *Pdom*, *GDE* and *tariff* are the import price, domestic price, real gross domestic expenditure and tariff rates, respectively. The prefix *L* represents the natural logarithm. Import demand (*M*) is positively affected by rising domestic prices and real domestic expenditure, but is negatively affected by rising import prices and tariffs. Import prices (*Pm*) can rise either through a depreciation of the exchange rate or a rise in foreign prices. We also estimate this function with *GDE* split into its various sub-components.[8] These include household and government expenditure, gross domestic fixed capital formation (GDFI) by type of asset (residential buildings, non-residential buildings, construction works, transport equipment and machinery and other equipment) and by economic activity (Electricity, water and gas; Transport, storage and communication; Community, social and personal services).

We estimate the import relationship over the period 1962 through 2004 using quarterly data obtained from the Reserve Bank. We find that the relevant data are non-stationary and follow the Johansen procedure to estimate the long-run relationship within a vector error correction (VECM) framework (Johansen, 1988; Johansen and Juselius, 1990).[9]

We report later the impact of different expenditure patterns but let us focus on a specification in which expenditure is divided into government consumption plus household expenditure (LCT) and total fixed capital formation (LGDFITOT). The estimation is repeated using the two different measures of relative prices: Log of import

[8] For example, we substitute $\delta_3 LGDE = \delta_3 L(CT+G)$ with $\delta_5 LCT + \delta_6 LI$ where *CT* is total consumption (household plus government) and *I* is investment. Note that $\delta_5+\delta_6$ does not necessarily equal δ_3. Further, if the equation with GDE disaggregated into its constituent parts is the correct specification, then specifications using aggregated GDE will yield biased estimates of the expenditure elasticity.

[9] The data appendix containing the relevant stationarity tests, cointegration tests and error correction representations can be obtained http://www.commerce.uct.ac.za/Economics/staff/ledwards/research.asp.

unit values to manufacturing PPI (PMUV/PMAN) and log of import PPI to manufacturing PPI (PPIM/PMAN). The estimated long run relationships are:

Result 1: Using Import unit value/PPI manufacturing as relative price

LM = - 0.877*PMUV/PMAN - 0.369*LTARSURP + 0.749*LCT + 0.229*LGDFITOT
ecm1(-1) = -.337 , T-Ratio = -3.65 [0.000] [10]

Result 2: Using PPI import/PPI manufacturing as relative price

LM = - 1.724*PPIM/PMAN + 0.00*LTARSURP + 0.653*LCT + 0.315*LGDFITOT
ecm1(-1) = -.275 , T-Ratio = -3.76 [0.000] [11]

The estimated responsiveness of import volumes to overall economic activity is quite similar in these two equations with the coefficients of household, government and investment expenditure summing up close to one in both cases. In the Appendix A1 we provide a summary of the results of other studies on South African import demand which find income elasticity estimates ranging from 0.43 to 2.2. Hence, our results are in line with these studies. The estimated import elasticity for household and government expenditure (0.65 to 0.75) exceeds that of total investment (0.23 to 0.31), but this comparison does not account for the relatively large share of expenditure accounted for by the former (approximately 84% of gross domestic expenditure). According to the first result, a one percent growth in GDE that stems from consumption and investment leads to increases of 1.04 and 1.36 percent in imports, respectively. In equation two the increases would be 0.90 and 1.83 percent for consumption and investment respectively.[12] Therefore, economic growth led by investment is expected to have far more serious

[10] 169 observations from 1962Q2 to 2004Q2. Order of VAR = 5, 1 cointegrating vector found. The probability statistic is provided in the square brackets.
[11] Order of VAR = 6, 1 cointegrating vector found. Cannot reject restriction LTARSURP = 0, but can reject LGDFITOT = 0 at the 5 percent level, but not at the 10 percent level.

[12] A R1 billion increase in GDE stemming from consumption and investment results in a 0.42% and 0.68% increase in quarterly import volumes, respectively.

implications for the balance of payments than consumption-led growth. We explore this in more depth later.

The long-run price elasticities in the literature, which range from -0.53 to -1.56 , are in line with our estimates using relative import unit values (-0.877) but below those using import producer prices. The coefficient on the relative imports prices of 1.72 is much larger than the coefficient on relative import unit values and higher than found in most other studies. At the same time the coefficient on the tariff variable is zero in the second equation when the relative import price variable is used whereas it is -.39 in the first equation. These results are exactly what we might expect since the second equation already captures the impact of tariff changes in the price variable, i.e. there is no additional explanatory power over and above the effect via domestic prices. Further, if unit value changes are not passed through proportionally into the domestic prices of imported goods as we might expect with non-tariff barriers and specific and formula tariffs for example, we would expect relatively smaller responses in the estimates of unit value changes**.** However, the coefficient certainly suggests that real exchange rates and other shifts in relative import prices will have substantial effects on import volumes and values.

These equations can also be used to allow us to decompose import behavior over the period, into its explanatory components.

Table 5: Annual growth rates of import demand variables

	LM	LGDE	LPMUV/PMAN	LPPIM/PMAN	LTARSURP	LCT	LGDFITOT
1962-2004	4.1%	3.5%	0.6%	-0.3%	-2.0%	3.8%	3.7%
1962-69	9.1%	8.2%	-0.5%	-0.5%	-1.3%	5.7%	9.7%
1970s	-0.1%	2.6%	3.2%	1.8%	-0.4%	3.7%	3.4%
1980s	0.3%	1.3%	-0.8%	-0.1%	8.6%	3.1%	-1.5%
1990s	5.8%	2.6%	0.6%	-1.8%	-7.9%	2.7%	3.1%

Note: Annual values are the average quarterly value for each period. Average annual growth rates calculated as: (ln(t+j)-ln(t))/j)

Table 6: Sources of import growth: Using Import unit values (Average annual growth rates)

	LPMUV/PMAN	LTARSURP	LCT	LGDFITOT	LM estimated	LM Actual
1962-2004	-0.55%	0.74%	2.85%	0.84%	3.9%	4.1%
1962-69	0.48%	0.46%	4.24%	2.23%	7.4%	9.1%
1970s	-2.77%	0.15%	2.79%	0.78%	0.9%	-0.1%
1980s	0.68%	-3.16%	2.31%	-0.35%	-0.5%	0.3%
1990s	-0.49%	2.91%	2.03%	0.70%	5.2%	5.8%

Note: Results based on Regression 1: LM = - .87710*LPMUV/PMAN - .36839*LTARSURP + .74933*LCT + .22925*LGDFITOT

Together Table 5 and Table 6 allow us to tell a coherent story about import growth. The 1960s (1962-69) are a period of very robust growth in imports. This growth was actually suppressed by relative price behavior and moderately boosted by trade liberalization. The dominant source of import growth was the very rapid increases in consumption and particularly in investment.

In the 1970s, imports barely grew. While income growth was fairly rapid, rising relative import prices played the key role in suppressing imports. This is not really captured in the tariff collections variable, or until the end of the 1970s, in the real exchange of the rand.[13] This was a period in which global prices of tradable goods grew particularly rapidly and more rapidly than domestic prices.

In the 1980s import demand remained stagnant in response to declining investment and increases in surcharges imposed in response to the balance of payments crisis after the mid-1980s. The effect of increased protection is sizeable, reducing import growth by 3.2% per annum over this period.

In the recent period, (90s to 2004) the big story is again trade policy. Over the period as a whole, relative prices do little to explain import growth. In other words the exchange rate and international price shifts do not play a major role. Trade liberalization

[13] The decomposition does not adequately capture the effect of surcharges imposed from 1977 which peaked in 1978. This explains why the estimated export growth in the 1970s exceeded actual export growth.

accounts for over half the import growth in this period increasing import demand 2.9% per annum. Income growth, including a modest recovery in investment, explains the rest.

The decomposition using relative import prices (Table 7) does not provide separate effects for trade policy, instead ascribing all import behavior to prices and activity. But it gives a very similar story. With relative import price behavior the key to why import growth reflected income growth in the 1960s, and failed to reflect it in the 1970s. This equation does poorly in predicting imports in the 1980s when it appears that protectionist trade policies were operational but accurately explains imports in the recent period as a response to relative import prices.

Table 7: Regression 2: Sources of import growth: Using PPI Imports (Average annual growth rates)

	LPPIM/PMAN	LTARSURP	LCT	LGDFITOT	LM estimated	LM Actual
1962-2004	0.5%	0.0%	2.4%	1.2%	4.1%	4.1%
1962-69	0.9%	0.0%	3.5%	3.1%	7.5%	9.1%
1970s	-3.1%	0.0%	2.3%	1.1%	0.3%	-0.1%
1980s	0.2%	0.0%	1.9%	-0.5%	1.6%	0.3%
1990s & 2000s	3.2%	0.0%	1.7%	1.0%	5.8%	5.8%

Notes: Results based on regression 2: LM = - 1.7238*LPPIM/PMAN + 0.00*LTARSURP + .65257*LCT + .31493*LGDFITOT

Income elasticities: Some Implications for ASGI-SA.

The regression results can also provide some insight into the implications for import demand arising from the ASGI-SA growth targets. Our import elasticity when using aggregate Gross Domestic Expenditure is 0.69, which falls on the low side of comparable studies conducted for South Africa (see Table A3 in appendix). However, once we decompose GDE into its constituent parts, we find that the various components of expenditure do not have uniform effects on import demand, with investment growth relatively more import intensive than household and government consumption. The implication for the ASGI-SA growth target is clearly reflected in Table 8 where we use the average expenditure elasticities from regressions 1 and 2 to estimate import growth arising from various combinations of growth in consumption and investment that equate to 8% growth in GDE. This growth in GDE corresponds with the GDP growth of close to

6% that occurred 1962 to 1969 and is hence a good reference for expected growth in the future.

Table 8: Import growth required to sustain an 8% increase in GDE driven by different combinations of consumption and investment (Average annual growth)

Scenario	GDE	HH & Gov	GDFI	Estimated Import demand
1	8.0%	9.5%	0.0%	6.5%
2	8.0%	8.0%	8.0%	7.7%
3	8.0%	6.0%	18.5%	9.2%
4	8.0%	4.0%	29.1%	10.7%
5	8.0%	2.0%	39.6%	12.1%
6	8.0%	0.0%	50.1%	13.6%
Historical data				
1962-69	8.2%	5.7%	10%	6.5%
Average expenditure elasticity		69%	27%	

Note: we use average real expenditure from 1990-05 to estimate the import demand effects. From 1962-69, GDP grew at 5.8% per annum.

Depending on the composition of GDE growth, import growth ranges from 6.5% to 13.6%. The primary implication that we can draw from the table is that the 6% growth in GDP foreseen by ASGI-SA will result in a growth of imports in excess of 6%. Such import growth will therefore require growth in exports in excess of 6% in order to maintain the current account balance.[14]

We also estimate a number of import functions with gross domestic fixed capital formation disaggregated into its sub-components. These results are presented in Table 9. In all cases, imports are sensitive to relative prices, tariffs and household and government consumption. Looking at result 3, investment in non-residential buildings are found to raise imports, but investment in residential buildings and machinery and equipment provide no additional explanatory power over an above the other variables. Transport equipment has the incorrect sign and could possibly be explained by the development of the motor vehicle industry under a protective environment. When analyzing investment according to Economic activity (results 4 to 6), we find that investment by the transport,

[14] Because the trade balance is currently in deficit, maintaining the current account balance will require more than a proportionate increase in exports.

storage and communication sector and community and personal services sector have relatively large impacts on import demand. In all cases, a 1 percent increase in investment and household plus government consumption raises import demand by at least 1 percent.

Table 9: Import demand functions with GDE disaggregated according to Asset and Economic Activity

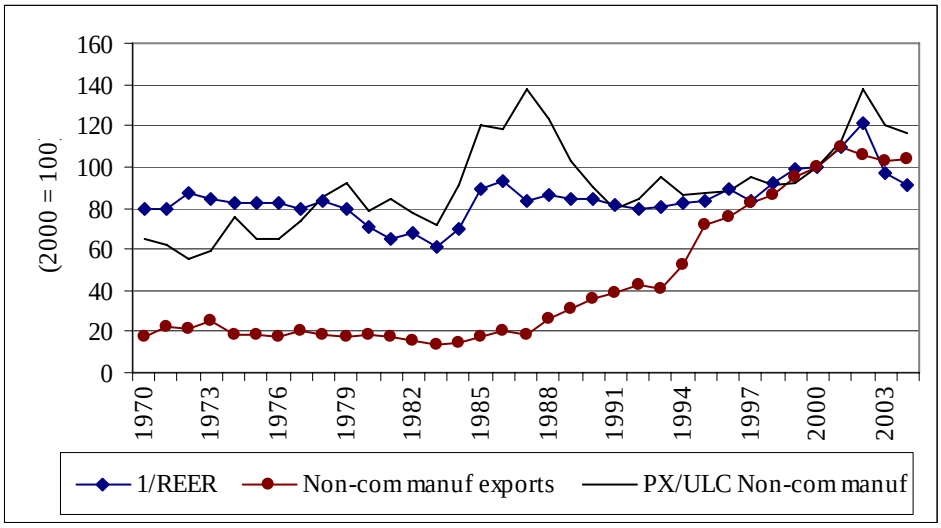
	Investment by asset	**Investment by economic activity**		
	Result 3	**Result 4**	**Result 5**	**Result 6**
Relative price (PMUV/PPI)	-0.55	-0.95	-1.03	-0.62
HH and Government consumption	0.98	0.91	0.98	0.75
Tariff (incl. surcharges)	-0.29	-0.22	-0.36	0.26
GDFI Residential buildings	0.00			
GDFI Non residential buildings	0.30			
GDFI Transport equipment	-0.37			
GDFI Construction works	0.21			
GDFI Machinery and other equipment	0.00			
GDFI by Transport, storage and communication activity		0.20		
GDFI by Electricity, gas and water activity			0.00	
GDFI by Community and Personal services				0.27
ECM	-0.35	-0.124	-0.22	-0.35
VAR	4	4	5	5

Note: we have not analyzed the impact of investment in other economic sectors such as mining, manufacturing, business services, etc.

Section III: Explaining Exports:

Let us turn then to exports, focusing first on non-commodity manufactured good exports. Figure 7depicts the volume of non-commodity manufactured goods exports and the real effective exchange rate which is inverted (1/REER) so that real depreciation of the Rand shows as an upward movement in the series that would be expected to exert a positive influence on exports. In the first part of the period, from 1970 to 1978, the real rand does not change much and neither do exports. But what is striking is the sluggishness in export performance when the rand appreciates through 1983, depreciates through 1986 and then gradually appreciates through 1991. To be sure there is some export growth between 1986 and 1988 which could be a lagged response to the earlier rand depreciation, but the exchange rate is clearly of little help in accounting for the rapid acceleration of exports between 1991 and 1997.

Figure 7: Non-commodity manufacturing and costs



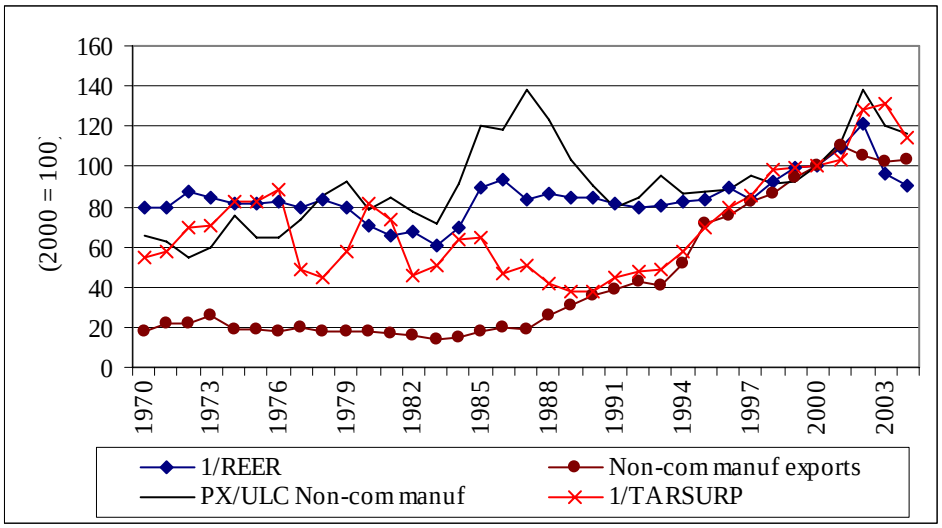
But perhaps, since the real exchange rate is derived looking at relative producer prices it may fail to fully capture the profitability of exporting. Accordingly we have also added the ratio of export prices of non-commodity manufactures to unit labor costs in these industries (PX/ULC) as a measure of export profitability. This series has

considerably greater variability than that of the real exchange rate suggesting additional movements in the relative price of manufactured goods and unit labor costs relative to the producer prices which are used in the real exchange rate measure. Through 1980 this series suggest a marked improvement in export profitability in the late 1970s and then a decline through 1983 that is associated with the stronger Rand, *but in neither case is there much response in export volumes.* Thereafter, however, the unit labor cost variable does provide some assistance in explaining responses. The improvement in the export profitability measure associated with the Rand decline in the mid 1980s is greater and longer lasting than in the real exchange rate and does add support to the notion that improved profitability helped to spur the export response between 1986 and 1988. There is again more improvement in export profitability between 1993 and 1997 than in the Rand's movement – again contributing to the explanation for the strong growth in exports during this period -- and an even greater improvement in export profitability through 2002. Thus the cost variables appear to operate effectively in driving these exports since the late 1980s whereas responses are extremely small prior to that.

The missing piece in the puzzle though is trade policy. Exporters rely heavily on inputs, both imported and domestic and particularly when it comes to deciding which markets to serve. The relative profitability of exports to domestic sales will also exert some influence. Accordingly the trade regime can have an independent impact on performance. For the period since 1988 we have computed a number of series that we will explore in depth in what follows. But first, for illustrative purposes we will use the ratio of tariff collections, inclusive of surcharges, to the value of imports as a measure of the restrictiveness of trade policy. While the variable (TARSURP) does a reasonable job of tracking scheduled tariff rates in the recent period (Edwards, 2005), as we have already noted, given the very extensive use of non-tariff measures, and the fact that by discouraging (or eliminating) imports, restrictive tariffs could reduce rather than increase the ratio of tariff collections to imports there is undoubtedly a downward bias in this measure. We have rebased this measure so that 2000 = 100 and express its inverse so that positive movements should be associated with faster export growth and liberalization.

Consider Figure 8 which reports non-commodity exports, the real exchange rate, export profitability and this inverted measure of tariff collections. Recalling that downward movement indicates a movement towards protection, the tariff variable reflects volatility in trade policy in the 1970s: with movement towards liberalization through 1976 protection through 1978 and liberalization through 1980. In the mid 1980s associated with the decline in the rand, there is a movement towards greater protection through the use of import surcharges and all told the variable suggests a trend towards greater protection. Thus trade policy offset some of the potential stimulatory impact of the improvements in export profitability both in the mid 1970s and especially in the mid 1980s.

Figure 8: Non-commodity manufacturing exports and tariffs



One of the particular strange features of South African export performance was the relatively sluggish response in exports to the massive depreciations of the rand in the mid-1980s. However, if the implicit export taxes between 1985 and 1989 increased by a similar proportion as the duties collection, this would suggest that it was increased by an effective rate of about 16 percentage points i.e. from 20 to 36 percent. Thus while the rapid growth in export prices improved the profitability of exporting, this effect was apparently partially offset by more expensive input prices.

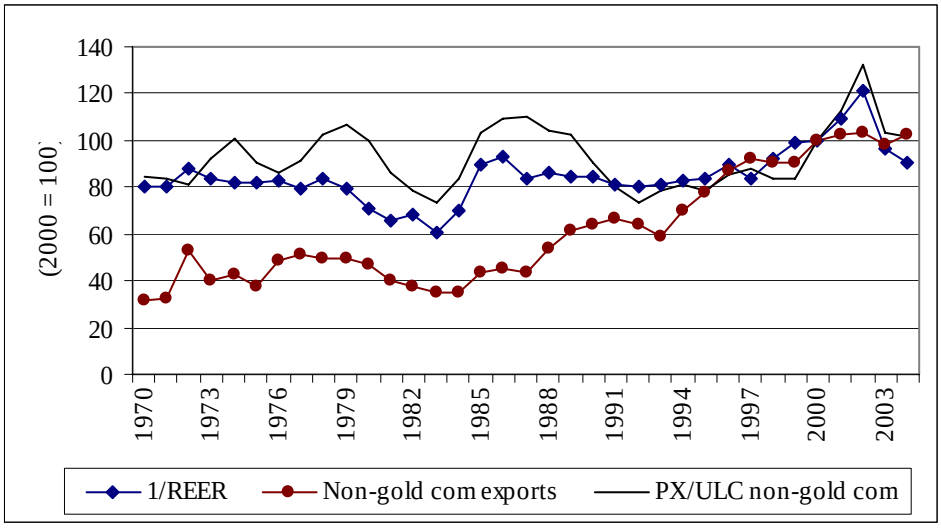
By contrast, in the more recent period, liberalization has had a marked impact in stimulating exports. In 1989 tariff collection revenues amounted to 11 percent of the value of imports. They fell fairly steadily until reaching a level of about 4 percent in 1998. The drop in the import-weighted effective rate of protection was significantly larger – from 35.6 percent in 1989 to 14 percent in 2000. Given this opening up of the economy, the import growth was quite understandable, but what is particularly interesting over the same period, is the rapid export growth – indeed over the ten year period export and import volumes increased at similar rates. The take off and rapid growth of South African non-commodity exports between 1992 and 2000 is not really well tracked by the measures of export profitability and the real exchange rate but the fit with the liberalization variable is remarkable.

Commodity exports[15]

Here we report both real exchange rate profitability measures together. The two commodity price booms are evident in the data for the 1970s. There is no Dutch disease associated with the first boom in commodity prices. It is not the case that strong commodity prices in 1973 and 1974 lead to a real appreciation of the Rand. But in response to the second boom and the soaring price of gold, the Rand does appreciate and the profitability of commodity production is depressed. In response commodities exports flatten. The Rand's decline between 1983 and 1987 improves profitability and exports respond. Growth in exports is particularly rapid between 1992 and 1998 as is the improvement in profitability – but what is striking is that there is no growth between 2000 and 2003 despite the dramatic improvement in profitability. *Nonetheless with the interesting exception of the recent period, the broad impression is that commodities export behavior has been responsive to relative profitability.*

[15] Non-gold commodity exports include both primary and manufactured commodity goods.

Figure 9: Non-gold commodity exports and costs



Aggregate export regressions

To analyze the determinants of South African export performance, we estimate a simple reduced form export function derived from an imperfect substitution model (Goldstein and Kahn, 1985; Edwards and Alves, 2006): [16]

$$X = \lambda_0 + \lambda_1\left(e + P^*\right) - \lambda_2 P - \lambda_3 T + \lambda_3 Y^* + \pi Z, \quad \lambda_i > 0 \qquad (2)$$

where (all variables in logs):

X = volume of exports

Y^* = real foreign income

P^* = foreign producer price

e = domestic to foreign currency exchange rate

P = domestic producer price

T = tariff rates

[16] For the full derivation of this relationship see the data appendix available from http://www.commerce.uct.ac.za/Economics/staff/ledwards/research.asp. This specification has a number of advantages. Firstly, homogeneity of degree zero in prices implies that $\lambda_1+\lambda_2=0$, in which case the foreign price in Rands ($e+P^*$) and the domestic price (P) can be combined to form the Real Effective Exchange rate ($P-e-P^*$). Secondly, in the case of a small price-taking economy, the reduced form equation effectively becomes the export supply equation, where the coefficient on ($e+P^*$) reflects the elasticity of export supply.

Z = vector of other real variables that influence the supply of exports.

Export volumes are positively affected by foreign income (Y^*) and the price of competing foreign goods, measured in Rands ($e + P^*$), but are negatively affected by rising domestic prices (P) and tariffs (T). The domestic price index captures two effects. Firstly, domestic and imported goods are imperfect substitutes. A rise in the domestic price, given constant export prices, causes exporters to shift production away from the export market towards the domestic market. Secondly, domestic prices are also a proxy for production costs. Rising production costs reduce the profitability of export production and hence reduce export volumes. Similarly, tariff protection (T) reduces exports by raising the cost of production thereby reducing profits, and raising the relative profitability of supplying the domestic market as opposed to the international market. Z is a vector of other variables that affect export supply and may include capacity utilization, infrastructure constraints and proxies for export potential.

A limitation in the estimation of the export relationship, however, is that domestic prices are themselves a function of foreign prices, measured in domestic currency, tariff rates and other variables.[17] As found in the import demand equations using PPI imports, tariffs may have no additional impact on exports over and above their effect through domestic prices (i.e. λ_3=0). To identify the impact of tariffs on prices, we specify an open economy price relationship as

$$P = \beta_0 + \beta_1 T + \beta_2 (e + P^*) + \beta' V, \quad \beta_i > 0 \qquad (3)$$

where V is a vector of other factors such as excess demand, transport costs , regulations, monetary policy, etc. that influence prices.

Including a price equation such as (3) has of number of implications for the interpretation of the reduced form export coefficients. The coefficient on Tariffs (λ_3) in the export equation is the marginal impact on export volumes, over and above the effect it

[17] The exchange rate may also be endogenous. Export growth leads to a trade surplus, which in turn may cause the currency to appreciate. We ignore this relationship in the discussion below, although in the estimates provided, we allow for the endogeneity of the exchange rate.

has on domestic prices and may equal zero if the effect of tariffs is fully captured via domestic prices (λ_2). The coefficient on the nominal exchange rate and foreign price variable (λ_1) is also not the long-run impact on export volumes. If the pass-through of exchange rate depreciation (or foreign price increases) to domestic prices is high (β_2 is close to 1) then the positive effect of a nominal depreciation on export volumes will be eroded by price inflation.

In estimating the export relationship, we therefore attempt to estimate both equation (2) and (3) in order to derive the net effect of exchange rate shocks and tariffs on export volumes. We analyze aggregate export performance in South Africa using non-gold merchandise exports (South African Reserve Bank quarterly Bulletin) and manufacturing exports (Quantec, 2005). Manufacturing exports are also divided into commodity manufactures and non-commodity manufactures using the classification presented in Appendix Table A1. The manufacturing trade data are only available in annual format over the period 1970 – 2004. Non-gold merchandise exports are available in quarterly and annual data over the period 1961:1-2004:3. We follow the Johansen procedure and estimate the long-run relationship within a vector error correction (VECM) framework (Johansen, 1988; Johansen and Juselius, 1990).[18]

In estimating the long-run relationships, we also include a number of additional stationary variables to those specified in the export equations above. These additional variables include a measure of the GDP gap, two oil shock dummies (1974-78, 1979-85), a dummy for the post-1994 period, a sanctions dummy (1986-1992), seasonal dummies and a dummy variable for the exchange rate shock in 2001/02.[19]

The estimated long-run relationships for aggregate non-gold merchandise exports are presented in Table 10. The long-run relationships for total manufacturing exports and the two sub-groupings, commodity and non-commodity manufactures, are presented in Table 11. In the tables, LPPIQSA is SA domestic PPI, LPPIFRAND is foreign PPI in

[18] As noted earlier, the relevant stationarity tests, cointegrating tests, etc. are available in the data appendix.
[19] The GDP gap is calculated as GDP – GDPHP where GDPHP is the long-run trend in GDP, calculated using a Hodrick-Prescott filter.

Rands, LPRODF is foreign output and LTARP is collection rates excluding surcharges (all variables in logs).

Table 10: Determinants of aggregate non-gold merchandise exports

	Quarterly data				Annual data	
Period	**1975q1 - 2004q3**		**1961q3 - 2004q3**		**1963 - 2004**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Export	**PPI**	**Export**	**PPI**	**Export**	**PPI**
LPPIQSA	-0.64		-0.86		-0.93	
	(0.21)		(0.25)		(0.11)	
LTARP	0	0.48	0	0.57	0	0.8
		(0.11)		(0.11)		(0.16)
LPPIFRAND	0.64	0.85	0.86	0.93	0.93	1.01
	(0.21)	(0.08)	(0.25)	(0.03)	(0.11)	(0.03)
LPRODF	1.05	0	1.4	0.32	1.28	0
	(0.38)		(0.1)	(0.1)	(0.04)	
Ecm1	-0.58	-0.03	-0.22	-0.03	-0.62	-0.14
	[.000]	[.083]	[.004]	[.003]	[.000]	[.000]
Ecm2	0.38	-0.05	0.13	-0.03	-0.16	-0.03
	[.003]	[.003]	[.172]	[.028]	[.315]	[.489]
VAR	2		2		2	
LR test of restrictions	4.93 [.085]		0.71 [.399]		2.05 [.359]	

Notes: 3 cointegrating vectors are found when using the quarterly data. In accordance with our specification above, we impose the assumption of 2 cointegrating vectors.
LPRODF is weakly exogenous in all regressions. LPPIFRAND is weakly exogenous in the estimates using quarterly data.
The errors in the error correction model for the price equation using quarterly data over 1961q3-2004q4 are not normally distributed. Estimates of the remaining error correction models for prices and exports satisfy all the diagonostic tests.

Our functions appear to be well specified with coefficients falling with the range of existing empirical studies. We find two long-run relationships, one of which is specified as the export equation, the other of which is specified as the price equation. In all export relationships we cannot reject the restriction that the absolute value of the coefficients on LPPIFRAND and LPPIQSA are equal, implying that the coefficient on these variables is the real exchange rate elasticity.

Looking at the long-run export and price relationships for non-gold merchandise exports over the period 1975q1 to 2004q3, we find that non-gold merchandise exports are sensitive, but not highly so, to changes in the real effective exchange rate. A 1 % real

depreciation reduces exports by 0.64% in long run. This coefficient is similar to those found for South Africa by Fallon and Pereira da Silva (1994); Smal (1996) and Senhadji and Montenegro (1998), but more inelastic than those (below -1) found by Tsikata (1999) and Edwards and Golub (2004).

Domestic prices are sensitive to tariff protection and the Rand value of foreign prices. We find a relatively high degree of pass-through of international prices and the exchange rate to domestic producer prices. A 1 % rise in aggregate foreign prices resulting from a depreciation or foreign inflation raises aggregate domestic producer prices by 0.85% in the long-run. The pass-through of foreign prices and the exchange rate to domestic prices appears large relative to inflation studies such as Nell (2000), Aron et al. (2004), Kaseeram et al. (2004) and Fedderke and Schaling (2005) whose estimates range from 0.2 to 0.6. However, the pass-through is less than the perfect pass-through estimated by Jonsson (1999) who also estimates a purchasing power parity relationship for South Africa between 1970 and 1998.

The implication of this result is that a nominal depreciation does not lead to a substantial real depreciation in the long-run, a result that is consistent with findings by Aron et al. (2000) in their estimation of the REER. The adjustment to this long-run relationship, however, is slow. According to the adjustment term in the error correction model for PPI, only 5% of the deviation from long-run equilibrium is 'corrected' in the subsequent period.

The high pass-through of exchange rate shocks to domestic prices has important implications for the long-run impact on export volumes. Although a nominal depreciation raises the profitability of export supply (and may reduce the dollar price of SA exports), most of these gains are eroded by higher domestic prices. According to the results of the export and price relationship, the long-run impact of a 1% depreciation of the nominal exchange rate on export volumes is only 0.1% ((1-0.85)*0.64).

Our estimates above suggest that tariffs have no direct effect on exports, but indirectly affect exports through their impact on domestic prices or costs. In the long run a 1% rise in tariffs raises domestic prices by 0.48%. This in turn reduces the profitability (both relative and absolutely) of export supply and hence lowers export volumes by 0.31% (0.48*0.64). This estimate of the responsiveness of exports to tariffs is slightly lower than the estimate (-0.86) of Tsikata (1999). Finally, we estimate a foreign income elasticity of 1.05, which falls in the middle of the range estimated in existing studies on South Africa.[20]

Table 11: Determinants of aggregate manufacturing exports, annual data

	Manufacturing		**Commodity manufactures**		**Non-commodity manufactures**	
Period	**1971-2004**		**1972-2004**		**1971-2004**	
	Export	**PPI**	**Export**	**PPI**	**Export**	**PPI**
LPPIQSA	-1.37		-1.59		-1.28	
	(0.3)		(0.22)		(0.3)	
LTARP	0	0.66	0	0.57	0	0.63
		(0.08)		(0.07)		(0.09)
LPPIFRAND	1.37	1	1.59	0.93	1.28	0.97
	(0.3)	(0.02)	(0.22)	(0.02)	(0.3)	(0.02)
LPRODF	0.93	0	0	0	1.31	0
	(0.21)				(0.21)	
Ecm1	-0.86	-0.03	-0.76	-0.01	-0.80	-0.06
	[.000]	[.494]	[.000]	[.648]	[.000]	[.044]
Ecm2	-0.05	-0.16	0.09	-0.19	0.30	-0.18
	[.880]	[.036]	[.774]	[.016]	[.404]	[.008]
VAR	1		1		1	
LR Test of Restrictions	2.49 [.288]		3.94 [.268]		0.95 [.621]	

Notes: 2 cointegrating vectors are found in each case. PPIFRAND and PRODF are weakly exogenous. Values in parentheses are the asymptotic standard errors. Values in square brackets are the probabability statistics. Estimates of the error correction models for prices and exports satisfy all the diagonostic tests.

The results for manufacturing are broadly similar, although manufacturing exports are more responsive to real exchange rate shocks than non-gold merchandise exports. The estimated elasticities range from -1.28 to -1.59 (Table 11) compared to the -0.64 to -0.93

[20] To test the sensitivity of the above result to the selection of time-period and frequency of data, we re-estimated the above relationship using quarterly data over the 1961q3 – 2004q2 period (columns 3 and 4 in Table 10) and annual data over the period 1963-2004 (columns 3 and 4 in Table 10). We find consistent results.

for non-gold merchandise exports. The difference reflects a relatively low price responsiveness of non-gold primary exports.

Interestingly, non-commodity exports are found to be less sensitive to the REER than commodity exports, although the difference is not statistically significant. We find significant differences in the impact of foreign income on exports. Foreign income raises exports of non-commodity manufactures (elasticity = 1.31), but not commodity manufactures. This insignificance of foreign income for commodity exports is consistent with the small-country model, where exporters are price takers in the international market. Commodity manufactures are characterized by relatively little product differentiation; hence firms have little market power to adjust prices from world prices. In contrast, non-commodity manufactures may be characterized by greater product differentiation and therefore market power. The positive impact of foreign income on non-commodity exports may also reflect the growth in markets for new product varieties.

As found for non-gold merchandise exports, tariffs negatively affect exports through their impact on domestic prices. Using the long-run relationships, a 1% rise in tariffs reduces export volumes by 0.8% (non-commodity manufactures) and 0.9% (commodity manufactures)

In all estimates for manufacturing, we find close to perfect pass-through of foreign prices (measured in Rands) to domestic prices in the long-run. The implication, as discussed above, is that a nominal depreciation does not raise real exports in the long-run as the improved profitability of export production is eroded by domestic inflation over time.[21]

In conclusion, we find empirical results consistent with our graphical analysis of South Africa export performance. Tariff protection negatively affects exports, a real

[21] The relatively slow adjustment of domestic prices to long-run equilibrium, however, suggests that the nominal depreciation may result in a short-run export response. Further, a nominal appreciation of the Rand will have a significant negative impact on the profitability of export supply in the short-run, as input costs are slow to adjust in response to the appreciation. If domestic prices are sticky downwards, we may find an asymmetric response to a rise or fall in the exchange rate.

exchange rate depreciation has a positive impact on export volumes, and finally nominal exchange rate shocks have a small effect on exports in the long-run, as domestic price increases erode the improved profitability of export supply.

Section IV: Export Taxes.

Let us consider in greater depth how trade policy has affected performance in the period of liberalization. Tariffs affect export performance in two ways. Firstly, tariffs raise the price of intermediate inputs and therefore reduce the profitability of export production. Secondly, nominal tariffs raise the relative return to production for the domestic market causing firms to shift production out of the export market and into the domestic market. If these variables have a significant impact on trade flows – and we will show below that they do –this implies that it is not simply factor endowments that are responsible for the patterns of export specialization we find in South Africa. In fact, policy has contributed to the patterns.

Table 12 below reports estimates of the effective rates of protection, export taxes (i.e. tariffs on inputs weighted by input shares as a share of value added in world prices) and a measure of anti-export bias which captures the impact of the scheduled tariffs both in raising export costs and in creating an incentive to service the domestic market i.e (1 + ERP) / (1 –XTAX). [22] Industry estimates are then weighted according to their 1990 trade shares to obtain aggregates for manufactured commodities and non-commodities. These estimates produce some interesting results.

First, in 1989 the average effective rates of protection were remarkably high -- 45.8 for commodities, 42 for other manufacturing and somewhat lower for primary commodities. With respect to export taxes, however, the picture is different. Partly because non-commodity manufacturing firms are more reliant on inputs from other firms both in their own sector and elsewhere, the impact of tariffs on their costs appears to be substantially greater than for producers of manufactured commodities. Indeed in 1989, the estimated export taxes on non-commodity manufacturing -- at 52 percent -- were

[22] $ERP_j = (t_j - \sum_i a_{ij}t_i) \Big/ (1 - \sum_i a_{ij})$ and $XTAX_j = \sum_i a_{ij} t_i \Big/ 1 - \sum_i a_{ij}$ where t_j is the tariff on outputs, t_i is the tariff on inputs and a_{ij} is the quantity of intermediate input i used in the production of one unit of j. Values of the anti-export bias in excess of 1 reflect relatively high returns in the domestic market compared to the export market.

twice as high as those commodity manufactured exports. Taking account of both effects, in the anti-export bias measure, therefore shows an anti export bias that is far higher at 2.96 than that for commodities.

Table 12: Effective protection rates, export taxes and the anti-export bias

	1989	1991	1993	1995	1997	1999	2001	2003
Effective Rate of protection								
Other Manufacturing	41.2	36.0	38.3	27.8	21.2	19.0	16.8	15.8
Commodity Manufacturing	45.8	39.4	37.7	28.9	14.2	12.9	12.7	12.2
Manufacturing	42.4	36.9	38.1	28.1	19.3	17.3	15.7	14.8
Goods	35.8	31.2	32.1	23.6	16.3	14.5	13.2	12.4
Export taxes								
Other Manufacturing	52.3	46.5	51.8	39.9	30.6	27.6	24.9	23.6
Commodity Manufacturing	20.8	22.9	23.0	17.3	11.3	10.1	9.7	9.5
Manufacturing	35.2	30.7	32.5	24.7	17.6	15.9	14.7	14.2
Goods	18.8	16.2	17.1	12.9	9.1	8.2	7.5	7.3
Anti-Export Bias								
Other Manufacturing	3.0	2.5	2.9	2.1	1.8	1.6	1.6	1.5
Commodity Manufacturing	2.0	1.8	1.8	1.6	1.3	1.3	1.3	1.2
Manufacturing	2.2	2.0	2.1	1.7	1.5	1.4	1.4	1.3
Goods	1.7	1.6	1.6	1.4	1.3	1.3	1.2	1.2

Note: Own calculations using data from Edwards (2005) and 1990s trade shares as weights

Over the next fourteen years there was major trade liberalization which actually reduced the effective rate of protection, and therefore value added, for commodity manufacturers (23%) by more than non-commodities (18%).[23] The impact of liberalization since 1989 in reducing export taxes on non-commodity manufactures has by contrast, been significantly larger than the impact on commodity manufactures. The effect of these reductions is equivalent to an improvement in export profitability of 60% for non-commodity manufacturing, compared to 24% for commodity manufacturing.[24] Overall, therefore, the reduction in anti-export bias from 2.96 to 1.52 was twice as high for non-commodity manufacturing as the reduction from 1.99 to 1.24 for commodity manufacturing and contributes to the explanation of why the growth in the volume of non-commodity manufactures (up 184 percent) is significantly higher than in commodity manufacturers (up 44 percent). In fact, the special programs for automobiles and textiles which are not captured in these data suggest an even greater role for trade policy in this outcome –

[23] These percentages reflect the change in value added arising from the decline in ERP and are calculated as Change in $VA_{ERP} = \Delta ERP/(1+ERP)$

[24] The improvement in export profitability is calculated as Change in $VA_{XTAX} = \Delta XTAX/(1-XTAX)$.

although on the other hand the ending of the General Export Incentive Scheme (GEIS) program moves in the opposite direction. Nonetheless, although significant liberalization has taken place, it still appears to be the case that South Africa's trade policy hinders its export performance overall and that the impact on non-commodity manufacturing is relatively higher than on manufacturing.

Figure 10: Do export taxes matter?

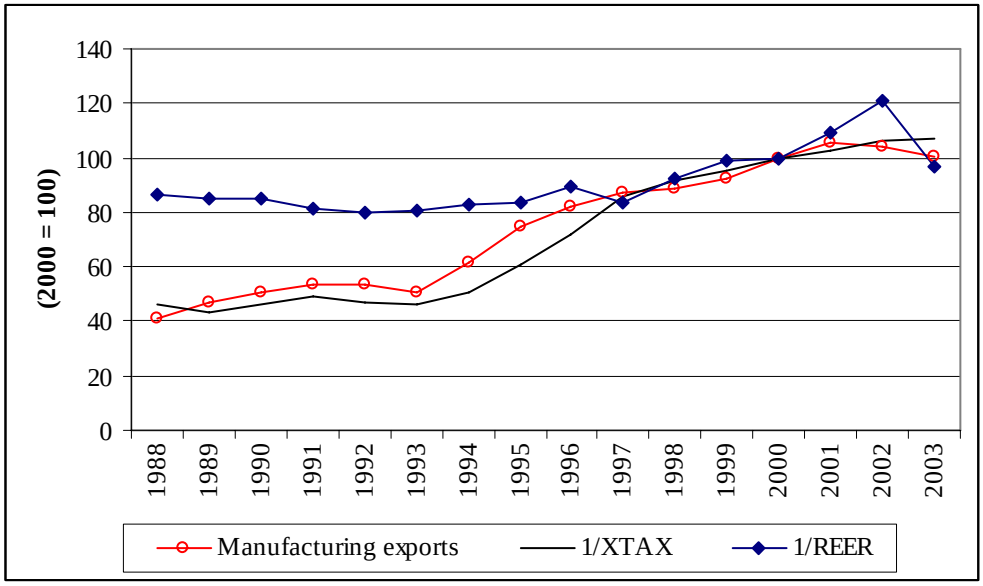


Figure 10 captures the relationships between export volumes and the inverted export tax variable for all manufactured products. There is a very strong correlation between the export tax variable and manufactured goods export volumes. By contrast up until 1997 neither the real exchange rate nor the ratio of export prices to unit labor costs which moves with it help explain the export surge. To be sure, there could be some contribution that comes from better tracking of exports and the impact of ending apartheid on exports to Africa but nonetheless the relationship remains remarkable and, as we now show, is both statistically and quantitatively significant.

Panel export regressions

To estimate the relationship between export performance and trade policy, we use a panel of 44 manufacturing sectors over the period 1990-2002. We use as our dependent variable the ratio of exports to domestic production. As our independent variables we specify separately scheduled tariffs and surcharges, drawn from Edwards (2005). One feature of the South African tariff regime was that tariff protection was granted not simply through ad valorem tariffs but in many cases with specific tariffs, compound tariffs, mixed tariffs and formula duties. The latter provided additional protection if the world price fell below a specified reference price. An important component of liberalization was the simplification and increased transparency of the tariff schedule achieved largely through a reduction in the use of non-ad valorem rates. Accordingly, we add in a variable which captures reductions in the complexity of the South Africa tariff schedule -- the proportion of HS 8 digit tariffs within each sector that are ad valorem. Since increases in this proportion represent greater liberalization, we would expect a positive coefficient in the regression.

In addition, we include a relative cost variable designed to capture the profitability of selling in the domestic market, the ratio of the nominal exchange rate to the domestic producer price index. We would expect that a depreciation would raise the relative price of exports and thus expect a positive coefficient on this variable. We also insert dummies to capture sector- and time- fixed effects, a trend term and a number of controls the capital labor ratio and the skill share.

Table 13 and Table 14 explore the impacts of scheduled tariffs, effective rates of protection and export taxes separately. We also divide the sample into commodities and non-commodities. All three of the variables have the expected negative effects on exports as a whole, but although the relationships show up in the sample that includes all sectors, they are more significant in non-commodities than commodities. The tariff, effective rate of protection and export tax variables all indicate a statistically significant negative impact on non-commodities exports. The 'transparency' of the tariff structure, as measured by the share of HS 8-digit tariff lines with ad valorem rates, is also an

important determinant of export performance of non-commodities, but comes in with the wrong sign with commodities. In addition, non-commodities respond significantly and elastically to the real exchange rate variable with an elasticity around 2. Commodities manufacturing are less responsive to relative prices and are overall not well explained by the regression. The nominal tariff coefficient is of correct sign, but insignificant. The coefficients on the surcharges and share ad valorem rates are incorrectly signed.

Table 13: Explaining export orientation in manufacturing, 1990-2002

	Scheduled tariffs			**Export tax**		
	All sectors Coef.	**Commodities Coef.**	**Non-commodities Coef.**	**All sectors Coef.**	**Commodities Coef.**	**Non-commodities Coef.**
Tariff variable	-1.46*	-1.06	-1.05*	-0.38***	0.09	-1.02*
Surcharges	-0.30	5.71*	-0.25			
Ad valorem	-0.10	-0.71*	0.73*	0.12	-0.49**	0.84*
Ln NEER/PPI	1.06*	-0.40	2.14*	1.08*	-0.06	2.03*
K/L	0.00*	0.00	0.00	0.00*	0.00*	0.00
Skill share	-0.58	-7.88**	7.54*	-1.79	-10.53*	7.75*
trend	0.06*	0.16*	0.00	0.06*	0.13*	0.00
F(18,510)	48.93	14.72	51.66	50.40	14.27	57.17
obs	572	208	364	572	208	364
groups	44	16	28	44	16	28
Elasticities						
Tariff variable	-1.28	-0.95	-0.91	-1.21	0.26	-3.27
Surcharges	-0.29	5.61	-0.24			
Share ad valorem	-0.12	-0.90	0.84	0.14	-0.61	0.97
Ln NEER/PPI	1.06	-0.40	2.14	1.08	-0.06	2.03

Table 14: ERP and export orientation in manufacturing, 1990-2002

	Effective rates of protection		
	All sectors Coef.	**Commodities Coef.**	**Non-commodities Coef.**
Tariff variable	-0.21 *	-0.01	-0.40 *
Surcharges			
Ad valorem	-0.05	-0.50 ***	0.67 *
Ln NEER/PPI	1.12 *	-0.05	2.23 *
K/L	0.00 *	0.00 *	0.00
Skill share	-0.72	-10.70 *	8.04 *
trend	0.06 *	0.13 *	0.00
F(18,510)	51.07	14.26	57.52
obs	572	208	364
groups	44	16	28
Elasticities			
Tariff variable	-0.25	-0.01	-0.28
Surcharges			
Share ad valorem	-0.06	-0.63	0.77
Ln NEER/PPI	1.12	-0.05	2.23

Notes: Estimations based on 44 manufacturing sectors over period 1990-2002. Estimated using fixed effects estimator, with time and sector fixed effects. The time and sector fixed effects are not presented. ERP and export tax are inclusive of surcharges. Tariffs, surcharges and ERP are measured as (1+t) where t is the protection rate. *, ** and *** reflect significance at the 1%, 5% and 10% significance level, respectively

In the next table (Table 15) we use both export tax and protection measures together. For all sectors tariffs (but not export taxes) have a negative and significant impact on exports, but while the nominal tariff is negative it is not significant and in this regression it is export taxes and the ad valorem share that are significant.

These results lend strong support to the proposition that trade policies were partly responsible for South Africa's weak manufacturing export performance, particularly during the 1970s and 1980s. Not only did the trade regime penalize non-commodity exports more than commodities but since non-commodity supplies are relatively more responsive to these penalties, the impact of these policies was magnified. The growth in exports, particularly non-commodity manufactures, during the 1990s is in large part due to the reduction in the anti-export bias brought about through tariff liberalization.

Table 15: Including nominal tariff and export tax variable

	All sectors Coef.		Commodities Coef.		Non-commodities Coef.	
Nominal tariff	-1.35	*	-1.06		-0.43	
Surcharges	-0.30		5.71	*	-0.55	
Share ad valorem	-0.09		-0.71	*	0.75	*
Export tax	-0.21		-0.01		-0.94	*
Ln NEER/PPI	1.06	*	-0.40		2.04	*
K/L	0.00	*	0.00		0.00	*
Skill share	-0.93		-7.91	**	7.79	
trend	0.06	*	0.16	*	-0.01	*
F(19,509)	46.41		13.87		51.16	
obs	572		208		364	
groups	44		16		28	
Elasticities						
Nominal tariff	-1.19	*	-0.95		-0.37	
surch_alt	-0.29		5.62	*	-0.54	
Ad valorem	-0.11		-0.90	*	0.87	*
Xtax	-0.66		-0.04		-2.99	*
Ln NEER/PPI	1.06	*	-0.40		2.04	*

Note: as above

Implications for factor demand.

It is apparent that commodity manufacturing is distinctive not only because it embodies primary inputs but also because it is highly capital intensive. Indeed this is clear whether we measure capital intensity by the ratio of capital (gross fixed capital stock) to value-added or the ratio of capital to labor (Table 16). And as Table 17 indicates there is a high correlation between commodity and capital intensity. It is also interesting that commodity manufactures are not unskilled- labor- intensive.

Alleyne and Subramanian (2001) undertook a decomposition of the factor content of South African trade and found paradoxically that it reflected patterns of specialization in capital intensive products. They argued that since South Africa has a relative abundance of unskilled labor, this specialization in capital intensity indicated that South Africa has a highly distorted labor market that artificially raises labor costs. But our analysis suggests that South African export policy has been particularly unfavorable to manufactured goods and relatively favorable to manufactured commodities. This leads us

to suggest, that the bias towards capital intensity may tell us more (or as much) about South African trade policy as it does about the South African labor market.

Table 16: Attributes of commodities and other manufacturing

	1970	1980	1990	2000	2004
Primary Commodity Intensity					
Other Manufacturing	0.02	0.02	0.02	0.02	0.02
Commodities	0.3	0.33	0.26	0.32	0.3
Ratio of Skilled to Unskilled Employment					
Other manufacturing	0.74	0.7	0.66	0.62	0.61
Commodities	0.77	0.71	0.62	0.57	0.55
Ratio of Capital to Labor					
Other manufacturing	0.05	0.06	0.06	0.09	0.1
Commodities	0.11	0.23	0.27	0.49	0.49
Ratio of Capital to Value_added					
Other Manufacturing	0.8	0.69	0.82	0.92	0.87
Commodities	1.48	2.67	2.47	2.74	2.6

Source: Own calculations using Quantec (2005) data.

Table 17: Industry characteristic correlations

	Pr/O	K/VA	Usk	K/L	X/VA
K/VA	0.63				
Usk	-0.30	-0.30			
K/L	0.63	0.94	-0.34		
X/VA	0.30	0.27	-0.28	0.23	
M/VA	-0.24	-0.06	-0.30	-0.09	0.46

Source: Own calculations using Quantec (2005) data.
Notes: Pr/O = share primary inputs to output, K/VA = ratio of capital to value added, Usk=share of unskilled in employment, K/L = capital-labor ratio, X/VA = ratio of exports to value added, M/VA=ratio of imports to value-added

Section V: Explaining the trade balance

Our analysis thus far indicates that trade liberalization has both raised exports and imports during the 1990s. The net effect on the trade balance, however, is ambiguous. Multi-country studies of developing countries in general find that trade liberalization worsens the trade balance (UNCTAD, 1999; Santos-Paulino and Thirlwall, 2004). In this section, we estimate the determinants of the manufacturing trade balance over the 1990s using the panel of 44 manufacturing industries over the period 1990-2002.

We estimate the following function:

$$TB_{it} = \mu_i + \beta_1 TAR_{it} + \beta_2 ADVALOR_{it} + \beta_3 RER_{it} + \beta_4 VOL_{it} + \delta' D + \lambda_t + \varepsilon_{it}$$

where TB is the trade balance measured as ln(export value/import value) TAR is a measure of tariff protection (As before, we explore the impact of scheduled tariff rates, surcharges, the effective rate of protection and implicit export taxes), ADVALOR is the measure of the complexity of the tariff schedule (the proportion of HS 8 digit tariffs within each sector that are ad valorem), RER is the relative price index calculated as the SA PPI relative to US PPI price (measured in common currency), and VOL is an index of domestic production per sector. In addition to these variables, we include sector fixed effects (μ_i) and time fixed effects (λ_t). These are included to account for time invariant sector effects and sector invariant time effects. The latter are expected to capture the effect of changes in gross domestic expenditure and other exogenous shocks that affect all sectors equally. In this case, particularly the end of Apartheid. No time trend is included (it was insignificant in all regressions). We also estimate the trade balance relationship for all manufacturing sectors, commodity manufactures and non-commodity manufactures.

This specification advances the literature in a number of ways. Firstly, unlike many of the multi-country studies that use dummy variables for the liberalization period (Bleaney, 1999; UNCTAD, 1999; Santos-Paulino and Thirlwall, 2004), we explicitly account for changes in protection through the use of the direct measures of protection at

the sector level.[25] Secondly, we estimate the Trade Balance relationship using a panel of sector level data. Trade liberalization has a non-uniform effect on exports and imports across sectors. We attempt to account for this heterogeneity through the use of sector fixed effects as well as estimates of the trade balance equation for sub-groupings of manufacturing. Finally, we are able to provide separate estimates of the effects of a variety of measures of tariff reform on the trade balance. These include measures of nominal protection, effective protection, and indicator of the complexity of the tariff schedule, surcharges and the implicit tax on exports arising from protection on intermediate inputs.

The results of the analysis are presented in Table 18 and Table 19. In the first table, we present estimates of the trade balance relationship using measures of both nominal tariff protection and effective protection. In the second table, we present estimates using our measure of the implicit tax of tariffs on exports and both nominal tariffs and export taxes. In the latter estimate we attempt to identify whether nominal output tariffs and export taxes have differing effects on the trade balance.

Table 18: Determinants of manufacturing trade balance: Nominal output tariffs and effective protection

	Nominal tariffs			Effective rates of protection		
	All sectors	Commodities	Non-commodities	All sectors	Commodities	Non-commodities
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Tariff	-1.34 ***	-0.78	-0.84 *			
Export tax						
ERP				-0.29 ***	-0.14	-0.41 ***
Surcharges	1.97 **	6.11 ***	3.05 ***	2.84 ***	6.92 ***	4.01 ***
Advalorem	-0.07	-0.37	0.37	-0.11	-0.43	0.27
REER	-0.25	0.78	-0.68 **	-0.23	0.78	-0.69 **
Volume	-0.09	-1.47 ***	0.50 ***	-0.09	-1.46 ***	0.51 ***
K/L	0.00 **	0.00 **	0.00 *	0.00 **	0.00 **	0.00 *
Skill share	1.46	-15.99 ***	12.08 ***	1.58	-15.84 ***	12.40 ***
DMIDP	0.39 ***		0.01	0.36 ***		-0.06
F-statistic	7.78 ***	5.09 ***	14.07 ***	7.93 ***	5.15 ***	15.04 ***
obs	572	208	364	572	208	364
groups	44	16	28	44	16	28

Notes: The equation is estimated using a two-way fixed effects estimator with sector and time fixed effects.

[25] The dummy variables capture the joint effect of a number of other policy and economic changes that usually accompany trade reform (currency appreciations, instability resulting from capital-account liberalisation, impact of trade liberalisation) and also fail to adequately measure the pace or extent of liberalisation.

Dependent variable is calculated as Ln(export value/import value). Tariffs, surcharges and ERP are measured as (1+t) where t is the protection rate. DMIDP is a dummy variable for the motor industry from 1995 to 2002.The K/L variable measures machinery and equipment capital stock (Rm in constant 2000 prices) per worker. The skill share measures skilled labor as a share total employment.

Table 19: Determinants of manufacturing trade balance: Export taxes and nominal output tariffs

	Export taxes			Nominal tariffs and export taxes		
	All sectors	Commodities	Non-commodities	All sectors	Commodities	Non-commodities
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Tariff				-1.26 ***	-0.75	-0.05
Export tax	-0.33	-0.21	-1.29 ***	-0.19	-0.20	-1.28 ***
ERP						
Surcharges	2.09 **	6.33 ***	3.05 ***	2.00 **	6.27 ***	3.05 ***
Advalorem	0.13	-0.27	0.40 *	-0.07	-0.38	0.39
REER	-0.25	0.78	-0.72 ***	-0.25 ***	0.82 ***	-0.72 ***
Volume	-0.10	-1.49 ***	0.46 ***	-0.09	-1.47 ***	0.46 ***
K/L	0.00 *	0.00 **	0.00	0.00 **	0.00 **	0.00
Skill share	0.23	-17.20 ***	12.88 ***	1.18	-16.56 ***	12.87 ***
DMIDP	0.40 ***		-0.12	0.37 ***		-0.12
F-statistic	7.38 ***	5.07 ***	15.48 ***	7.43 ***	4.84 ***	14.7 ***
obs	572	208	364	572	208	364
groups	44	16	28	44	16	28

Notes: as above

These results indicate that a depreciation of the bilateral real exchange rate (RER) vis-à-vis the USA improves the trade balance. In most of specifications, a 1 percent depreciation is estimated to raise the value of non-commodity exports relative to non-commodity imports by approximately 0.7 percent. However, we find no such relationship for commodity exports where the coefficient has the wrong (positive) sign, although it is mostly insignificant. This could be due to the fact that there is reverse causation with the rise in commodity exports leading to an appreciation of the Rand.[26]

Looking at our various measures of protection, we find a large positive and significant impact of surcharges on the manufacturing trade balance in all regressions. However, higher nominal output tariffs, effective protection rates and the implicit tax on exports all worsen the trade balance. The coefficients on each of these variables are significant in the case of non-commodity manufactures. For commodities, though, these coefficients are not significant. Our results when including both the export tax and the nominal output tariff in the regression (Table 19) suggest that the improvement in the

[26] See Bell et al. (1999) on changes in the commodity composition of manufacturing in response to commodity price cycles.

trade balance for non-commodities is primarily driven by a reduction in the implicit tax on exports, rather than changes in the tariff on output. When all manufacturing sectors are included, though, the opposite is the case and it is higher nominal tariffs that lead to a declining trade balance. These results starkly contrast the multi-country studies of developing countries by UNCTAD (1999) and Santos-Paulino and Thirlwall (2004). Rather than worsening the trade balance, our results suggest that the stimulus to non-commodity export growth from liberalization exceeded the increase in imports. In sum, we not only find that trade liberalization stimulates sectoral exports but that it also boosts the sectoral balance of trade.

These results may seem surprising, but they are quite in line with the findings of Edwards (2001) that on balance, changes in trade flows had very small effects on employment in the 1990s and with the data on the ratio of trade balances to total output in manufacturing reflected in Table 20 below.

Table 20: Ratio of net trade balance to output (current dollars)

	1970	1980	1990	2000	2004
Manufacturing	-0.28	-0.26	-0.10	-0.10	-0.14
Man Commodities	-0.01	0.02	0.07	0.09	0.10
Other Manufacturing	-0.27	-0.28	-0.18	-0.19	-0.24
Services	0.00	0.01	0.01	0.01	0.01
Total	-0.02	0.05	0.03	0.02	0.00
Total Non-Gold	-0.06	-0.05	0.00	0.00	-0.02

Source: Quantec (2005)

Conclusions

If South Africa is to boost its investment relative to GDP, as called for under its ASGI-SA program, this paper concludes that at constant exchange rates, import growth is likely to outpace output growth. Absent an adequate availability of foreign capital or continued improvements in the terms of trade, policies to switch expenditures from foreign to domestic output and increase national saving could well be required.

On average, a one percent increase in gross domestic expenditure leads to similar growth in import demand. Each one percent increase in industrial production in the rest of the world has a similar impact on South African non-commodity exports. But on the import side, the mix of expenditure also matters. In particular, gross fixed investment is about fifty percent more import-intensive than consumption expenditure. If South Africa is to boost its investment relative to GDP, as called for under the ASGI-SA program, import growth is likely to outpace output growth. Absent an adequate availability of foreign capital or continued improvements in the terms of trade, policies to switch expenditures from foreign to domestic output and increase national saving could well be required. This paper explored trade policy as an expenditure switching instrument.

South African trade policy has exerted a major influence on the composition and aggregate growth of trade. In the Apartheid period, trade protection seriously impeded both exports and imports, and the economy depended on global commodity price trends to avoid running into an external constraint. South Africa developed a comparative advantage in capital-intensive primary and manufactured commodities partly because of its natural resource endowments but also because the pattern of protection was particularly detrimental to exports of non-commodity manufactured goods. High and opaque tariffs seriously impeded export growth. When global commodity markets were weak, in combination with declining gold exports, this seriously constrained aggregate growth and dulled the response of exports to the weaker rand in the late 1980s. On the other hand, surcharges were effective in reducing imports. By contrast, trade liberalization in the 1990s not only increased imports but, by reducing both input costs and the relative profitability of domestic sales, also boosted exports. Indeed, the growth in non-commodity manufactured sectoral exports as a result of liberalization was actually faster than sectoral imports.

In addition to tariffs, both non-commodity exports and aggregate imports are responsive to changes in the real exchange rate. This evidence suggests, therefore, that South African entrepreneurs are not inherently biased against exports but instead respond rationally to the incentives that they face. It points to the importance of policies that

afford them access to inputs at world prices as well as a competitive real exchange rate. It also suggests that additional trade liberalization could well be part of the strategy to enhance export diversification – one of the goals of ASGI-SA.

References

Alleyne, T. and Subramanian, A. 2001 "What Does South Africa's Pattern of Trade Say about its Labor Market?" (October 2001). IMF Working Paper No. 01/148

Aron, J., Elbadawi, I. and Kahn, B. 2000. "Real and Monetary Determinants of the Real Exchange Rate in South Africa." In Elbadawi, I. and T. Hartzenberg (eds.) *Development Issues in South Africa*, London, MacMillan.

Aron, J., Muellbauer, J. and Smit, B. 2004. "A Structural Model of the Inflation Process in South Africa." CSAE Working paper series 2004-08.

Bahmani-Oskooee, M. 1988. "Cointegration Approach to Estimate the Long-run Trade Elasticities in LDCs." *International Economic Journal*, 12, 3: 89-96.

Bahmani-Oskooee, M. and Niroomand F. 1998. "Long-run Price Elasticities and the Marshall-Lerner Condition Revisited." *Economics Letters*, 61, pp. 101-109.

Behar, A. and Edwards, L. 2004. "Estimating Elasticities of Demand and Supply for South African Manufactured Exports using a Vector Error Correction Model." Centre for the Study of African Economies Working Paper Series, WPS/2004-04.

Bell, T., Farrell, G. and Cassim, R. 1999. "Competitiveness, International Trade and Finance in a Minerals-Rich Economy: The Case of South Africa." Paper prepared for IDRC project April 1999

Bhorat, H. 1998. "Income and price Elasticities in Manufactured Exports". Working Paper 13, Development Policy Research Unit.

Bleaney, M. 1999. "Trade reform, Macroeconomic Performance and Export Growth in Ten Latin American Countries, 1979-95." *Journal of International Trade and Economic Development*, 8: 1, 89-105.

Edwards, L. 2001. "Globalisation and the Skill Bias of Occupational Employment in South Africa." *South African Journal of Economics*, 69, 1: 40-71.

Edwards, L. 2005. "Has South Africa Liberalised its Trade?" *South African Journal of Economics*, 73, 4: 754-775.

Edwards, L. and Golub, L. 2004. "South Africa's International Cost Competitiveness and Productivity in Manufacturing." *World Development*, 32, 8: 1323-1339

Edwards, L. and Wilcox, O. 2003. "Exchange Rate Depreciation and the Trade Balance in South Africa." Prepared for South African National Treasury.

Edwards, L. and Alves, P. 2006. "South Africa's Export Performance: Determinants of Export Supply." *South African Journal of Economics*, 74, 3: 473-500.

Fedderke, J. and Schaling, E. 2005. "Modelling Inflation in South Africa: A Multivariate Cointegration Analysis." *South African Journal of Economics*, 73, 1: 79-92.

Fallon, P. and Pereira da Silva, L. 1994. "South Africa: Economic Performance and Policies." World Bank Informal Discussion Papers on Aspects of the South African Economy no. 7, The Southern Africa department, The World Bank.

Goldstein, M. and Khan, M.S. 1985. "Income and Price Effects in Foreign Trade." In Jones, R.W. and Kenen, P.B. (eds.) *Handbook of International Economics,* Vol. II.

Golub, S. 2000. "South Africa's International Cost Competitiveness." Paper presented at the TIPS annual forum, 18-20 September, 2000.

Golub, S.S. and Ceglowski, J. 2002. "South African Real Exchange rates and Manufacturing Competitiveness." *South African Journal of Economics*, 70(6), 1047-1075.

Gumede, V. 1999. "Import Demand Elasticities for South Africa: An Application of Recent Time Series Econometric Techniques." Paper presented at TIPS annual forum, 1999.

Gumede, V. 2000. "Import Demand Elasticities for South Africa: A Cointegration Analysis." *Journal for Studies in Economics and Econometrics*, 24: 21-37.

Jenkins, C., Bleaney, M. and Holden, M. 1996 "Trade Liberalization in Sub-Saharan Africa: Case Study of South Africa." Center for the Study of African Economies, Oxford University WPS/96-6

Johansen, S. 1988. "Statistical Analysis of Cointegrating Vectors." *Journal of Economic Dynamics and Control*, 12: 231-254.

Johansen, S. 1992. "Determination of Cointegration Rank in the Presence of a Linear Trend." *Oxford Bulletin of Economics and Statistics*, 54: 383-397.

Johansen, S. and Juselius, K. 1990. "Maximum Likelihood Estimation and Inference on Cointegration – with Applications to the Demand for Money." *Oxford Bulletin of Economics and Statistics*, 52, 2: 169-210.

Jonsson, G. 1999. "Inflation, Money Demand and Purchasing Power Parity in South Africa." IMF Working paper WP/00/122.

Kaseeram, I., Nichola, T. and Mainardi, S. 2004. "South African Inflationary Dynamics and the Pass-Through Effects from Depreciation to Unit Labour Costs." *South African Journal of Economics*, Vol. 72(1), 85-107.

Lall, S. 2000. "The Technological Structure and Performance of Developing Country Exports." 1985-1998. QEH Working Paper 44, Queen Elizabeth House, Oxford University.

Lerner, Abba P. 1936. "The Symmetry between Import and Export Taxes." *Economica* NS 3 (August): 306-13.

MacDonald, R. and Ricci, L. 2004. "Estimation of the Equilibrium Real Exchange Rate for South Africa." *South African Journal of Economics*, 72, 2: 282-304.

Narayan S. and Narayan P.K. 2003. "Import Demand Elasticities for Mauritius and South Africa: Evidence from Two Recent Cointegration Techniques." Technical Report Discussion papers no. 09/03, Department of Economics, Monash University, Australia.

Naudé, W. A. 2000. "The Determinants of South African Exports: An Econometric Analysis." South *African Journal of Economics*, 68(2), 246-265.

Naudé, W. A. 2001. "Shipping Costs and South Africa's Export Potential: An Econometric Analysis." *South African Journal of Economics*, 69(1), 123-146.

Nell, K. 2000. "Imported Inflation in South Africa: An Empirical Study." University of Kent, Studies in Economics Series 0005

Quantec 2005. *South African Standardised Industry Database*, Quantec Research. Available from http://www.tips.org.za/data/

Santos-Paulino, A. and Thirlwall, A.P. 2004. "The impact of trade liberalisation on exports, imports and the balance of payments of developing countries." *The Economic Journal*, 114 (February), F50 – F72.

Senhadji, A. 1997. "Time-Series Estimation of Structural Import Demand Equations: A Cross-Country Analysis." International Monetary Fund (IMF) Working Paper, WP/97/132.

Senhadji, A. and Montenegro, C. 1998. "Time Series Analysis of Export Demand Equations: A Cross-Country Analysis." IMF Working Paper, WP/98/149.

Smal, M.M. 1996. "Exchange Rate Adjustments as an Element of a Development Strategy for South Africa." South African Reserve Bank Quarterly Bulletin, No. 200, Article, pp. 30-39.

Tsikata. Y. 1999. "Liberalisation and trade performance in South Africa." World Bank Informal Discussion Papers on Aspects of the South African Economy no. 13, The Southern Africa department, The World Bank.

UNCTAD 1999. *Trade and development report, 1999*. United Nations, Geneva

Appendix

Table A1: Ratio of Primary Commodity Inputs to Output, 2000

Coke & refined petroleum (331-333)	0.495
Food (301-304)	0.395
Tobacco (306)	0.323
Basic iron & steel (351)	0.314
Other manufacturing (392-393)	0.233
Non-metallic minerals (342)	0.218
Wood & wood products (321-322)	0.178
Basic chemicals (334)	0.161
Basic non-ferrous metals (352)	0.134
Glass & glass products (341)	0.1
Beverages (305)	0.079
Rubber products (337)	0.067
Paper & paper products (323)	0.066
Textiles (311-312)	0.049
Other chemicals & man-made fibers (335-336)	0.021
Furniture (391)	0.018
Metal products excluding machinery (353-355)	0.013
Plastic products (338)	0.008
Footwear (317)	0.008
Motor vehicles, parts & accessories (381-383)	0.007
Professional & scientific equipment (374-376)	0.006
Electrical machinery & apparatus (361-366)	0.005
Machinery & equipment (356-359)	0.005
Leather & leather products (316)	0.004
Other transport equipment (384-387)	0.003
Wearing apparel (313-315)	0.001
Printing, publishing & recorded media (324-326)	0
Television, radio & communication equipment (371-373)	0

Table A2: Variable descriptions

Variable name	Description and source
Aggregate import equations	
M	Imports: Volume (Unit: Index 2000=100, seasonally adjusted (Period); Source: SARB Quarterly Bulletin (S-089))
PPPI/PMAN	Relative Price (Pmppi/PPIMan), calculated using PPI imports and PPI manufacturing production for domestic use
PMUV/PMAN	Relative Price (Pmuv/PPIman) , using Import unit values (SARB) and PPI for Manufacturing
TARP	Collection rates, calculated as tariff revenue as share merchandise import value [SARB data] (%)
TARSURP	Collection rates incl surcharges [SARB data] (%)
GDE	Gross domestic expenditure, 2000 prices (Unit: R millions (Period)) [Source: SARB QB (S-117)]
CT	Final consumption expenditure: Households + Government, Constant 2000 prices (Unit: R millions (Period)) [Source: SARB QB (S-117)]
GDFIRES	Gross fixed capital formation by type of asset: Constant 2000 prices - Residential buildings (Unit: R millions (Period)) [Source: SARB QB (S-128)]
GDFINRES	Gross fixed capital formation by type of asset: Constant 2000 prices - Non-residential buildings (Unit: R millions (Period)) [Source: SARB QB (S-128)]
GDFICONST	Gross fixed capital formation by type of asset: Constant 2000 prices - Construction works (Unit: R millions (Period)) [Source: SARB QB (S-128)]
GDFITRANS	Gross fixed capital formation by type of asset: Constant 2000 prices - Transport equipment (Unit: R millions (Period)) [Source: SARB QB (S-128)]
GDFIME	Gross fixed capital formation by type of asset: Constant 2000 prices - Machinery and other equipment (Unit: R millions (Period)) [Source: SARB QB (S-128)]
GDFITOT	Gross fixed capital formation: Constant 2000 prices, S.A. annualised rates by organisation: Total (Unit: R millions (Period)) [Source: SARB QB (S-125)]
GDFIELECT	Gross fixed capital formation: Constant 2000 prices by economic activity: Electricity, gas and water (Unit: R millions (Period)) [Source: SARB QB (S-125)]
GDFITSC	Gross fixed capital formation: Constant 2000 prices by economic activity: Transport, storage and communication (Unit: R millions (Period)) [Source: SARB QB (S-125)]
GDFICOMM	Gross fixed capital formation: Constant 2000 prices by economic activity: Community, social and personal services (Unit: R millions (Period)) [Source: SARB QB (S-125)]
Aggregate export equations	
XVOL	Exports: Excluding gold - Volume (Unit: Index 2000=100, seasonally adjusted) [Source: SARB Quarterly Bulletin (S-087)]
PRODF	Weighted average index of foreign Industrial production. constructed using SARB weights as used in REER
TARP	Collection rates, (t) calculated as collection duties over import values using SARB data.
PPIQSA	PPI: Total output of SA industry groups - All groups - South African (Unit: Index: 2000=100) [Source: P0142.1 - Table 11]. Prior to 1970 estimated using PPI from SARB
PPIF	Weighted average foreign price, constructed using SARB weights as used in REER [YASH]
GDPGAP	Difference between GDP (constant 2000 prices, SARB) and Hodrick-Prescott smoothed GDP
XCOM	Commodity manufacturing exports (Rm, constant 2000 prices), Quantec (2005)
XNCOM	Non-commodity manufacturing exports (Rm, constant 2000 prices), Quantec (2005)
XMAN	Manufacturing exports (Rm, constant 2000 prices), Quantec (2005)
NEER	Nominal effective exchange rate, calculated using SARB weights as used in REER
Panel estimation	
Ad valorem	Share of HS-8 digit tariffs lines with advalorem rates. Source: Edwards (2005)
K/L	Machinery & equip K stock/empl 1995 prices. Source: Quantec (2005)
Skill share	share highly skilled+ skilled/employment. Source: Quantec (2005)
Surcharges	Surcharge revenue as share import value. Source: Edwards (2005)
ERP	ERP using 93 sector Supply Use table for 2000 and scheduled tariff rates. Source: Edwards (2005)
Volume	Sales measured in 2000 prices. Source: Statistics South Africa
Export tax	Input weighted tariff as share value added at world prices. Source: Edwards (2005)
TB	Trade balance. Ln(export value/import value). Source: Customs and Excise data, South African Reserve Bank

Note: Variables preceded by "L" are in logs

Table A3: Import Demand Studies for South Africa

STUDY	PRICE ELASTICITY	INCOME ELASTICITY	PERIOD	COMMENT
This study (Average)	-0.871 to -1.72		1962Q1 – 2004Q3	Johansen cointegration technique
Bahmani-Oskooee and Niroomand (1998)	-0.53	0.43	1960 – 1992 Annual Data	Johansen cointegration technique for 30 countries
Edwards and Wilcox (2003)	-1.59	1.92	1972Q1 – 2001Q4, Quarterly Data	Johansen cointegration technique
Golub (2000)	Range between -0.05 and -0.32	Range between 0.93 and 1.04		Ordinary Least Squares, using varying effective exchange rate measures
Gumede (1999) & (2000)	-0.71 for capital intensive goods -3.00 for labour intensive goods -1.56 total	1.06 total	1960 – 1996 Quarterly	Engle-Granger cointegration approach
Narayan and Narayan (2003)	-0.61	1.19	1960 – 1996 Quarterly Data	Bounds test cointegration approach
Senhadji (1997)	-1.00 in the long-run -0.44 in the short run	0.68	34 observations	Fully modified (FM) estimators using Monte Carlo method for 77 countries
Smal (1996)	-0.85	1.47	1985Q1 – 1994Q4, Quarterly Data	Ordinary Least Squares using non-oil imports
Bahmani-Oskooee (1998)	-1.37	2.174	1973-1990 Annual data	Johansen cointegration technique
Golub and Ceglowski (2002)	-0.48 to -1.05	1.06 to 1.88	1970- 1980 Annual data	OLS
Fallon and Pereira de Silva (1994)	-0.74 to -1.46	1.12 to 1.61 for GDP ΔInv/GDP = 0.53	1960 – 90 Annual data	OLS

Table A4: South African price, income and other export elasticities

Author	Price elasticity of demand	Price elasticity of supply	Income	Other	Period	Comments
Alves and Edwards (2006)	infinity	1.81 to 2.05	1.2 to 1.61	Import penetration (0.23 to 0.55) Infrastructure (+)	1970-2002	Panel of data for 28 manufacturing sectors. Fixed effects and GMM estimators
Behar and Edwards (2004)	-3 to -6	0.76 to 1.3	2 to 3.5		1975q1 to 2000q4	Manufacturing. Uses VECM
Edwards and Golub (2004)	-1.62 to –2.76 (RULC)		1.28 to 3.19		1970-1997	Manufacturing. Uses panel data techniques Relative price is RULC
Golub and Ceglowski (2001)	0.78 to -1.08		0.76 to 1.46		1970-98	Uses alternative price variables in REERs.
Golub (2000)	-0.78 to -1.37 -0.99 to –0.84		0.62 to 1.42 NS to 3.62		1970-98 1971-98	Uses alternative price variables in REERs.
Naude (2000, 2001)						Data non-stationary, no cointegration. Estimated in first differences. REER, shipping and imports significant
Tsikata (1999)	-1.09 in SR –1.6 in LR -0.8		0.55 in SR 0.81 in LR. 0.45 (short run)	Tariff (0.77) Sanction (-0.14) Capacity (NS) Tariff (-0.86) Capacity (NS)	1970-96	Reduced form Export function OLS and 2SLS
Senhadji and Montenegro (1998)	-0.5		0.65		Obs = 34	Multi-country study
Smal (1996)	-0.58 for merchandise, -1.4 for manufacturing, -0.31 for minerals		0.76 to 1.04		1985Q1 to 1994Q4	
Fallon and Pereira de Silva (1994)	-0.43 in SR -0.63 in LR		0.02 (only for post 85)	Capacity (1.63 to –2.24)	1972-89	OLS
Bhorat (1998)		2.99 for Paper & paper prods	1.01 for Food,beverage, tobacco		Quarterly data: 1990.02 – 95:12	Export supply function using cointegration. 7 sectors.