Productivity-raising interventions for the South African economy: A CGE analysis

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ABSTRACT

The paper employs a Standard International Food Policy Research Institute (IFPRI) computable general equilibrium model for South Africa to evaluate the impact of a range of policy interventions on total factor productivity and the economy as a whole. The model is characterised by imperfect competition in the manufacturing sector and is underpinned by the most recent SAM released by Statistics South Africa. A number of policy levers are tested including tariff liberalisation, increased competition as well as rising levels of investment. The results indicate that increasing the level of competition has strong positive impact on growth with GDP being approximately 1.2 per cent higher in the short- to medium term. In addition, reducing the level of tariffs and increasing the level of investment have an even stronger growth impact, emphasising the advantages of introducing a suite of complementary policy interventions. However, the dependence of foreign savings due to the low level of domestic savings limits the positive benefits. Most sectors of the economy benefit, independent of whether they experience a direct rise in the level of competition, as strong growth within the manufacturing sector generates extensive spillovers to the other sectors of the economy. At an industry level, the Electrical Machinery, Construction, chemicals and metal producing industries expand rapidly. Trade liberalisation offers wide-ranging economic benefits with the employment of low skilled workers and household expenditure both rising significantly. The paper concludes by highlighting policies that can increase the level of productivity in South Africa and explores some further avenues of research that will benefit the current analysis.

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1. Introduction

Productivity growth plays an integral role in economic development; it is critical in raising the sustainable rate of economic growth and provides the foundation for improving living standards and welfare. The literature emphasises that productivity gains are influenced by a range of factors. These include investment in education, research and development (R&D) and infrastructure but also policies to boost the framework conditions for productivity growth such as conducive competition and regulatory policy. In this paper we concentrate on three policy levers – trade liberalisation, increased competition and a higher rate of investment – and evaluate the impact of policy interventions in these areas on total factor productivity (TFP) and the economy as a whole.

The analysis employs a Standard International Food Policy Research Institute (IFPRI) general equilibrium model for South Africa with imperfect competition. The results confirm the positive effects of increased competition and tariff liberalisation, which have been evidenced in the literature.[2] However, rising inequality and low levels of domestic saving may limit the benefits. Further the productivity response of some sectors may be too weak to compensate for the increased levels of competition.

The paper is structured as follows. In section 2 we provide a brief background to South Africa's productivity performance, illustrating the role of productivity in the economic growth and providing some international comparisons. Section 3 discusses the drivers of productivity growth paying attention to the theory and empirical literature informing on how changes in our policy levers affect productivity. Section 4 provides an overview of the methodology that is employed in the paper with reference to the implementation of imperfect competition. This is followed by a discussion of the results, which outline the economy wide effects from implementing the policy levers and identify some important constraints. Section 6 concludes by providing some policy recommendations.

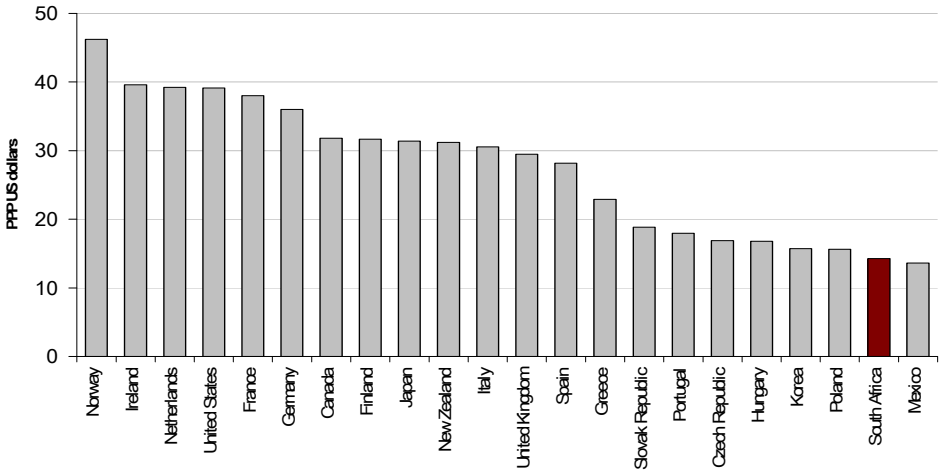
[2] For a comprehensive review see Fedderke and Simbanegavi (2008).

2. South Africa's productivity performance

Productivity essentially conveys the efficiency with which factor inputs are combined in the production process. In South Africa, growth accounting exercises have suggested that there has been a structural shift in the sources of economic growth with productivity or technological progress becoming more important after the transition to democracy in 1994 (Fedderke, 2002; Arora and Bhundia 2003; Faulkner & Loewald, 2008). Indeed, it has been estimated that growth in total factor productivity accounted for half of real GDP growth between 2001 and 2007 (Faulkner & Loewald, 2008).

From an international perspective, however, South Africa's (labour) productivity, as measured by output per worker hour is shown to be very low. Recent calculations suggest that out of a 29 country sample of OECD countries, South Africa's economy-wide productivity level over the last five years ranks 28th with average output per worker half that in most advanced economies and below many emerging markets.[3] Only Mexico ranks lower.

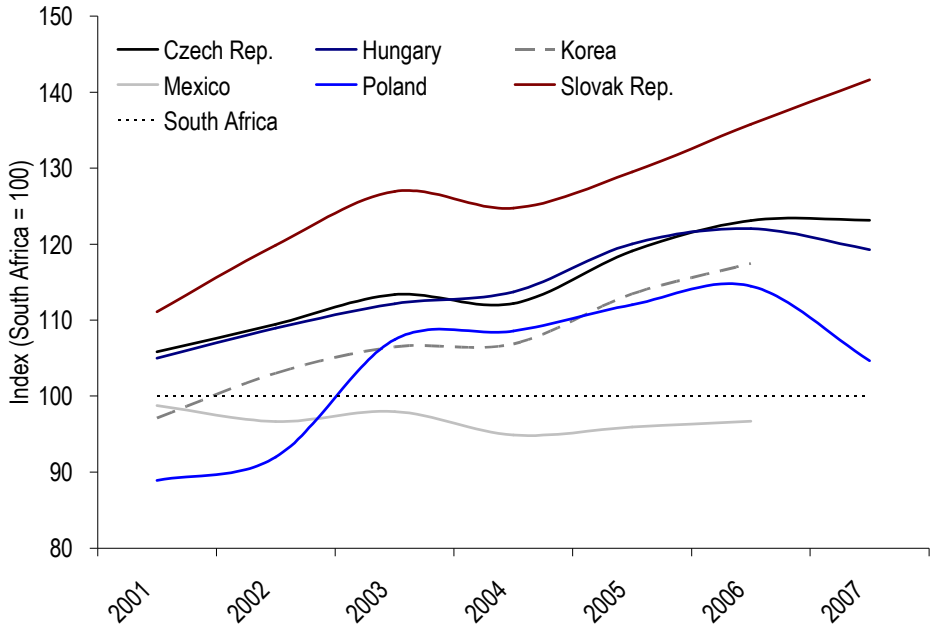
Figure 1: International comparison of average labour productivity (output/worker hour) US$ at PPP exchange rates, 2003-2007



[3] Productivity levels, measured by output per worker hour were converted into a common currency – US dollars – using purchasing power parity (PPP) exchange rates.

What is also evident is that it has been the emerging market economies, arguably South Africa's closest competitors in the global market, that have experienced the highest levels of labour productivity growth. Any productivity advances South Africa has made, which are quite limited, have been against advanced economies. This divergent trend, which has been noted before in relation to manufacturing sector competitiveness (Edwards and Golub, 2002), must therefore be a concern.[4] The result is apparent in the emerging and growing productivity gap between South Africa and its emerging market rivals over the period 2001 to 2007 (figure 2). Relative productivity has deteriorated significantly over this period ranging from a 13.6% decline in relative productivity against Hungary to a deterioration of 27.5% against the Slovak Republic. Indeed from a position of broad parity in 2001, South Africa is shown to have become significantly less competitive.

Figure 2: Productivity gap with emerging market economies, 2001-2007[5]



[4] Edwards and Golub (2002) investigating South Africa's manufacturing sector find that whilst competitiveness had risen relative to developed countries in the 1990s compared to the 1970s and 1980s, the sector remained much less competitive relative to developing countries.

[5] Figure 5 should be read as following. Each economy's labour productivity is calculated as a ratio to South Africa – hence why South Africa is 100. An increase in this ratio shows that productivity levels have grown relative to South Africa. The figures represent the percentage deterioration in South Africa labour productivity relative to each comparator.

These findings should be of considerable concern for policy makers given that labour productivity levels are an important indicator of international competitiveness and that productivity growth is important for achieving long-term and sustainable economic growth. Raising productivity should be a priority for South Africa, and it is to the drivers of productivity growth that we now turn.

3. The drivers of productivity growth

There are manifold drivers of an economy's productivity performance. Investment in physical capital can raise labour productivity directly by providing workers with machinery and equipment to operate and can facilitate the introduction of new technology. Improving human capital and skills will raise the productive potential of employees. Direct engagement in activity to raise innovation and technological progress through research and development (R&D) will accelerate the adoption of new technologies and best practice. Competition reduces slack within the firm and provides the incentives for firms to adopt new technologies and engage in innovative activity. Stimulating enterprises through increased competition will also benefit productivity due to pro-competition effects and the fact that cutting-edge innovation is often derived from new market entrants.

In this paper we concentrate on the effects of competition, trade liberalisation and investment on productivity, applying policy interventions within these areas to the South African context.

3.1 Competition and productivity

Increased competition can generate both static (one-off) and dynamic (on-going) gains in productivity. Static gains to productivity, once-off efficiency gains, derive from both within-firm effects and between firm effects. Heightened competition reduces managerial inefficiency or less slack in the use of inputs – so-called "x-inefficiency" – in response to greater pressure to perform. Static gains are also realised from resource reallocation as competition ensures a market-sorting process whereby higher productivity firms expand market share at the expense of less productive firms. Dynamic gains or dynamic efficiency is increased through the

enhanced incentives to undertake technological improvements and innovation or the more rapid diffusion of innovation.

Static gains: eliminating x-inefficiency and the market-sorting mechanism

The empirical literature provides strong evidence for the effect of stronger competition on static efficiency gains. Imperfect competition can weaken the incentives for production efficiency within the firm and therefore can impair performance. This channel receives significant empirical support and there are many instances where productivity has improved markedly in the wake of regulatory reform in industries sheltered from competition. Often these weaknesses can be traced to weak governance structures (Nickell, 1996). Increasing competition helps alleviate these inefficiencies, provide a frame of reference for management performance and reduce the underlying principal-agent problem (Griffith, 2001).[6] Bloom and Van Reenen (2006), for example, find poor management practices are more prevalent when product market competition is weak. In particular, "surprisingly bad" management practices are found in firms and industries characterised by low competition.

Market sorting also allows heightened competition to generate static gains through a Darwinian mechanism whereby more efficient and productive firms are "rewarded" with higher profits and market share (Office of Fair Trading, 2007). Attempts to determine whether within-firm or between-firm effects are dominant have delivered ambiguous results. These will often be determined by the country and time period of study. Scarpetta et. al. (2002) find that market-sorting accounts for between 20 and 40 per cent of total productivity growth across ten OECD countries in the 1980s and 1990s.

Dynamic gains: innovation and technological progress

In the medium and long run, it is dynamic gains and dynamic efficiency that matters for higher sustainable rates of economic growth and improved standards of living.

[6] Griffith (2001) finds that an exogenous rise in competition increases the productivity of firms likely to be subject to principal-agent problems but not in firms without such problems.

The importance of innovation and technological progress for economic growth is well-established. Using private sector R&D as a proxy for innovation activity, the OECD estimates that a 1 per cent increase in the R&D to GDP ratio raises economic activity by 1.2 per cent (Bassinani & Scarpetta, 2001). Supporting this finding from the South African perspective, Fedderke (2005) finds a positive relationship between R&D and total factor productivity (TFP) growth.

The precise relationship between competition and innovation has been subject to intense debate and there are opposing views as to whether monopoly or strong competition is a more important stimulatory factor for innovative activity and the creation of new products and processes. There is a seeming tension and therefore balance to be achieved between fostering competition and the protection of intellectual property rights. It has been argued that increased competition encourages innovation through a number of channels. In imperfect competition new firms, who are the undisputed drivers of innovation, are in short supply. Regulatory reform to facilitate entry can therefore spur innovation and dynamic efficiency.

Vibrant product market competition has been shown to be essential in generating *ex ante* incentives to engage in innovative activity. At the same time, however, R&D may also be encouraged when innovating firms are providing some degree of market premium over new innovations *ex post*. Recent empirical evidence is also mixed. Bassinani & Ernst (2002) and Ahn (2002) shown that a product market regulatory environment conducive to competition has a positive effect on R&D intensity in manufacturing. The OECD has also illustrated repeatedly that many cross-country differences in R&D intensity can be explained by differences in such regulations. Other studies, however, argue that the relationship may be an inverted "U" shape (Aghion et. al. 2002, 2006) indicating that neither monopoly nor a highly competitive structure is most advantageous to innovation.

Competitive structure and mark-ups

The concept of competition is hard to quantify and difficult to measure accurately. Direct measures are not available and this results in the application of a range of proxies including price levels, concentration ratios or profit margins. In South Africa

the literature investigating concentration and mark-ups has tended to use the Gini and Rosenbluth indices, the C5% index and to a lesser extent Concentration Ratios and the Herfindahl-Hirschmann index (see Fedderke and Simbanegavi (2008) for a thorough review). This empirical literature tends to find that industry concentration in South African manufacturing is high and increasing up to 1996 with some decrease post-1996.

A growing literature focuses on profit mark-ups to proxy the intensity of competition. The OECD (Høj et. al. 2007) for example suggests that among the G7, Japan has the lowest average mark-ups in manufacturing (~10%), with other smaller OECD economies such as Belgium, Denmark and Luxembourg also experiencing low mark-ups as they benefit from a high degree of trade openness. The highest average mark-ups are found in some continental European countries and Canada (~15%). Høj et. al. (2007) show that mark-ups tend to be lower in manufacturing because of the greater exposure to international competition. Services are less traded and are often subject to greater regulation and stricter standards. Empirical evidence for South Africa suggests manufacturing mark-ups are significantly higher than in comparable industries world-wide and non-declining (Fedderke et. al. 2005, Aghion et. al. 2007, Aghion et. al. 2008).[7]

Product market regulation, mark-ups and competition

There is increasing attention dedicated to the analysis of product market regulations (PMR) and the relationship between the policy/regulatory environment and competition. Measures of PMR provide a snapshot of economy-wide regulation and are indicators that summarise rules and regulations with the potential to reduce the strength of competition. It has been shown that a PMR environment that is less conducive to competition is positively and significantly correlated with mark-ups across countries. Høj et. al. (2007) show that the correlation is strongest with barriers to trade and investment, entry barriers and economic regulation.

[7] There are dissenting voices to this view, in particular Edwards & Van der Winkel (2005) and Du Plessis and Gilbert (2007).

There is growing empirical support for the productivity-enhancing effects of raising the intensity of competition. Using estimates of price-cost mark-ups, the literature finds a positive and significant long-term effect of product market competition on productivity growth. Nickell (1996) finds a negative relationship between the size of the price-cost mark-up and productivity growth within a panel of British manufacturing firms.[8] In South Africa, Aghion et. al. (2006) find similar results and emphasise the deleterious effects higher mark-ups have on productivity growth, estimating that a 10 per cent reduction in South African mark-ups would increase productivity growth by close to 2 per cent per year .

3.2 Trade liberalisation and productivity growth

Gains from international trade and investment potentially accrue through a number of channels. The most familiar is that trade improves the efficiency in the allocation of resources across countries through the exploitation of comparative advantage. In a similar process to the market-sorting mechanism discussed earlier, the more efficient allocation of resources will provide static gains to an economy's productivity.

Trade liberalisation and increasing openness can be influential determinants of productivity growth. This can be through the pro-competitive channel outlined above. Edwards and van de Winkel (2005) find that a 1 per cent decline in tariff rates reduces mark-ups by 10 to 14 percentage points on average. However, this effect does not only take place through the pro-competitive effects of trade liberalisation but also through the impact on new ideas, adoption of international best practice, capital deepening, learning effects and technology transfer (Aron, 2001; Arora & Bhundia, 2003). Trade and FDI are also likely to allow the exploitation of increasing returns to scale as firms are able to expand production for larger markets. Ratso and Stokke (2008) separate the effect of openness on South Africa between investment and productivity. They find that the effect on long-run GDP is divided between 1/3 directly via investment, 1/3 directly via productivity and 1/3 indirectly via the productivity effect on investment.

[8] Nickell (1996) finds that a 10 percentage point increase in the mark-up is associated with a loss of 1.3 to 1.6 percentage points in multi-factor productivity.

The scale of benefits of these types of reforms is illustrated in a paper that attempts to quantify the benefits of liberalising product markets and reducing barriers to international trade and investment (OECD, 2005). In adopting the "best practice" with respect to these areas (i.e. reducing the barriers to trade to the lowest in the OECD), the OECD estimates an increase in exports of 25 per cent and GDP per capita to rise by 1¼ to 3 per cent. These are permanent gains. The recent OECD economic assessment of South Africa (OECD, 2008) provides an insight into product market regulation in the economy and suggests PMR is towards the higher end of the OECD scale. This suggests that were South Africa to adopt "best practice", gains of this magnitude could also be realised.

3.3 Investment and productivity

Investment in physical capital has an important influence on productivity. Historically the strong link between investment in plant and machinery and productivity growth emphasises the pivotal role of mechanisation. An important explanation for the productivity enhancing effects of investment is the technology and technological progress embodied in capital investment. De Long (1991) shows that countries that have invested heavily in machinery that have grown most rapidly and argues that investment provided workers with the capital and machinery to gain experience with technologies that raised productivity. The poor labour productivity performance in the United Kingdom and its productivity gap with other G7 countries is also largely attributed to the lower capital stock of firms and stock of public infrastructure (HMT, 2000). Arora and Bhundia (2003) find investment in capital and machinery to be important in explaining TFP growth in South Africa.

The investment-productivity relationship is, however, subject to concerns relating to endogeneity, since faster technological change and higher productivity can induce investment and capital deepening.

Infrastructure investment also has a role to play, indirectly increasing the productivity of private investment through improving the economy's underlying transport infrastructure, energy generation and telecommunications network. Fedderke &

Bogetic (2006) estimate the impact of infrastructure spending on TFP growth and, once controlling for endogeneity, find a positive and significant relationship.[9]

4. Methodology

Our approach is based on a Standard International Food Policy Research Institute (IFPRI) computable general equilibrium (CGE) model for South Africa, which incorporates imperfect competition.

The implementation of imperfect competition in the model is based on Francois (2004). We effectively place a wedge between the producer price (PDS) and the consumer price (PDD). This is reflected in the mark-up price PDM.

$$PDM_C = \frac{\varepsilon_C}{\varepsilon_C + \Omega} \cdot PDS_C$$

$$\Rightarrow PDM_C = \frac{-\left(\sigma_c + (1-\sigma_c)\frac{PDD_C QD_C}{PQ_C QQ_C}\right)}{-\left(\sigma_c + (1-\sigma_c)\frac{PDD_C QD_C}{PQ_C QQ_C}\right) + \Omega} \cdot PDS_C$$

where

σ_c - CET elasticities by commodity

Ω- market power index

QD_c - quantity sold domestically of domestic output

QQ_c - quantities of goods supplied to the domestic market (composite supply)

PQ_c - composite commodity supply

In addition, the equation for income for domestic non-government institutions is changed to reflect the extra source of income.

[9] Fedderke and Bogetic (2006) estimate that a 1% increase in infrastructure expenditure results in a 0.04 percentage point increase in TFP.

In order to avoid calculating Ω, we endogenise omega and calculate the mark-ups exogenously. There are a number of studies that have done this for South Africa. These include Edwards and van de Winkel (2005), Fedderke et al. (2005) and Aghion et al. (2006). However, their findings are considerably different. For example, Fedderke et al. (2005) find that the average mark-up for manufacturing is between 72 per cent and 79 per cent, while Edwards and van de Winkel (2005) find this mark-up to be around 42 per cent.[10] An additional problem is that the calculated mark-up using these studies exceeds the total gross operating surplus in the Social Accounting Matrix. This mainly reflects that mark-ups are calculated over marginal cost rather than average cost. To circumvent this problem we calculate the return on capital as in Edwards and van de Winkel (2005), using

$$R = ((i - \Pi_E) + \delta).p_k$$

Where

R- rental price of capital

i- the long-run interest rate

Π_E - the expected inflation rate

δ - the depreciation rate

p_k - price deflator for investment

A common depreciation of 5 per cent is imposed onto all sectors. The rent from imperfect competition is calculated as a residual from the gross operating surplus after accounting for the return on capital. Table A1 in Appendix shows the calculated mark-ups.

Further, the model has 48 production activities and is based on 2005 SAM, generated by Quantec. [11] Production is a constant elasticity of substitution (CES) aggregation. The factors of production are divided into formal and informal labor, self-employed

[10] Fedderke and Simbanegavi (2008) provide possible explanations for these dicrepencies.
[11] For more detail on the model see Kearney(2004)

labor, and capital. Further, labour is divided into skilled, semi-skilled and unskilled. High- skilled labour is fully employed and reflects the skill constraint which characterises the South African economy. Capital is fully-employed but also activity-specific. In all simulations the exchange rate is flexible.

In addition, imported and domestic goods are imperfect substitutes in domestic consumption (Armington hypothesis), likewise exports and local sales are imperfect substitutes for local producers.

Four simulations are implemented in the CGE framework to test how increased levels of competition and trade liberalisation will impact the economy through their impact on productivity.

1. **Mark-ups across the manufacturing sector are removed.** In this scenario, we test what the impact on the economy would be if mark-ups decline and productivity does not react.
2. **Mark-ups across the manufacturing sector are removed, but productivity responds as in Aghion et al. (2006).** This scenario aims to illustrate the economy wide impacts from increased levels of competition and subsequent response from productivity gains. The shocks to productivity are summarised in Table 1 below.
3. **Tariff liberalisation leading to higher levels of competition, productivity and investments.** This simulation builds on the first two, but it also introduces findings from Edwards and van de Winkel (2005) as well as Rattso and Stokke (2008). In this case it is tariff liberalisation that leads to increased levels of competition as in Edwards and van de Winkel (2005). This has an impact on productivity, which affects investment. The shock to investment leads to further gains in productivity. Investment expenditure is financed from domestic savings
4. **Tariff liberalisation leading to higher levels of competition, productivity and investments.** This is the same simulation as simulation 3, but is partly financed through foreign savings.

Table 1: Productivity and mark-up shocks for the different sectors (%)

Industries	Base mark-up (%)	Productivity shock(%)
Food	4.77	0.76
Beverages and Tobacco	26.65	4.26
Textiles	2.05	0.33
Wearing apparel	2.02	0.32
Leather and leather products	2.27	0.36
Footwear	8.95	1.43
Wood and wood products	3.41	0.55
Paper &paper products	7.38	1.18
Printing, publishing and recorded media	0.00	0.00
Coke & refined petroleum products	20.65	3.30
Basic chemicals	10.20	1.63
Other chemical and man-made fibres	3.97	0.63
Rubber products	3.92	0.63
Plastic products	5.84	0.93
Glass & glass products	20.03	3.20
Non-metallic minerals	27.30	4.37
Basic iron & steel	9.78	1.56
Basic non-ferrous metals	33.16	5.31
Metal products, excluding machinery	6.13	0.98
Machinery and equipment	2.61	0.42
Electrical machinery	2.54	0.41
Television, radio and communication equip	11.03	1.77
Professional & scientific equipment	16.66	2.66
Motor vehicles, parts and accessories	0.47	0.08
Other transport equipment	0.63	0.10
Furniture	0.00	0.00
Other industries	46.24	7.40

5. Results

We turn now to the results. Increasing the levels of competition and trade liberalising have positive effects on the economy. However the results depend on the availability of savings, which are needed to provide funds for investment.

Eliminating mark-ups in the manufacturing sector in **simulation 1**, lead to higher levels of output. Prices of intermediate and final goods decline, encouraging consumption. It is this higher level of consumption, which offsets lower profitability and stimulates further production and investment.

Although, only mark-ups in the manufacturing sector decline, all sectors of the economy benefit from lower prices and higher demand from households. The higher production levels increase employment, which provides further stimulus to household demand. The overall effect is that GDP increases by 0.7 per cent in the short to medium-run (table 2).

Imports decline as domestic goods become cheaper, whereas exports decline due to an appreciation in the rand.

Table 2

Real GDP (% change from base)

	Simulation1	Simulation 2	Simulation 3	Simulation 4
Private Consumption	1.0	1.5	-3.1	1.9
Gross Fixed Investment	1.7	2.4	20.0	20.0
Change in Inventories	0.0	0.0	0.0	0.0
Government Consumption	1.2	0.1	0.0	0.0
Exports	-0.1	0.7	2.8	-5.1
Imports	-0.1	0.7	2.7	5.5
GDP at Market Prices	0.7	1.2	1.2	1.4
Net Indirect Taxes	0.5	1.0	1.3	2.9
GDP at Factor Cost	0.7	1.1	1.2	1.2

Simulation 2 builds onto simulation 1 by introducing the effect of increased levels competition on productivity as explained in Aghion et al. (2006). While some firms will exit the market, others will become more productive and will experience both static and dynamic gains

Investment and consumption increase by more than in simulation 1, with output rising by 1.2 per cent in the short-run compared to the base case (Table 2). Firms that become more efficient and productive generate higher profits and market share. Sectors that experience the largest drop in mark-ups, also have the largest productivity gains, causing larger increases in output (Table 3).[12] Even though, the rand appreciates in relative terms (table 7), the higher levels of productivity lead to higher exports as South Africa's competitiveness improves. Government savings also rise in response to the higher economic activity (Table 7). Consumers benefit from higher employment, which in turn leads to higher income and consumption (Tables 3-5).

[12] These sectors include Beverages and Tobacco, Glass and Glass Products as well as Basic non-ferrous Metals.

The key question then is what will lead to a reduction in the levels of mark-ups and subsequent increase in productivity. Trade liberalisation is one shock to the economy, which can increase the levels of competition, stimulate investment and increase productivity as discussed in the Literature Review section.

Simulation 3 combines trade liberalisation with increasing the levels of competition, higher productivity and investment. An important assumption in this case is that investment is financed from domestic saving.

Table 2 indicates that consumption declines by around 3 per cent despite employment rising in Table 4. This largely reflects the need to increase the levels of savings in order to finance the increase in investment and thus productivity. Sectors that rely on household consumption such as Textiles and Wearing Apparel experience declines whereas those that are investment driven such as Construction record a positive growth.

The higher levels of productivity along with weaker exchange rate (Table 7) make South Africa's exports more competitive (Table 2), while the higher levels of production by some sectors and lower import tariffs encourage imports despite the weaker currency. Overall imports rise by 2.7 per cent and exports by 2.8 per cent.

Table 3

Real GDP by sector (% change from base)

Industries	Simulation 1	Simulation 2	Simulation 3	Simulation 4
Agriculture, forestry & fishing	0.8	0.8	0.4	-0.8
Coal mining	0.2	0.2	0.6	-1.1
Gold and Uranium ore mining	-0.3	-1.0	1.0	-6.7
Other mining	0.0	0.1	0.4	-0.5
Food	1.2	1.4	-0.7	0.2
Beverages and tobacco	2.6	5.5	4.6	3.6
Textiles	1.3	1.2	-1.6	-3.8
Wearing apparel	0.4	0.3	-2.8	-1.9
Leather and leather products	3.9	3.7	3.0	-3.1
Footwear	3.6	4.1	-0.7	-1.0
Wood and wood products	1.7	1.9	5.5	2.0
Paper &paper products	3.0	3.7	3.6	1.5
Printing, publishing and recorded media	0.8	1.1	-0.5	0.8
Coke & refined petroleum products	0.5	2.9	2.8	2.5
Basic chemicals	3.4	4.4	4.9	2.2
Other chemical and man-made fibres	2.2	2.4	1.4	0.7
Rubber products	3.1	3.2	1.3	-1.9
Plastic products	2.2	2.7	4.0	2.5
Glass & glass products	4.1	6.1	6.2	3.9
Non-metallic minerals	3.0	4.8	11.2	10.6
Basic iron & steel	0.9	2.1	3.1	0.5
Basic non-ferrous metals	1.4	6.8	7.1	6.4
Metal products, excluding machinery	3.7	4.3	9.1	5.8
Machinery and equipment	2.7	2.5	6.6	0.1
Electrical machinery	3.8	4.2	10.6	8.4
Television, radio and communication equipment	1.9	2.9	6.4	0.9
Professional & scientific equipment	3.3	5.7	6.6	-1.3
Motor vehicles, parts and accessories	1.0	0.9	2.0	0.8
Other transport equipment	1.1	0.8	2.1	-2.3
Furniture	1.1	0.5	2.3	-2.1
Other industries	2.5	7.3	8.0	8.0
Electricity, gas and steam	0.5	1.0	0.6	0.6
Water supply	0.7	1.1	-0.5	1.1
Building construction	1.5	2.2	16.1	16.4
Wholesale & retail trade	1.3	2.0	2.2	2.4
Catering &accomodation services	0.5	0.5	-1.2	-1.0
Railway transport	0.7	1.0	1.6	-0.1
Road transport	1.1	1.7	0.1	1.6
Transport via pipeline	0.1	0.2	0.5	-0.2
Water transport	0.3	0.4	1.3	-0.9
air transport	1.1	1.2	3.6	-1.0
Transport supposrt services	0.4	0.6	1.1	-0.1
Communication	0.3	0.5	-0.3	0.2
Finance & Support	0.5	0.8	-0.1	1.0
Business Services	0.6	0.8	0.4	1.2
Medical, dental & other health & veterinary services	0.5	0.9	-3.4	0.8
Community, social & personal services	0.3	0.6	-3.5	-0.7
Government	-1.1	-1.1	-1.2	-1.1

Table 4

Employment (% change from base)

Labour Categories	Simulation1	Simulation 2	Simulation 3	Simulation 4
High-skilled (formal emp)	0	0	0	0
High-skilled (self emp.)	0	0	0	0
Medium-skilled (formal emp.)	2.0	2.7	2.5	3.2
Medium skilled (self emp.)	0	0	0	0
Low-skilled (formal emp.)	2.1	2.5	3.5	3.6
Low-skilled (self-emp)	0	0	0	0
High-skilled (informal emp)	0	0	0	0
Medium skilled(informal emp)	3.1	4.3	5.7	6.7
Low-skilled (informal emp)	2.7	3.4	6.0	6.1

Table 5

Household Income (% change from base)

Household Deciles	Simulation1	Simulation 2	Simulation 3	Simulation 4
HHD0	-0.2	-0.1	-2.2	-0.8
HHD1	-1.1	-1.1	-3.2	-2.1
HHD2	0.0	0.1	-2.2	-0.5
HHD3	-0.3	-0.3	-3.4	-1.2
HHD4	0.7	1.0	-2.6	0.3
HHD5	1.0	1.3	-2.6	0.5
HHD6	1.3	1.6	-2.9	0.9
HHD7	1.4	1.8	-3.3	0.9
HHD8	1.6	2.1	-2.3	1.5
HHD91	1.8	2.3	-2.3	1.7
HHD921	1.9	2.4	-2.1	1.9
HHD922	1.2	1.4	-11.4	-1.4

Table 6

Household Consumption (% change from base year)

Household Deciles	Simulation1	Simulation 2	Simulation 3	Simulation 4
HHD0	0.8	1.1	0.7	2.5
HHD1	-0.3	-0.1	-0.5	1.0
HHD2	0.6	0.9	0.3	2.3
HHD3	0.1	0.3	-1.1	1.3
HHD4	0.9	1.3	-0.7	2.4
HHD5	1.0	1.4	-0.9	2.5
HHD6	1.2	1.6	-1.3	2.6
HHD7	1.3	1.8	-1.9	2.5
HHD8	1.3	1.9	-1.2	2.8
HHD91	1.3	2.0	-1.4	2.7
HHD921	1.4	2.1	-1.4	2.8
HHD922	0.6	0.9	-11.0	-0.8
TOTAL	1.0	1.5	-3.1	1.9

All deciles experience similar decline in household consumption with the exception of the top decile, which is disproportionately affected by lower mark-ups and the need to save more to finance the investment expenditure.

The Government deficit widens in Table 7 reflecting lower tax revenues. Our assumption is that government expenditure remains unchanged.

Table 7

% change from base	Exchange rate	Government Saving
Simulation 1	-0.7	-48.3
Simulation 2	-1.1	2.5
Simulation 3	0.3	-51.6
Simulation 4	-4.5	-30.5

In the last simulation (**Simulation 4),** foreign savings are assumed to finance some of the increase in investment. This provides for some relief on domestic savings. Households are able to increase their consumption (Table 6) in response to the higher levels of employment (Table 4) compared to simulation 3. However, some deciles still experience a decline in income. This reflects the fall in economic activity in some sectors such as Textiles and Wearing Apparel. The productivity gains in these sectors are not enough to compensate for the higher levels of competition from cheap imports.

In addition, some sectors of the economy decline as the flow of capital into the country appreciates the rand and makes local products uncompetitive despite the higher productivity. Exports decline by 5.1 per cent (Table 2). However, sectors such as Construction, continue to benefit from the higher investment expenditure. The overall impact on the economy is positive, with GDP growth rising by 1.4 per cent.

Unfortunately, the income gains are unequally distributed pointing in the direction of rising levels of inequality. The skill constraint in South Africa pushes up real wages for high-skilled labour as output and the demand for labour increases. In addition, it is the top deciles that own capital, which is fully employed and activity specific. Factor incomes for capital also increase with economic growth, contributing to higher

income for the top deciles. This is true for all simulations except simulation 3, where households need to cut expenditure and save.

Overall, the results indicate that productivity has a positive net effect on the economy whether it is stimulated through increased levels of competition or trade liberalisation.[13] However, the impact depends on how investment is financed and thus the level of domestic savings imposes an important constraint. Further for some sectors, the productivity gains are too small to compensate for the increased competition from imports.

6. Conclusion

South Africa's productivity growth continues to fall behind other emerging countries. This has important implications for the country's competitiveness. The value of the exchange rate has often been blamed for the lack of competitiveness of South Africa's exports, while the role of competition and productivity has been avoided in the debate.

While productivity can be increased through a number of different ways including education and research and development, this paper tests the impact of increased trade liberalisation and competition on productivity and the economy as whole. The results are positive with GDP increasing by 1.4 per cent when tariff liberalisation leads to higher competition, productivity and investment. However, the lack of domestic savings compromises the benefits for the country as households either need to save more and sacrifice consumption or the country needs to rely on foreign savings to finance its investment expenditure. In addition, the levels of inequality may increase further as the top deciles of the income distribution benefit disproportionately from higher incomes due to the skills constraint characterising South Africa. More people are employed implying that although inequality may be rising, the levels of poverty are declining.

[13] The same simulations were done using the estimated mark-ups from Edwards and van de Winkel (2005), the economy wide effect was larger and more positive reflecting the elimination of larger rents due to imperfect competition. The results were also compared to a simulation where all the mark-ups in the economy were eliminated. Generally, mark-ups tend to be lower in manufacturing because of the greater exposure to international competition (Høj et. al. 2007). The interaction between the different sectors and the elimination of much greater rents in the tertiary sector, accompanied by stronger productivity shocks generated GDP growth benefits of more than 10 per cent.

South Africa has increased its efforts in curbing anti-competitive behaviour, however these still remain inadequate. While improving the resource base within institutions such as the Competition Commission may address the problem to some extent, it will never be enough to solve the inherently uncompetitive South African economy. Further trade liberalisation can do that and policy makers should stop delaying the process. While vocal lobby groups will argue against it, the benefits for all South Africans form higher levels of competition, lower prices and higher productivity should be born in mind. Further policies to facilitate investment and provide sufficient funds for investment must be put in place.

The results from the paper are largely based on the size of the mark-ups on which there is no consensus in South Africa (Table A1 in the Appendix). This largely reflects the unavailability of firm level data which has complicated the estimation process (Edwards and Rankin 2008). Assuming higher mark-ups and removing them leads to higher benefits for the economy. Our paper looks only at the manufacturing sector and hence does not eliminate the distortions that exist in other sectors of the economy. Preliminary results point in the direction that eliminating all the rents will have much larger and positive impact on the economy. Further research should address these issues as well as investigate how rents from anti-competitive behaviour are distributed.

References:

Aghion, P., Bloom, N., Blundell, R., Griffith, R., and Howitt, P. (2002) Competition and Innovation: An Inverted U Relationship, *NBER Working Paper No. 9269*

Aghion, P., Braun, M., and Fedderke, J. (2006) Competition and Productivity Growth in South Africa, *CID Working Paper*, No.132

Aghion, P., Blundell, R., Griffith, R., Howitt, P., and Prantl, S. (2006) The Effects of Entry on Incumbent Innovation and Productivity, *NBER Working Paper No. 12027*

Ahn, S. (2002) Competition, Innovation and Productivity Growth, *OECD Working Paper No. 317*

Arora, V. and Bhundia, A. (2003) Potential Output and Total Factor Productivity in Post-Apartheid South Africa, *IMF Working Paper*, WP/03/178

Bassinani, A. and Scarpetta, S. (2001) Does Human Capital Matter for Growth in OECD Countries? *OECD Working Paper No. 282*

Bassinani, A. and Ernst, E. (2002) Labour Market Institutions, Product Market Regulation, and Innovation: Cross Country Evidence, *OECD Working Paper No. 316*

De Long, B. (1991) Productivity and Machinery Investment: A Long Run Look 1870-1980, *NBER Working Paper No. 3903*

Edwards, L., and T. van de Winkel (2005) The Market Disciplining Effects of Trade Liberalisation and Regional Import Penetration on Manufacturing in South Africa, *TIPS Working Paper Series*, Working Paper No 1-2005.

Edwards, L., and N. Rankin (2008) South African Exporting Firms: What do we know and what should we know, *Journal of Development Perspectives,* Vol 4(1), pp. 93-118.

Faulkner, D. and Loewald, C. (2008) Policy Change and Economic Growth: A Case Study of South Africa, *Commission on Growth and Development Working Paper No. 41*

Fedderke, J. W. (2002) The Structure of Growth in the South African Economy: Factor Accumulation and Total Factor Productivity Growth 1970-1997, *South African Journal of Economics*, 70(4), 612-646

Fedderke, J., Kularatne, C., and Mariotti, M. (2007) Mark-up Pricing in South African Industry, *Journal of African Economics*, 16(1), 28-69

Fedderke, J. and Simbanegavi, W. (2008) South African manufacturing industry structure and its implications for competition policy, *Journal of Development Perspectives*, Vol. 4:1, p. 134-189.

Golub, S. and Edwards, L. (2003) South African International Cost Competitiveness and Exports: A Sectoral Analysis, *Trade and Industry Monitor*, Vol. 25 (March)

Griffith, R. (2001) Product Market Competition, Efficiency and Agency Costs: An Empirical Analysis, *Institute of Fiscal Studies Working Paper No. WP01/12*

H M Treasury (2000) Microeconomic Reform in Britain: Delivering Opportunities for All edited by Balls, E., Grice, J. and O'Donnell, G., Palgrave

Høj, J., Jimenez, M., Maher, M., Nicoletti, G., and Wise, M. (2007) Product Market Competition in the OECD Countries: Taking Stock and Moving Forward, *OECD Working Paper No. 575*

Nickell, S. (1996) Competition and Corporate Performance, *Journal of Policitical Economy,* Vol. 104 724-746

Nicoletti, G and Scarpetta, S. (2003) Regulation, Productivity and Growth, *OECD Working Paper No. 347*

OECD (2005) The Benefits of Liberalising Product Markets and Reducing Barriers to International Trade and Investment: The Case of the United States and the European Union, *OECD Working Paper No. 432*

OECD (2008) South Africa Economic Assessment

Office of Fair Trading (2007) Productivity and Competition: An OFT perspective on the productivity debate

Rattso, J., and E. Stokke (2008)" Trade Barriers to Growth in South Africa: Endogenous Investment-Productivity-Trade Interactions"

Scarpetta, S., Hemmings, P., Tressel, T. and Woo, J. (2002) The Role of Policy and Institutions for Productivity and Firm Dynamics: Evidence from Micro and Industry Data, *OECD Working Paper No. 329*

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Appendix

TableA1: Mark-ups for the South African Manufacturing Sector

Industries	Aghion et al. (2006) Table 10:1995:2004	Edwardsand van de Winkel (2005): table	Faulkner and Makrelov (2009)
Food	1.08	1.12	0.05
Beverages and Tobacco	2.29	2.26	0.27
Textiles	-7.79	0.25	0.02
Wearing apparel	1.26	1.15	0.02
Leather and leather products	0.63	-0.3	0.02
Footwear	-0.25	0.3	0.09
Wood and wood products	0.47	0.4	0.03
Paper &paper products	0.22	0.06	0.07
Printing, publishing and recorded media	1.19	1.57	0.00
Coke & refined petroleum products	0.07	0	0.21
Basic chemicals	2.12	0.84	0.10
Other chemical and man-made fibres	0.59	1.11	0.04
Rubber products	0.29	-0.05	0.04
Plastic products	0.07	-0.23	0.06
Glass & glass products	0.85	-0.32	0.20
Non-metallic minerals	1.36	0.68	0.27
Basic iron & steel	1.03	0.97	0.10
Basic non-ferrous metals	1.52	0.85	0.33
Metal products, excluding machinery	1.55	-0.01	0.06
Machinery and equipment	0.79	1.57	0.03
Electrical machinery	0.27	0.19	0.03
Television, radio and communication equipment	-0.01	-0.03	0.11
Professional & scientific equipment	0.52	-0.24	0.17
Motor vehicles, parts and accessories	1.12	1.69	0.00
Other transport equipment	1.41	1.16	0.01
Furniture	0.11	-0.31	0.00
Other industries	0.42	0.22	0.46