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An Empirical Assessment of the Impact of Trade Liberalization on Employment in South Africa

Evans K. Chinembiri

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A paper for
Trade and Industrial Policy Studies

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Acronyms

EOI	Export Oriented industrialisation
GDP	Gross Domestic Product
ISI	Import substitution Industrialisation
SIC	Standard industrial Classification/Code

Executive summary

This study seeks to model the effects of trade on employment in South Africa in a Labour Demand framework. The study uses aggregated data, as opposed to a number of studies that have used either factor content or growth accounting approaches. Specifically, the paper seeks to determine the extent to which imports, exports, wages and output have impacted upon employment levels across the primary, secondary, and tertiary sectors at the aggregated level of the Standard Industry Classification (SIC).

Tertiary employment lagged by one year was found to have a significant effect on current tertiary employment. In the regression that included employment levels in other economic sectors as variables and tertiary employment figures from the previous year were statistically significant at one percent level. Moreover, primary employment levels are significant at five percent in this regression. The categorical variable introduced to represent the change in a number of policies (dummy 1994) was also found to be significant at the 10 percent level. The proxies for trade liberalisation, wages and the effect of technological advancement (captured in the time variable) were *not* found to have any effect on tertiary labour.

In the secondary sector import penetration was found to have a significant effect on employment at the 10 percent level of significance. The coefficient carried with it a negative sign, reflecting a negative association between import penetration and secondary sector employment. As in the tertiary sector the lagged dependent variable indicates persistence in the level of employment, as it was found to be significant at the 1 percent level. The proxy for technological advancement (captured in the time variable) was also found to be significant at five percent level. The explanatory variables included in the regression were found to explain 76 percent of the variation. The estimated equations were found to be highly statistically significant.

In the secondary employment sector regression that included other economic sectors import penetration emerged as negatively associated with employment levels and significant at five percent. Moreover, the employment levels from the previous year were found to have an impact on the current employment figures. Eighty-five percent of the variation in secondary sector labour was captured by the variables included in the equation. Export openness and wages were found not to have a statistically significant effect on secondary labour.

In the Primary sector first regression wages narrowly falls out of the significant range. Both the tertiary and secondary sector the lagged dependent variable, as it was found to be significant at five percent level. The dependent variables included in the equation accounted for less than half of the variation in employment levels, suggesting that factors other than those included in the equation could have played role. The second estimated equation that included employment levels of other sectors revealed import penetration as having a negative impact on primary employment levels at the five percent level of significance. The levels of employment from the preceding year seemed to have a positive effect on the current levels of employment. Finally export openness, wages and the other sectors employment levels were found not to have any effect on Primary sector employment.

The analysis carried out in the study reveals that the derived labour demand in the primary sector (agriculture, fishery forestry and mining activities) and the secondary (manufacturing, utilities and construction) industries have been impacted negatively by increased imports. There was insufficient statistical evidence from the data to suggest that derived labour demand for any of the sectors was increased by growing exports openness however.

Introduction

As the world progresses towards a unified global community driven by the *neo-liberalism* ideology, developing countries have jumped on to the liberalisation band wagon, some as a result of choice, but most as a result of Breton-Woods institutional support conditions. South Africa is no stranger to liberalisation and has elected, over the past two decades, to pursue extensive liberalisation in a number of its sectors, after a history of inward looking policies (Cassim *et al.* 2004). Theory states that trade expands as entrepreneurs and firms worldwide continue to search for the cheapest source of intermediary goods and export to markets that have the best price, and will continue to do so because they find it advantageous. This leads to a rationalization of resources in line with the principles of comparative advantage; allowing for increased efficiency, (reflected in lower prices of inputs and final goods) and a wider selection of commodities of differing quality from which the consumer can choose (Jansen & Lee 2007). The practicality of rationalization of jobs comes in the form of company closures and job losses in some parts of the economy (job destruction), with start-ups of new firms, investment in increased production and vacancy announcements (job creation), in other parts of the economy.

The Heckscher-Ohlin framework suggests that South Africa has a comparative advantage in unskilled labour intensive goods, given high levels of unemployment and the country's abundance of labour. The Heckscher-Ohlin theory predicts that liberalising trade would lead to an expansion in the demand for unskilled labour commodities driving the increase in wages and possibly employment for unskilled labour. The ultimate result would be a decreasing income inequality and poverty. Sadly this appears not to have been the case (as shown by Natrass 1998). Undeniably, there has been an increase in exports and imports following the opening up of the economy (Pretorius 2002). This is as predicted by theory but the accompanying increase in employment levels is still to be seen.

This paper seeks to empirically quantify the impact of trade liberalisation on different employment sectors. This study models the effects of trade on employment in the South African context in a labour demand framework but using aggregated data as opposed to a number of studies that have used either factor content or growth accounting approaches

Specifically, the paper will seek to determine the extent to which imports, exports, wages, and output have impacted upon employment levels across in the primary secondary and tertiary sectors using data spanning 38 years (from 1970-2008) and the Standard Industry Classification (SIC). The novelty of this study is that it takes a look at how employment has been affected by trade

liberalisation at the primary, secondary and tertiary sectors. This will give greater insight as to which sector (using the SIC) benefited most from liberalisation and to what extent, a gap that has not been addressed by the literature to the author's knowledge.

South Africa's Trade and Employment studies

The term liberalisation describes the complete or partial elimination of trade distorting government policies, and is a form of trade policy that allows traders to act and transact with minimal interference from government. This interference usually manifests itself as subsidies, taxes and tariffs, and non-tariff barriers (such as regulatory legislation and quotas). South Africa provides a classic example of a switch away from inward looking trade policy characterised by high tariffs, quota restrictions and import substitution policies towards a liberalised export oriented trade strategy. Unfortunately the increased openness has not been accompanied by the expected rapid employment growth, but appears to have actually led to formal sector employment declines (Jenkins 2006). According to Jenkins, (2006) the "job shedding growth" paradox sparked research into the possible causes of this and consequently generated a large body of research that contains an assortment of results: interestingly, the studies have yielded inconclusive results even within the same theoretical framework (see Edwards & Behar 2005). The remainder of this section will take a look at some of the prominent studies that have been carried out on trade and employment.

Researchers Edwards & Behar (2005), using the ideologies that form the basis of theoretical frameworks used in trade and employment studies identified two major camps of studies. The one camp founded their analysis on the neo-classical model; while the other group based their investigations on heterodox approaches.¹

Trade economists Alleyne & Subramanian (2001) carried out a full factor content study that estimated the capital labour ratio and the skilled-unskilled labour ratio of exports and imports. Essentially a factor content study in this context refers to analysing the amount of labour required to produce an export good and also determines the amount of labour that would have been required to domestically produce an imported good. The net effect of trade is then approximated as the disparity in labour content between exports and imports which can be determined in aggregate

¹ The Neo-classical approach is based on the Heckscher-Ohlin-Samuelson model which predicts that countries have comparative advantages in producing goods that employ the most abundant factor most intensively. A key part of this model is the assumption that labour markets are competitive. While there is no single theoretical model on par with the HOS model in neoclassical, heterodox approaches are identified by certain key features that include amongst other things, imperfect labour markets.

terms, categories of workers and for particular industries. The results of the study showed that South Africa's exports are relatively capital intensive compared with both imports and domestic consumption.

In contrast, Bell & Cattaneo (1997), who employed a heterodox approach, showed that labour intensive exports had declined while import penetration was particularly marked in ultra labour intensive sectors. The study further revealed that skill intensity of exports increased but it was not as skill intensive as what was observed for imports.

Another trade and employment study was carried out by Borat (1999) which contributed to the body of literature on trade and unemployment. The author, using the Katz and Murphy approach, showed that trade in manufactures made a positive contribution to employment between 1970-1987 but had a negative impact between 1988 and 1997. A number of studies that used different methodologies agree with the findings of Borat (1999). An example of this would be Birdi *et al.* (2002) who made use of Arellano & Bond's (1991) econometric approach thereby estimating a labour demand equation using dynamic panel data. Another example of concurring work would be that of Edwards (2001).

The study conducted by Edwards (2001) drew upon the works of Greenhalgh *et al.* (1998) who augmented the growth decompositions in Chenery (1979) and Chenery *et al.* (1986) to incorporate occupational employment. Essentially this approach breaks down changes in occupational employment into four demand side factors: domestic final demand expansion, export expansion, import substitution, and technological change. The study revealed that trade in manufactures had a positive effect on trade between 1984 and 1988, which later turned negative in the following five year period as trade liberalisation was intensified, and was neutral between 1993 and 1997, an outcome similar to that of Birdi *et al.* (2002) and to Borat (1999).

Fedderke *et al.* (2003) also carried out a product-price study. This research employed a number of techniques to study Stolper-Samuelson effects in the quantity as well as the price dimension. The findings of the study revealed that prices seemed to increase most rapidly in labour intensive industries and that trade has mandated an increased earnings for labour and reduced the rate of return to capital, what Jenkins, (2006) described as a surprising result as this did not fall in line with what was expected from the theory.

South African Trade Policies and Employment Trends

According to Barker (1999), it is particularly difficult to isolate the effects of trade policy on employment. This is because of the wide range of causes that can attribute to changes in employment levels. These causes can be at a national level (labour market policies, macroeconomic policies, or movements along the business cycle) or could be the result of global changes (technological change, and Global downturns). This section will give a brief historic account of the instruments relating to trade that have been used by the South African Government.

A number of studies reveal that South Africa has switched between Import Substitution Industrialisation (ISI) and Export Oriented Industrialisation (EOI).² According to Moritz (1994), 1925 saw South Africa espouse ISI as the conduit of industrialisation, a position that was motivated by the Second World War. This policy successfully saw the transition of the economy from the production of light to heavy industry increasing the share of Heavy industry manufacturing value added from 36.4 percent to 64.3 percent (Moritz 1994). South Africa chose to deepen ISI, as opposed to switching to EOI, once the relatively easy stage of ISI was implemented. Cassim *et al.* (2004) report that ISI deepening was aligned with upstream, capital intensive heavy industrial chemical ventures (the likes of Sasol, Atlantis Diesel Engines and Mossgas). These industries were allowed to develop by means of direct support as well as through protection from international rivals though in return these industries had to meet a number of requirements (such as supplying a minimum of 60 percent of output to the domestic market as well as other employment, economic growth and technological development criteria - Cassim *et al.*, 2004).

Significant changes have taken place since 1948 with regard to economic growth in South Africa, (as measured by changes in GDP). According to Moll (1989), the economic growth pattern of South Africa can be split into six phases. The first phase ran from 1948 to 1960 and was characterised by relatively high economic growth rates and low inflation. Employment (as measured by the standardised employment series³) increased at an average of 2.2 percent per annum translating to an increase of 104 000 labour units per annum over this first period. 1961 to 1972 marked the second phase that saw growth rates of up to 5.3 percent per annum and a corresponding increase in the employment rate of 2.63 per annum (142 000 new jobs per annum). The third phase that

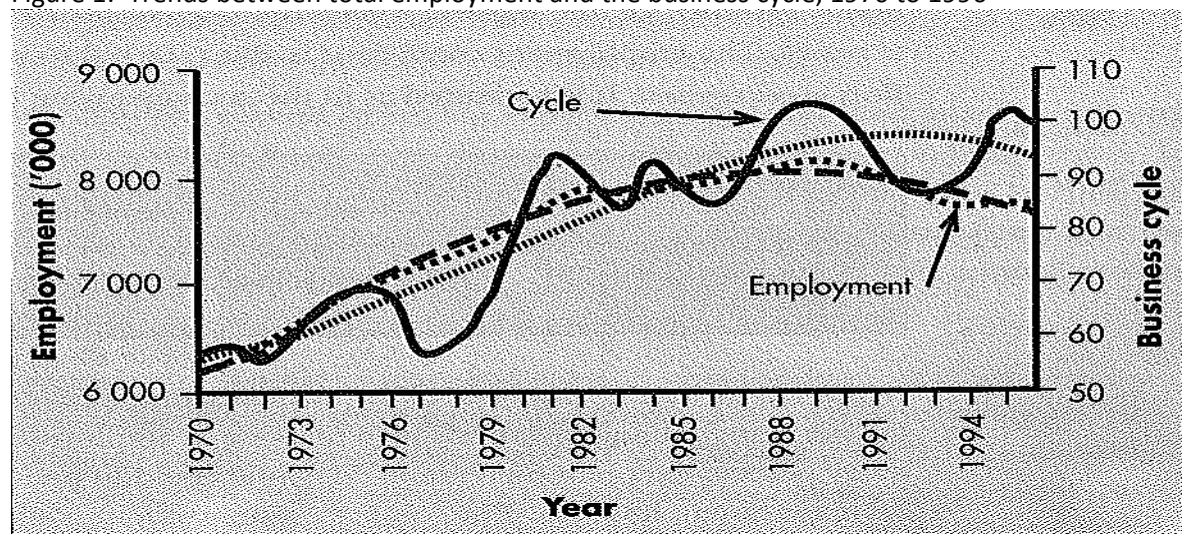
² See Holden (1990), Bell (1993), Strydom (1995); Belli, Finger & Ballivan (1993); Jenkins & Siwisa (1997).

³ The Standardised Employment Series is a series that records employment levels as units of full time equivalents (40 hour working week), and takes account of formal employment and domestic workers. The series is largely based on Central Statistical Service Surveys (Klassen & Wolard 1999).

spanned 1973-1978 was characterised by comparatively low but fluctuating growth rates – these averaged 2.9 percent per annum over the period - and employment growth slowed down to average 2.2 percent per annum. Economic growth subsequently improved to 3.1 percent per annum in the period 1979-1984, but the rising civil and political unrest suggested that this growth rate was unsustainable. Over this latter period, employment growth rate dropped to 1.4 per annum. The 1985 foreign debt crisis left South Africa stuck in the typical developing country debt trap, worsened by extensive capital outflows and declining raw material prices. To top it all off, sanctions, civil unrest, and disinvestment reduced the average growth rate to a mere 0.6 per annum in that year. Employment between 1985 and 1983), initially increased slightly but declined after 1989 - , and the net decline over the period averaged 148 000 labour units.

It was not until the democratic elections of 1994, that the economy showed signs of recovery - economic growth averaged 2.75 percent per annum between 1994 and 1997. Although the average growth was modest, it was far better than prior to the elections. The economic growth failed to translate into job creation however and employment continued to decline by 0.18 percent per annum. Figure 1 shows the trends between total employment and the business cycle.

Figure 1: Trends between total employment and the business cycle, 1970 to 1996



Source: Barker (1999), Figure 4.1, p. 109.

South African Trade Policy

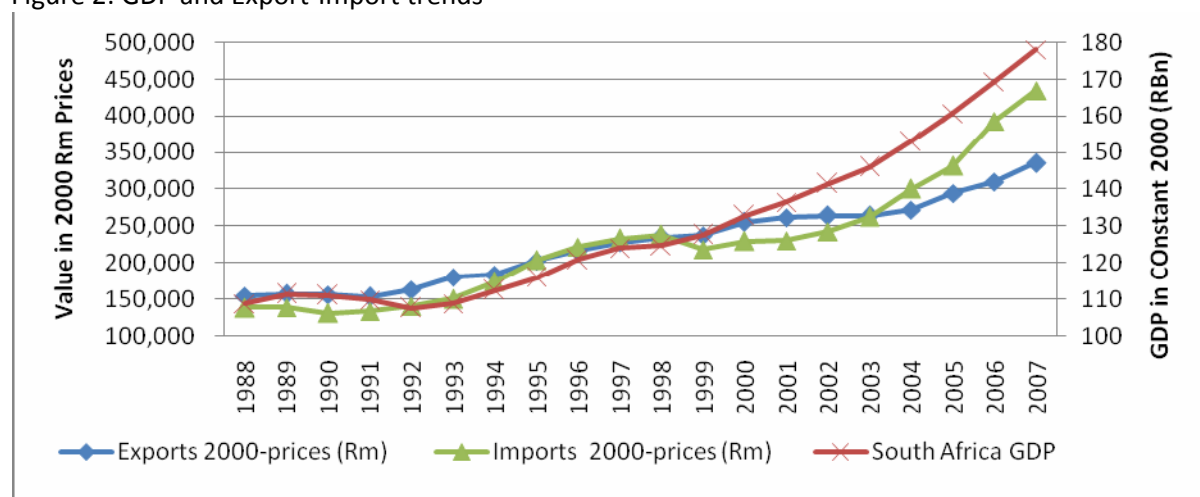
On the trade policy aspect, the use of import controls became the major device in supporting import substitution and the permits issued during the 1960 were skewed in favour of capital goods, a key requirement for the country's industrialisation process. To put it briefly, the import substitution

policy created capital intensive production structure which was strongly dependent on imports of intermediate and capital goods. The policy failed to create employment, encourage the emergence of a diversified, internationally competitive manufacturing sector and very nearly drove the economy towards de-industrialisation, (Moritz 1994; Draper & Alves 2007; Department of Trade and Industry 2007).

The 1990s were characterised by a declining GDP, low investment and an external capital account that was in deficit for close to a decade, it was clear that the South African economy faced a crisis. During that period South Africa's trade policy favoured the domestic industries, with high tariffs and incentive schemes that were running at heavy cost to the fiscus, (Department of Trade and Industry 2007). This undoubtedly led to low levels of productivity and competitiveness. Additionally the legacy of apartheid left the bulk of the population, excluded from the economy, unemployed and unskilled and facing extreme poverty.

In 1994 the democratically elected government of South Africa ushered in a new economic era, symbolised by the stabilisation of critical macroeconomic variables, a market determined exchange rate, a more competitive international trade arena, and the removal of gross allocative inefficiencies, all which were sufficient to put the South African economy on the path to economic prosperity. The economy diversified its exports from the former natural resource based products towards the agro processing and services sector (Draper & Alves 2007).

Figure 2: GDP and Export-Import trends



Sources: Quantec Database 2009 & World Development indicators Online (consulted 2009)

Figure 2 reveals some interesting trends, South African GDP, Exports and Imports tend to follow the same path up until 1992 (the height of political pressures against the Apartheid Government) sees a

decline in GDP to levels below the 110 billion mark, and steadily begins to rise in 1992 onwards, as South Africa's policies began to change. From 1998-2003, South Africa experienced a trade surplus as exports outstripped imports. Only from 2003 to 2007 a trade deficit becomes apparent and continues to grow at an alarming rate up to 2007.

South Africa's Sectoral Employment

The following section of the paper will begin by taking a closer look at what the definitions of the three sectors of the economy that this paper focuses on. The focus then shifts towards specific sector and gives a brief description of the employment trends by these sectors.

A simple definition of the primary sector is that portion of the economy that deals with the extraction of raw materials from natural resources that are used by the other sectors of the economy or exported to other countries. The secondary industry on the other hand is the portion of industry that is responsible for the turning of raw materials into saleable products; this transformation is carried out by the manufacturing sector of the economy. Finally, a plain description of the tertiary industry is the portion of industry that is responsible for providing the economy with services that include *inter alia* teaching, nursing and government services.

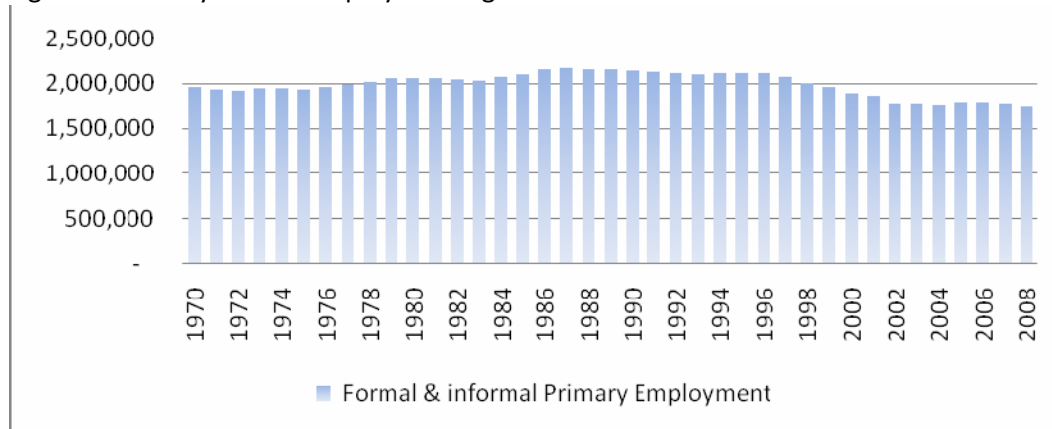
According to Barker (1999), South Africa has seen a significant decline in employment share of the primary sectors. He notes that whereas prior to 1950 agricultural employment accounted for nearly 27 percent of the total employment, this share had fallen to below half that figure (to 11 percent) in 1996. In 1950 the secondary sector had an employment share of 16.6 percent which grew to 25.1 percent in 1996, an increase of 8.5 percent, (Notably, however, the steepest increase in employment shares came in the tertiary sector industries, where the share increased from 26.6 percent in 1950 through to almost half (46.6 percent) of the total labour in 1996.

Primary Labour employment figures

More often than not, large (relative to other sectors), primary sectors are commonly associated with fledgling developing economies. For the purposes of this paper the primary sector is classified as all activities that fall under the SIC 1-2, which essentially covers agriculture, fishery forestry and mining activities. From 1970 through 2008 the primary employment figures compiled by Quantec revealed

that the highest employment figure was a little over 2.1 million in 1987 while the lowest figure reported was 1.7 million 2008 – see Figure 3Error! Reference source not found..

Figure 3: Primary Labour Employment figures



Source: Quantec Database.

Averages taken at five year intervals reveal that the difference between the primary employment averages have been declining since the 1990 pentad as shown by figure 3; the largest decline was nine percent in the period 2005-2008. Borat (n.d.) proposes that the decline is driven mainly by Job losses in agriculture and mining. He goes on to state that in a 25 years period agriculture lost 1.2 million Jobs, and 211 000 jobs in the mining sector.

Table 1: Primary Industry Pentad Employment Averages

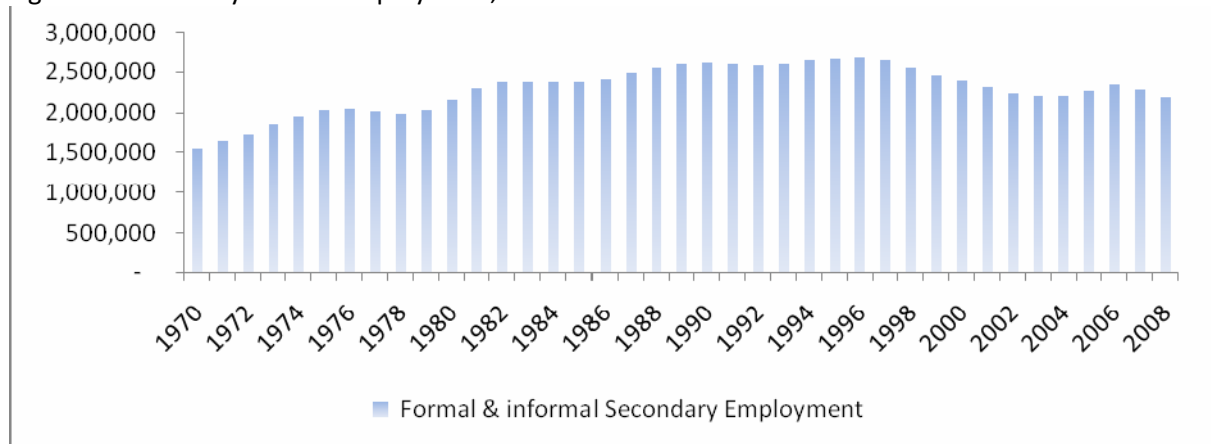
Years	1970-1974	1975-1979	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2008
Average Number of jobs	1 939 500	2 017 762	2 066 341	2 158 877	2 114 257	2 009 482	1 958 764	1 774 418
Change Average(number)		78 262	48 579	92 536	-44 620	-104 775	-50 718	-184 346
Percentage change		4	2	4	-2	-5	-3	-9

Source: Author's own calculation using Quantec data

Secondary Labour Employment figures

For the purposes of this paper, Secondary industries refers to industries that fall under the SIC classification 3-5 which essentially is manufacturing, utilities and construction industries. Two years following the democratic elections, the secondary industry had the highest number of employees, totalling 2.6million workers, but has since been on a downward trend. The lowest figure recorded was in 1970 with 1.5 million as illustrated in figure 4.

Figure 4: Secondary Labour Employment, 1970 to 2008.



Source: Quantec Data (collected 2009).

A comparison of the secondary industry pentad employment averages shows that five year average of the period 1990-1994 was higher than that of the consequent pentad (1995-1999) and from that period on there has been a decline in the five year average, unlike primary employment average that began to decline in the 1990-1995 pentad.

Table 2: Secondary Industry Pentad Employment Averages

Years	1970-1974	1975-1979	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2008
Secondary Jobs	1 788 67	2 047 462	2 360 939	2 533 125	2 621 671	2 547 752	2 472 666	2 270 594
Change in jobs		258 791	313 477	172 186	88 546	-73 919	-75 087	-202 072
Percentage change		14	15	7	3	-3	-3	-8

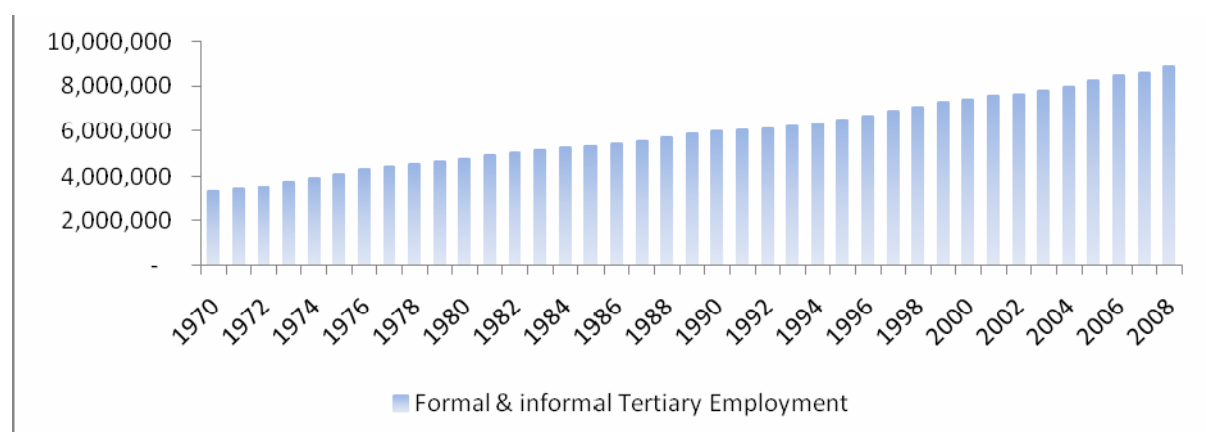
Source: Author's own calculation using Quantec data.

The most severe fall in secondary job numbers occurred in most recent years specifically the period 2005-2008. That being said, secondary sector does show a net rise in employment levels, roughly some 430 000 jobs, an increase that pales in comparison to what is observed for the tertiary sector (Bhorat n.d.).

Tertiary Labour Employment

As an economy develops this portion of the economy is largest in an economy. For the purposes of this paper tertiary industry refers to industries that fall under the SIC classification 6-9 (see appendix for the list of the three sectors and the corresponding SIC classification). Figure 5 is a graphic depiction of the trends in tertiary employment between 1970 and 2008.

Figure 5. Tertiary Labour Employment figures



Source: Quantec Data (collected 2009).

The largest percentage increase in employment was in the financial and business services sector, closely trailed by wholesale and retail trade. However wholesale and retail trade posted a combined job creation total of 1.2 million employees in 1995 (Bhorat n.d.). Social and personal services, as well as transport and community, sectors had noteworthy increases in job figures.

Table 3: Tertiary Industry Pentad Employment Averages

Years	1970-1974	1975-1979	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004	2005-2008
Average Tertiary Jobs	3673760	4524438	5128092	5709774	6234687	7056652	7228650	8534953
Change in jobs		850678	603654	581682	524913	821965	171999	1306303
Percentage change		23	13	11	9	13	2	18

Source: Author's own calculation using Quantec data.

Modelling employment effects

The demand for labour is a derived demand meaning that it is derived from the demand for the product or the service provided by the employee. The demand for labour will therefore be affected indirectly by economic conditions, the macroeconomic policies in place, domestic and foreign competitiveness, cost and productivity of labour (Barker 1999). For the purposes of this study, a regression based approach established in a dynamic model of labour demand to quantify possible employment losses resulting from a more efficient use of labour. This section relies on the previous work of Greenaway *et al.* (1999). The assumption is that all firms in the industry possess a Cobb-Douglas production function where the representative firms in industry *i* in period *t* is given by:

$$Q = AVK_{it}^{\alpha}L_{it}^{\beta} \tag{1.1}$$

Where Q_{it} = Real Output in Firm *i* at time *t*

K_{it} = Capital Stock in firm i at time t

L_{it} = Number of labour units utilised in firm i at time t

α, β = factor share coefficients

γ = factors changing the efficiency of the production process

Production economics theory teaches that a profit maximising firm will employ labour and capital at such levels that the marginal revenue product of labour is equal to wage (w). Similarly, profit maximising firms will use capital to such an extent that it is equal to its user cost (c). Based on this the above equation can be solved simultaneously eliminating capital to yield:

$$Q_{it} = A^\gamma \left(\frac{\alpha L_{it} w_t}{\beta c} \right)^\alpha L_{it}^\beta \quad (1.2)$$

The preceding equation can be used to derive the firms and by extension the industries derived demand for labour, which take the form:

$$\ln L_{it} = \phi_0 + \phi_1 \ln \left(\frac{w_t}{c} \right) + \phi_2 \ln Q_{it} \quad (1.3)$$

Where: $\phi_0 = \frac{-(\gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta)}{(\alpha + \beta)}$; $\phi_1 = \frac{-\alpha}{\alpha + \beta}$; $\phi_2 = (\alpha + \beta)^{-1}$

Greenaway *et al.* (1999), propose that technical efficiency of the production process will increase over time and as such the rate of technology adoption and increases in x-efficiency would be correlated with trade changes. Based on this, Greenaway *et al.* (1999) hypothesise that parameter A in the production function varies with time as defined by the following equation:

$$A_{it} = e^{\delta_0 T} M_{it}^{\delta_1} X_{it}^{\delta_2} \quad \delta_0, \delta_1, \delta_2 > 0 \quad (1.4)$$

Where: T = Time trend ; M = Import Penetration ; X = Export penetration

By this definition equation 1.3 can be rewritten as

$$\ln L_{it} = \phi_0^* - \mu_0 T - \mu_1 \ln M_{it} - \mu_2 \ln X_{it} + \phi_1 \ln \left(\frac{w_t}{c} \right) + \phi_2 \ln Q_{it} \quad (1.5)$$

Where: $\phi_0^* = \frac{-(\alpha \ln \alpha - \alpha \ln \beta)}{(\alpha + \beta)}$; $\mu_0 = \mu \delta_0$; $\mu_1 = \mu \delta_1$; $\mu_2 = \mu \delta_2$; $\mu = \frac{\gamma}{(\alpha + \beta)}$

Empirical Specification of the Model

It is assumed that there are costs linked with employment adjustment and which cause the level of employment to possibly diverge from the equilibrium position as the process of adjustment takes its course. With this in mind the inclusion of a lag on employment into the employment function appears to be the best way to proceed.

Nickell (1986) cited in Greenaway *et al.* (1999) suggests additional lags may be necessary in instances where the employment measure is an aggregation across workers with differing adjustment costs (to allow for heterogeneity effects) in cases where serially correlated technology shocks are present. A categorical variable was introduced to cater for the change in trade and government policy after the first democratic elections.

The first equation estimated in this study takes the form:

$$\Delta \ln L_{it} = \lambda - \mu_0 T - \mu_1 \Delta \ln M_t - \mu_2 \Delta \ln X_t + \phi_1 \Delta \ln w_t + \phi_2 \Delta \ln Q_t + \text{Dummy 1994} + \varepsilon_t \quad (1.6)$$

The non stationary nature requires that all the analysis be carried out in the first order time difference, represented by the Delta in equation 1.6. Additionally the inherent nature of the data requires that it be the first order time difference transformation, removing the industry specific fixed effects.

Intuitively it is assumed that there is a relationship, an association if you like, between the three sectors that stems from the way the three sectors work together within the greater economy. Because of this relationship it is hypothesised that employment levels in one sector has an effect on another. Bearing these attributes in mind the second estimating equation in this study takes the form:

$$\Delta \ln L_{it} = \lambda - \mu_0 T - \mu_1 \Delta \ln M_t - \mu_2 \Delta \ln X_t + \phi_1 \Delta \ln w_t + \phi_2 \Delta \ln Q_t + \Delta \ln L_{it-1} + \Delta \ln L_{jt} + \text{Dummy 1994} + \varepsilon_t$$

Data

The dataset used in this study has been assembled by Quantec using a diversity of sources that forms a comprehensive database of industrial, labour market and trade statistics. The industry classification is based on a 2-digit scheme used in 17 non-manufacturing industries and 28 manufacturing industries reported by Statistics South Africa (StatSA) in its monthly sales, production, price and employment releases. For ease of calculation, it is assumed that the explanatory variables in the estimated equation have common impacts across all sampled industries. All monetary data

used here are real, with 2000 as the base year. An Ordinary Least Squares regression will be carried out on the following equations:

$$\Delta \ln L_{it} = \lambda - \mu_0 T - \mu_1 \Delta \ln M_t - \mu_2 \Delta \ln X_t + \phi_1 \Delta \ln w_t + \phi_2 \Delta \ln Q_t + \text{Dummy 1994} + \varepsilon_t$$

$$\Delta \ln L_{it} = \lambda - \mu_0 T - \mu_1 \Delta \ln M_t - \mu_2 \Delta \ln X_t + \phi_1 \Delta \ln w_t + \phi_2 \Delta \ln Q_t + \Delta \ln L_{it-1} + \Delta \ln L_{jt} + \text{Dummy 1994} + \varepsilon_t$$

The coefficient of imports is expected by theory to take on a negative sign as theory dictates that there is a negative relationship between foreign competitiveness and employment. Conversely one would expect the export openness index to take on a positive value. An inverse relationship is theorised to exist between the demand for labour and wages and, as such, one would expect the coefficient of wages to take on a negative value. Finally the coefficient of output is expected to take on a positive value.

As previously mentioned the study will look at the effect of trade on employment across all industry classification, and will then take a look at the extent to which the chosen variables impact on employment. The proxies for openness for the purposes of this study are a simple import penetration index, the export penetration index and the categorical variable (dummy 1994). The first variables, in this model represent the level of integration of the South African economy into the Global economy, while the last variable is used to represent the change in South Africa's policies, marked by the 1994 democratic elections. The study uses the Stata 9 statistical package to analyse the data.

Results

Tertiary sector

Overall the equation estimated for the tertiary sector was found to be statistically significant and had the independent variables explaining 75 percent of the variation in tertiary employment in the regression that excludes the other sectors over the 1970 to 2008 period. The coefficient for the categorical variable representing the first democratic elections (Dummy 1994) just fell outside of the 10 percent level of significance. From the first estimated equation tertiary employment from the previous year was found to have a significant effect (at one percent level of significance) on current tertiary employment. The positive coefficient on the lagged dependent variable indicates persistence in the level of employment.

Table 4. Tertiary Sector OLS Regression Results

Tertiary Sector		
Variables	Regression 1	Regression 2
R ²	0.7487	0.8503
Adjusted R ²	0.6968	0.806
Δ Wage	0.040567	-0.0322
Δ Export Openness	-0.004046	0.03657
Δ Import penetration	0.0064615	-0.009
Dummy 1994	0.0002091	*0.0657
Time	0.0002091	-0.0122
Lagged Tertiary employment	***0.07731928	***0.6852
Δ Secondary Employment		***0.1737
Δ Primary Employment		** -0.1057

* 10 percent level of significance, ** 5 percent level of significance *** 1 percent level of significance

In the regression that included other sectors it was found that tertiary employment levels from the previous year were all found to be statistically significant at one percent levels and primary employment levels at five percent. The categorical variable introduced to represent the change in a number of policies was also found to be significant at 10 percent level. It would appear that, the changes in trade and economic policies implemented reflected have a statistically significant positive effect on this particular sector. In this sector analysis the proxies for trade liberalisation, wages and the effect of technological advancement (captured in the time variable) were not found to have any effect on tertiary labour⁴.

Secondary sector

In the secondary sector first regression import penetration was found to have a significant effect on employment at 10 percent and reflected by the negative impact import penetration had on secondary sector employment. As in the tertiary sector the lagged dependent variable indicates persistence in the level of employment, as it was found to be significant at 1 percent level. The time variable was also found to be significant at five percent level. The explanatory variables included in the regression were found to explain 76 percent of the variation. Both estimated equations were found to be highly statistically significant.

Table 5: Secondary Sector OLS Regression Results

Secondary Sector		
Variables	Regression 1	Regression 2
R ²	0.7622	0.8503
Adjusted R ²	0.713	0.806

⁴ The actual value of the lagged dependent coefficient has economic meaning. See Greenaway *et al* 1999

Δ Wage	-0.062061	-0.0818
Δ Export Openness	-0.1013215	-0.0767
Δ Import penetration	** -0.045274	** -0.04523
Dummy 1994	0.0093949	0.00047
Time	** -0.0007238	-0.0005
Lagged Secondary employment	*** 0.07731928	*** 0.63955
Δ tertiary Employment		0.32143
Δ Primary Employment		-0.257

* 10 percent level of significance, ** 5 percent level of significance *** 1 percent level of significance

The second regression found import penetration to be negatively associated with employment levels and significant at five percent and in addition to that the employment levels from the previous year were found to have an impact on the current employment figures. 85 percent of the variation in secondary sector labour was captured by the variables included in the equation. Export openness, and wages were found not to have a statistically significant effect on secondary labour.

Primary sector

In the primary sector first regression wages narrowly falls out of the significant range (0.115). As both in the tertiary and secondary sector the lagged dependent variable indicates persistence in the level of employment, as it was found to be significant at five percent level. The dependent variables included in the equation accounted for less than half of the variation in employment levels, suggesting other factors apart from those included in the equation could have played role.

Table 6: Primary Sector OLS Regression Results

Variables	Primary Sector	
	Regression 1	Regression 2
R²	0.4488	0.4778
Adjusted R²	0.3388	0.3231
Δ Wage	-0.0832283	-0.0731
Δ Export Openness	0.007354	0.0226
Δ Import Penetration	0.0025688	** -0.0011
Dummy 1994	-0.0078325	0.00415
Time	** -0.000395	0.00046
Lagged Primary employment	** 0.419565	*** 0.33628
Δ tertiary Employment		0.32143
Δ Secondary Employment		-0.257

* 10 percent level of significance, ** 5 percent level of significance *** 1 percent level of significance

The second equation import penetration was found to have a positive impact on primary employment levels at five percent level of significance and the levels of employment from the preceding year seemed to have a positive effect on the current levels of employment. Again export openness, wages and the other sectors were found not to have any effect on Primary sector employment.

Conclusion

As previously mentioned, pinpointing the effects of particular policies, especially policies that have wide ranging effects, is a difficult process as policies are usually designed to target a host of issues and are normally meant to complement each other in order to achieve broader national objectives. With that in mind, the analysis carried out in the study reveals that the derived labour demand in the primary sector (agriculture, fishery forestry and mining activities) and the secondary (manufacturing, utilities and construction industries) have been impacted negatively by the increased imports. There was, in contrast insufficient statistical evidence from the data to suggest that derived labour demand for any of the sectors was increased by increased exports openness. Authors Segal & Brawley, (2009) attribute the latter characteristic to the legacy of apartheid: apartheid distorted factor markets; (including patterns in land ownership, unionization, investment, infrastructural development and more) and go on to state that the rewards from freer trade will only be accessible when policies that target flexibility in factor markets to support trade adjustment are implemented.

The categorical variable that represented the end of the apartheid era and beginning of interaction of South Africa's economy with the global economy seemed to have a statistically significant effect on the derived labour demand for the tertiary sector.

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Appendix 1

SIC	Industry / product
1-2	Primary industries
1	Agriculture, forestry & fishing
2	Mining & quarrying
21	Coal mining
23	Gold & uranium ore mining
22/24/25/29	Other mining
3-5	Secondary industries
3	Manufacturing
301-306	Food, beverages & tobacco
301-304	Food
305	Beverages
306	Tobacco
311-317	Textiles, clothing & leather
311-312	Textiles
313-315	Wearing apparel
316	Leather & leather products
317	Footwear
321-326	Wood & paper; publishing & printing
321-322	Wood & wood products
323	Paper & paper products
324-326	Printing, publishing & recorded media
331-338	Petroleum, chemicals, rubber & plastic
331-333	Coke & refined petroleum
334	Basic chemicals
335-336	Other chemicals & man-made fibers
337	Rubber products
338	Plastic products
341-342	Other non-metallic mineral products
341	Glass & glass products
342	Non-metallic minerals
351-359	Metals, machinery & equipment
351	Basic iron & steel
352	Basic non-ferrous metals
353-355	Metal products excluding machinery
356-359	Machinery & equipment
361-366	Electrical machinery & apparatus
371-376	Radio, TV, instruments, watches & clocks
371-373	Television, radio & communication equipment
374-376	Professional & scientific equipment
381-387	Transport equipment
381-383	Motor vehicles, parts & accessories

384-387	Other transport equipment
391-392	Furniture & other manufacturing
391	Furniture
392-393	Other manufacturing
4	Electricity, gas & water
41	Electricity, gas & steam
42	Water supply
5	Construction (contractors)
51	Building construction
52-53	Civil engineering & other construction
6-9	Tertiary industries
6	Trade, catering & accommodation services
61-63	Wholesale & retail trade
64	Catering & accommodation services
7	Transport, storage & communication
71-74	Transport & storage
75	Communication
8	Finance, insurance, real estate & business services
81-82	Finance & insurance
83-88	Business services
9	Community, social & personal services
93-96	Community, social & personal: Other services
93	Other services: Medical, dental & veterinary
94-96	Other services: Excluding medical, dental & veterinary
98	Community, social & personal: Other producers
99	General government services