CHAPTER 4

TRADE AND LABOUR DEMAND IN MANUFACTURING

4.1 INTRODUCTION

There are relatively few studies analysing the effect of trade-induced shifts in the composition of employment in developing countries, in general, and in their manufacturing industries, in particular. Yet, growth in trade and increased foreign competition exact important effects on the economy. Trade may affect the efficiency with which firms use factors of production, such as labour, as well as the distribution of output within a sector between more and less efficient firms. The backdrop, however, is that the net effect of trade liberalisation on employment in manufacturing is not agreed *a priori*[45] (Wacziarg and Wallack, 2004:3).

Since employment issues are of critical importance in South Africa's manufacturing sector, the direct investigation of the impact of international competition on labour demand is required to meet needs in both academic and policy circles. Some effort in this direction is found in Gunnar and Subramanian, (2000), Petersson (2002) and Moolman (2003), among others. These studies succeed in revealing some important informative regularities; however, most other previous attempts ignored the role of trade or used highly aggregate data for analysis. In this study, a break with these past methodological tendencies is made. In addition, by relying on micro level data, the hope is that the substantial variability among industries that is resident within the three digit sectors will be

[45] A discussion of the plusses and minuses is provided in Section 4.2 of the study.

exploited. The contribution of this investigation, therefore, lies in using longitudinal South African manufacturing industries data to generate more tractable and robust results. This approach allows for the control of industry specific factors at the disaggregated level, in order to uncover the impact of competition on labour demand. Most importantly, the analysis employs data on imports by origin concorded to the industrial chapters, representing one of the first attempts to emphasise the issue of concordance in the analysis of the effects of trade on labour demand in South Africa. The issue of concordance is not trivial as it is important to tie imports directly to the industries in which the impact of trade on employment is being investigated.

This chapter provides empirical estimates of the impact of trade on derived labour demand in South Africa. Initially, it discusses literature relevant to labour demand and trade analysis in Section 4.2. The empirical specification is presented in Section 4.3. The data investigated is discussed in Section 4.4. The results are provided in Section 4.5, which is followed by concluding comments in Section 4.6.

4.2 TRADE AND LABOUR DEMAND

Opponents of free trade argue that lower production costs and fewer regulations in foreign countries allow foreign firms to out-compete domestic producers. In this vein, trade liberalisation has substantially aggravated the employment situation, because higher imports have caused job losses in South Africa (ILO, 1999). In other words, trade expansion leads to less domestic output and fewer domestic jobs. Proponents of free trade, on the other hand, argue that free trade expands export markets resulting in greater demand for products, greater domestic production and more jobs. The interest groups that are for and against liberalisation appear to agree that it leads to labour displacements of some form. Davidson, Martin and Matusz (1999:272) suggest that such arguments are misguided and appear to propose that debate should instead focus on the impact of trade on factor markets. It is, for example, argued that trade expansion leads to an increase in labour demand elasticities and as a result places labour markets under increased pressure. Rising labour demand elasticities matter because higher elasticities can trigger more volatile responses of wages and employment to any exogenous shocks to labour demand (Krishna, Mitra and Chinoy 2001:392, Slaughter, 2001:29).

In the classical model, movements of labour and capital across sectors allows countries to reap the benefits of trade openness. In this paradigm, trade gains obtain from the reallocation of resources towards sectors offering comparative advantage. In the Ricardian model, comparative advantage is a result of relative technological differences across countries, while in the Heckscher-Ohlin vintage, it is due to varying relative factor endowments (Wacziarg and Wallack, 2004:4). In a simple Heckscher-Ohlin-Samuelson (H-O-S) model of comparative advantage, trade leads to a reallocation of resources and to production specialisation in those sectors that intensively use the country's most abundant factor. For developing countries, the model predicts output shifts towards low-skill labour intensive goods, increased demand for unskilled workers and an upward shift in their wage, relative to other factors. For the developed countries, there should be a widening gap between unskilled and skilled relative wages.

The Heckscher-Ohlin-Samuelson framework provides a clear prediction regarding the effect of trade on employment across sectors. Trade liberalisation contracts the import substitute sector, reducing jobs in that sector, while the export sector expands along with employment in that sector. Trade redistributes employment from the import substitute sector to the export sector. Empirical evidence appears to contradict this prediction in many developing countries (Bussolo, Mizala and Romaguera, 2002:640). It is recognised that the HOS framework needs to be adjusted in the context of intra-industry trade (IIT), because a large part of trade is between countries with similar factor endowments trading in products that are vertically or horizontally differentiated. The analysis then needs to adjust for expansions and contractions that occur within industries. More fundamentally, it is argued that technical change affects IIT sectors more than the non-IIT sectors, because more product and process innovation occurs here. The sensitivity of IIT industries may, therefore, be greater in the sense that the adjustment to trade occurs more rapidly (Greenaway, Hine and Wright, 1999:488).

New trade theory also posits sectoral labour shifts as a result of increased trade. For example, models with increasing returns to scale suggest that trade liberalisation may lead to agglomeration of production (Krugman, 1995). Grossman and Helpman (1991) indicate that trade policy openness facilitates transmission of technology. Labour reallocation, for example, occurs with a reduction in trading frictions, especially when technological transmission affects sectors differently. Another class of models suggest that the effects of liberalisation need not involve labour movements, because economic integration allows countries to exploit increasing returns to research and development activities, yielding dynamic productivity benefits that need not stem from changes in specialisation patterns. In a nutshell, gains from trade are possible in the absence of intersectoral factor movements (Wacziarg and Wallack, 2004:2,3).

Experience in industrialised countries has seen a large fall in employment amongst the unskilled workers, while that for skilled labour has risen. Wage levels for skilled workers have increased in relation to those of unskilled workers, a development consistent with the Stolper-Samuelson theorem

(Deardorff, 1994). This development is explained by the shift towards skill-biased technological growth and expansion in international competition. It should be pointed out that examinations of the impact of trade on labour markets in the context of the Heckscher-Ohlin theory has focused primarily on developed country contexts (Krugman, 2000, Milner and Wright, 1998, Leamer, 1998 and Sachs and Shatz, 1994).

While the Stolper-Samuelson and Heckscher-Ohlin theories hold in the long run equilibrium, real world processes seldom reflect pure equilibrium states. Any empirical application of these theories must therefore take into consideration the dynamic adjustment to equilibrium that is an important aspect of the impact of trade on derived labour demand (Pesaran and Smith, 1995). In addition, theory implicitly presumes that the impact of trade liberalisation is uniform across industries. There are many reasons as to why the impact of trade liberalisation may actually differ across manufacturing sectors. Some of these reasons include differences in the degree of liberalisation across sectors, differences in the types of non tariff barriers across industries and differences in the level of organisation of labour across the manufacturing sector. These factors affect the extent to which the impact of trade liberalisation as predicted the Heckscher-Ohlin theory may hold in real life (Fedderke et al 2003). In view of this discussion, Section 4.2.1 looks at the approaches that have been employed to unravel the impact of trade on derived labour demand in manufacturing.

4.2.1 Approaches to the study of effects of trade on employment

At the empirical level, three main approaches have been used to evaluate the impact of trade on employment in manufacturing (Sakurai, 2003:2 and Greenaway, Hine and Wright, 1999:489). These approaches include, the factor content approach, the growth accounting approach and an eclectic regression framework based on static or dynamic labour demand equations. Each of these approaches is discussed below, in turn.

4.2.1.1 The factor content approach

In the factor content trade approach, trade in goods is interpreted as trade in factor content, which is embedded in the traded goods. This approach provides a link between changes in factor content trade as changes in relative factor prices (Deardoff and Staiger, 1988). In the factor content variant, estimates are made of the labour required to produce a given amount of exports or the amount of labour being displaced by a given amount of imports.

Most of the earlier evidence based on factor content trade finds that trade induced variations in labour demand by skill are not sufficient to account for the actual movements in relative wages. Even work comparing relative product price changes to relative wage changes concludes that the role of trade is negligible. Sapir and Schumacher (1985) argue that since imports and exports of European Union and other OECD countries have similar labour contents, an expansion in trade would have minor effects on employment, although trade between the European Union and developing countries would lead to a loss of jobs. Other investigations following this line, such as Wood (1994), have been criticised for assuming, in their analysis, that similar technologies of production are used both in the north and south. Cortes and Jean (2000) and Krugman (1995) also conclude that the labour market impact of trade with developing economies has been modest. Sakurai (2003:2) calculates the factor content of trade embodied in Japanese exports and imports in order to estimate the effect of trade on employment and the wages of skilled and unskilled labour. He finds a negative effect of increased trade on the Japanese manufacturing labour market, but the magnitude of the effect was not very large.

One of the limitations of the factor content analysis is that it is based on the assumption of competitive labour markets. The impacts of state regulations, unions, collective bargaining and institutional rigidities are ignored. However, in the era of increased globalisation, the patterns of economic growth and employment will depend upon domestic labour market conditions. Empirical evidence indicates that labour market regulations do interact with expanded trade (Bussolo, Mizala and Romaguera, 2002:664). Krishna, Mitra and Chinoy (2001:393) also suggest that the linkage between greater trade openness and labour demand may be empirically quite weak. This could be explained by the fact that most analyses ignore the impact of a variety of frictions affecting firm labour demand decisions. In particular, the inflexibility of industrial labour may be due to regulations affecting minimum wages or contractual wage agreements. Even state regulations, union collective bargaining or other institutional rigidities, can make labour market adjustment induced by trade policy behave rather differently.

Milas (1999: 149) alludes to the view that employment and wage inflexibility are also caused by large firing and hiring costs, the threat of strikes and the role of unemployment benefits. In short, the labour market does not behave according to the perfectly competitive paradigm (Bussolo, Mizala and Romaguera, 2002:640). Market rigidities, in practice, tend to extend the duration of unemployment when certain skills become obsolete. Shortages of labour with relevant skills may also hamper export expansion in some sectors (Petersson, 2002:241).

4.2.1.2 The growth accounting approach

In the growth accounting variant, sources of employment are decomposed into domestic demand, trade and productivity elements. It is also generally found that trade factors have played only a minor role in job losses and productivity growth has been the main factor displacing labour in the short run. However, Gregory and Greenhalgh (1997) recover, using this approach, a positive gain in employment from trade changes, especially for financial services and primary and extractive sectors, but a loss for the manufacturing sector in the United Kingdom.

The problem with the growth accounting approach is that components of employment change, namely domestic demand, trade and productivity are assumed to be independent (Greenaway et al, 1999). These components may, however, not be independent. For example, if imports stimulate faster productivity growth then it is possible that secondary effects due to trade are not being picked up by this method. In addition, trade induced productivity growth might be stimulated via various channels. For example, evidence is available that growth in trade is linked to growth in labour productivity (Cortes and Jean, 2000). Caves and Krepps (1993) also show the existence of pro-competitive impacts of trade on technical efficiency. In the same vein, Bussolo, Mizala and Romaguera, (2002:240) and Borgas and Ramey (1994) emphasise the effect of domestic labour market conditions and point to a role for reduced rents and unionised labour employment. Feenstra and Hanson (1996) show that trade expansion may result in relocation abroad of most labour intensive stages of the production processes. In addition, in an environment of increased competition from imports, firms adopt defensive changes in output prices and techniques of production (Neven and Wyploz, 1996).

Leamer (1994) argues that the growth accounting approach is flawed in a fundamental way; trade is not capable of explaining changes in aggregate employment, since employment in the tradable sector is derived as a residual, after adjusting for factor supplies and factor demands by the non-tradable sector as well as adjusting for technology. The growing globalisation of the world economy is, according to Leamer, the critical issue. Attempts to apportion relative importance to either trade or technology are, therefore, likely to be irrelevant.

The growth accounting variant also does not adequately explain the impact of increased trade on labour demand in manufacturing in the light of intra-industry trade. An increase in intra-industry trade or the exchange of essentially similar products creates relatively low-trade induced adjustment costs and can facilitate further trade liberalisation (Greenaway and Milner, 1986). Intra-industry trade brings smaller adjustment costs than a concentration of production to a few sectors in line with comparative advantage. Wage flexibility and the ability to reallocate labour within, compared to between, sectors determines whether adjustment would be smoother due to intra-industry, as opposed to inter-industry trade. Labour requirements are more similar under intra-industry trade, which involves the exchange of goods with similar production techniques, than between industries, because less retraining will be required and labour can transfer with ease (Petersson, 2002). The result is that there will be smaller effects on the distribution of incomes between labour, varyingly skilled, and capital. Under intra-industry trade, the distribution of manufacturing employment across regions and countries is likely to be similar. Deepening integration with advanced countries, such as those in the European Union, should, therefore, expand intra-industry trade in a few sectors, producing differentiated and skill-intensive products. This kind of specialisation may suggest a continuation of weak trade-induced employment creation in South African manufacturing (Petersson, 2002).

4.2.1.3 Labour demand in a regression framework

The regression approach essentially employs regression techniques that are implemented within the context of either static or dynamic[46] labour demand equations. Greenaway, Hine and Wright (1999:491) using the dynamic variant, find that, when trade is introduced, increases in trade volumes, both in terms of exports and imports, cause reductions in the level of derived labour demand. Disaggregating imports by origin provides supportive evidence for a positive relationship between openness and increased labour efficiency in the firm. Increased import penetration induces the elimination of x-inefficiency and the take up of new technology.

Gunnar and Sabramanian (2000:29), using a static analysis with South African data, show that employment tends to fall less in the sectors where tariffs are reduced more aggressively. Their result questions the argument that trade expansion could aggravate the unemployment problem, as firms might reduce the workforce to remain competitive. Correlation analysis conducted in a static framework by Petersson (2002:258) also appears to suggest that employment changes were positively correlated with increased exports and imports. This was specifically more so with imports than exports, suggesting that increased imports do not crowd out domestic jobs, but seem to accompany booming sectors.

In most of the Turkish industries considered by Krishna, Mitra and Chinoy, (2001), the hypothesis of no relationship between trade openness and labour

[46] The bulk of the regression approaches have used the dynamic models of labour demand to account for labour market adjustment as well as quantify the possible employment losses that may result from more efficient use of labour.

demand elasticities could not be rejected, a finding that was robust to changes in specification. Results from Japan also provide conflicting conclusions on the impact of increased trade on employment in firms; for example, Sakurai (2003:19) suggests that the effect of increased trade on the Japanese manufacturing labour market was not very large. However, studies that link Japan to other countries in a cross-industry framework, or those based on surveys of firms, found that increasing trade, especially increasing imports from developing countries, had some negative impact on the employment and the wage levels of Japanese manufacturing labour (Higuchi and Genda, 1999). Furthermore, Tomiura (2003:120) using a longitudinal data set of manufacturing industries[47] and controlling for industry specific factors, finds a significant impact of import price changes on Japanese employment. In this study, a substantial share of the decline in average employment was accounted for by intensified import competition; furthermore, employment sensitivity increased with import share.

Empirical evidence of the effects of trade liberalisation on labour demand remains mixed. Levinsohn, (1999: 322) opens this debate by indicating that both job creation and destruction are possible, because jobs can be simultaneously created or destroyed in both expanding and contracting industries. Roberts and Tybout (1996) find that industry exit and entry do not increase with import competition, once demand shocks are controlled for. Papageorgiou et al (1991) uncover few relationships between trade liberalisation and transitional shifts in employment in nineteen liberalisation episodes that they examine over various periods ranging from 1960 to 1979 in developing countries. For example, in Brazil, Singapore and Peru they found no relationship between a sector's imports

[47] A criticism has been levelled against using industry level data because this means focusing on net employment changes. If the effect of trade liberalisation is to reallocate jobs within an industry leaving the net employment about the same, industry-level data will be unable to detect this reallocation. One may then erroneously conclude that trade had little to no impact on jobs. See Levinsohn (1999).

and employment change. In the Philippines, evidence indicated that import liberalisation could be linked to a fall in employment in only one of the decontrolled sectors. It was only in Chile that the impact of liberalisation on manufacturing employment varied by sector, with export sectors expanding and import competing sectors contracting, though net employment increased. Such variations in results have been explained as resulting from restrictive labour markets. Indeed, it has been posited that sluggish labour market response to trade liberalisation is due to imperfect competition. Currie and Harrison (1997) document the case of Morocco, where many firms adjusted to trade reform by reducing profit margins and raising productivity rather than laying off workers. In other countries, trade reform could generate a limited impact on employment, because the patterns of labour market regulations made it difficult to fire workers.

4.3 ECONOMETRIC SPECIFICATION

4.3.1 The analytical framework

Empirical evidence shows that evaluating the impact of trade on employment by relying either on the factor content, or the growth accounting approaches, generates limited evidence, if any, of the direct effects of trade on employment. Available evidence also suggests that the impact of trade on derived labour demand can be modelled in a context that permits the use of concorded, but disaggregated, data on trade-intensity. More specifically, the impact of trade can be discerned using a data set that allows categorisation of imports by country or region of origin. This approach facilitates a recovery of the effect of trade on technical efficiency in manufacturing. A simple model that incorporates a profit maximising firm in the context of a Cobb-Douglas production function of the form:

$$y_{it} = A^{\theta} k_{it}^{\alpha} . n_{it}^{\beta} \tag{28}$$

is built, where y denotes the firm's real output level, k and n denote homogenous inputs of capital and labour, respectively. In equation (28) variables α and β represent coefficients of factor shares and θ provides for factors altering the efficiency of the production process.

A profit maximising firm employs labour and capital at levels in which the marginal revenue product of labour is equated to the wage w and the marginal revenue product of capital equals its user cost r (Sapsford and Tzannatos, 1993: 150, and Hamermesh, 1986: 431). Ignoring capital, a firm's output is given by expression (29), below:

$$y_{it} = A^{\theta} \left(\frac{\alpha n_{it}}{\beta} \frac{w_i}{r} \right)^{\alpha} n_{it}^{\beta} \tag{29}$$

Taking logs to linearise the above expression yields a firm's derived labour demand:

$$\ln_{it}^{*} = \sigma_0 + \sigma_1 \ln\left(\frac{w}{r} \right) + \sigma_2 \ln(y_{it}) \tag{30}$$

where $\sigma_0 = -\left(\frac{\theta \ln A + \alpha \ln \alpha - \alpha \ln \beta}{\alpha + \beta} \right)$, $\sigma_1 = \frac{-\alpha}{(\alpha + \beta)}$ and $\sigma_2 = \frac{1}{(\alpha + \beta)}$

The negative sign on σ_1 implies that an increase in the price of labour relative to the price of capital results in a decrease in the firm's labour demand. Technical efficiency, as well as the rate of technology adoption, is assumed to increase over time. As the labour force increasingly familiarises with installed technical equipment its efficiency will improve. In this framework, increases in x-efficiency will be correlated with trade expansion because it is assumed that more technology becomes available with increased trade. The estimating equation in Sub-section 4.3.2 has to account for the of impact of trade on technical change. In line with Greenaway et al (1999: 491) parameter A, in the production function, varies with time in the following way:

$$A_{it} = e^{\delta_0 T_i} (mz)_{it}^{\delta_1} (ex)_{it}^{\delta_2}, \text{ where } \delta_0, \delta_1, \delta_2 \rangle 0 \quad (31)$$

where T is the time trend, import penetration (mz) is equal to imports (z) divided by domestic demand[48] (d), and export share (ex) is measured as the ratio of exports (x) to output (y). Since trade expansion implies increased competition from imports in the domestic market or greater exposure of exports to the international market, it implies that there will be induced efficiency effects in the use of the labour input. In this framework, a general formulation, in which an industry's labour demand is affected by trade shares, can be given as:

$$\ln n_{it} = \sigma_0^* - \phi_0 T - \phi_1 \ln mz_{it} - \phi_2 \ln ex_{it} + \sigma_1 \ln\left(\frac{w}{r}\right) + \sigma_2 \ln y_{it} \quad (32)$$

with $\sigma_0^* = -\frac{(\alpha \ln \alpha - \alpha \ln \beta)}{(\alpha + \beta)}$; $\phi_0 = \phi\delta_0$; $\phi_1 = \phi\delta_1$; $\phi_2 = \phi\delta_2$; $\phi = \frac{\theta}{(\alpha + \beta)}$.

Labour demand is inherently dynamic in nature and panel data has the advantage of allowing for the dynamics of labour adjustment. A dynamic specification is preferred, because labour demand fluctuations can also be influenced by a number of factors such as seasonality, the business cycle, plant level idiosyncratic shocks as well as adjustment costs associated with hiring, training and firing. The factors causing labour demand fluctuations affect adjustment costs, which drives a wedge between the wages paid to labour and the marginal product. The existence of these costs implies that a firm's demand for labour depends not only on current exogenous factors but also on the initial level of employment and the expectations about the future level of such factors, making the employment decision rule a dynamic problem (Dutta, 2004: 236). To properly capture the impact of adjustment costs, it is important to relate current to past levels of employment in industries.

[48] Domestic demand is defined as value of output of domestic industries plus value of imports.

One method of recognising adjustment costs is to distinguish between desired and actual levels of employment, $\ln n_t^*$ and $\ln n_t$ respectively. Because of the existence of adjustment costs, only some fraction of the adjustment required to bring existing employment up to the desired level will be achieved during a single period. In a partial adjustment model, only some fraction, say λ,of the desired employment change is achieved during the current time period. This dynamic adjustment mechanism can be stated as:

$$\ln n_t - \ln n_{t-1} = \pi\left(\ln n_t^* - \ln n_{t-1}\right) \quad (33)$$

where $0 \leq \pi \leq 1$. Substituting (33) into (32) and rearranging, an expression for the determinants of actual employment is generated as:

$$\ln n_{it} = \sigma_0^* - \phi_0 T - \phi_1 \ln mz_{it} - \phi_2 \ln ex_{it} + \sigma_1 \ln\left(\frac{w}{r}\right) + \sigma_2 \ln y_{it} + \sigma_3 \ln n_{it-1} \quad (34)$$

where $\sigma_3 = (1-\pi)$

Large values of π imply rapid adjustment, while low values imply slow adjustment. The adjustment costs associated with the employment decision rule makes it possible for the level of employment to deviate from its steady state when adjustment to equilibrium is occurring. Again, if the employment measure is an aggregation across workers with differing adjustment costs, an additional lag structure may be necessary to allow for the effects of labour heterogeneity[49] (Nickell, 1986). Dutta (2004: 235) and Alonso, (2004:477) show that industries display significant rigidities in labour adjustment and the degree of adjustment differs between industries as well as between types of labour, which is reflected in divergent persistence profiles. Furthermore, justification for a longer lag structure may be necessary if serially correlated technology shocks are present. Lags may also be justified in the labour demand function, once bargaining

[49] Some empirical studies explicitly recognise the heterogeneity of labour types and account for this by specifying and estimating separate labour demand equations for different categories of workers. This may be important because theoretical arguments highlight the differential degree of quasi-fixedness of different types of labour as in Alonso, (2004)

considerations are taken into account to capture sequences of bargaining or expectations formation about future wages on output levels (Hamermesh, 1993).

4.3.2 The estimating equation

The employment equation needs to capture the impact of adjustment in derived labour demand. The adjustment dynamics are normally characterised by the presence of a lagged dependent variable among the regressors (Baltagi, 2001:129; Ahn et al, 2000).

$$\ln n_{it} = \delta \ln n_{i,t-1} + x_{it}\beta + \mu_{it} \qquad (35)$$

where X_{it} consists of forcing variables which affect the efficiency of production, these include variables such as the extent of foreign competition, the degree of market power, the level of import or export penetration for an industry and the level of competing imports by place of origin. Assuming a two-way error component model,

$$\mu_{it} = \eta_i + \lambda_t + \nu_{it}, \qquad (36)$$

where λ_t is the time effect common to all industries, η_i is the permanent but unobservable, industry specific effect and ν_{it} is the remainder of the error term.

Dynamic panel data regressions of the form represented in (35), above, are characterised by two sources of persistence over time. The first is autocorrelation, due to the presence of a lagged dependent variable among the regressors. The second is the individual effects that characterise the heterogeneity among individuals. Inclusion of a lagged dependent variable makes the OLS estimator biased and inconsistent in estimating the coefficient of the dependent variable. Even the fixed effects estimator based on the within transformation will still be biased and inconsistent for a typical panel where N is large and T is fixed. The random effects GLS estimator is also biased in a dynamic panel data model.

While, the instrumental variable (IV) estimation method is consistent, it does not necessarily generate efficient estimates of model parameters. Ahn and Schmidt (1995), show that the IV estimator does not make use of all the available moment conditions and does not take into account the differenced structure of the residual disturbances.

Arrellano and Bond (1991) proposed a generalised method of moments (GMM) procedure to tackle the above problem. This procedure requires additional instruments that can be obtained by utilising the orthogonality conditions that exist between lagged values of the dependent variable and the disturbances. The generalised method of moments in Arellano and Bond (1991:288) employs differences, rather than levels, for instruments dated $t-2$ and earlier, as in equation (37) below.

$$\ln n_{it} = \alpha_1 \ln n_{i(t-1)} + \alpha_2 \ln n_{i(t-2)} + \beta\ (L)X_{it} + \lambda_t + \eta_t + \nu_{it} \qquad (37)$$

The remainder of the variables are as earlier defined, X is the vector that contains explanatory variables and $\beta(L)$ is a vector of polynomials in the lag operator. Allowance for a distributed lag structure for the independent variables may be necessary, because it is difficult to impose a common evolution for employment following changes in the explanatory variable. This allowance, in essence, provides for the lack of clarity regarding the source of the dynamics in the employment equation. In a dynamic setting, a baseline differenced employment equation is recommended, so that the industry specific effects are transformed out.

4.3.2.1 The moment conditions

The Arrellano and Bond (1991) generalised method of moments (GMM) procedure is more efficient than the Anderson and Hsiao (1982) estimator. The rationale for the procedure is that if the orthogonality conditions that exist between lagged values of n_{it} and the disturbances v_{it} are utilised, additional instruments can be obtained in a dynamic panel model. Assuming x'_{it} is a vector of explanatory variables and the labour demand equation is represented as:

$$n_{it} = \delta n_{i,t-1} + x'_{it}\beta + \mu_{it} \qquad \mu_{it} = \eta_i + v_{it} \tag{38}$$

To get a consistent estimate of δ it implies the following moment conditions

$$E(\Delta v_{it} n_{it-s}) = 0 \qquad s \geq 2 \tag{39}$$

Where Δ is the first difference operator. These conditions imply that values of the dependent variable lagged two or more periods can be used as valid instruments in the first difference equations. Condition 39 may be expressed as $E(Z'_i \Delta v_i) = 0$ where $\Delta v_i = (\Delta v_{i3}, \ldots\ldots, \Delta v_{iT_i})'$ is a vector and Z_i is a matrix of instruments.

$$Z_i = \begin{bmatrix} n_{i1} & & & 0 \\ & n_{i1}, n_{i2} & & \\ & & \ddots & \\ 0 & & & n_{i1}, \ldots, n_{i,T-2} \end{bmatrix} \tag{40}$$

Arrellano and Bond (1991) suggest that it is possible to exploit the exogeneity assumption regarding some or all of the explanatory variables (x_{it}) outside the dependent variable. For example, if the (x_{it}) are predetermined such that $E(x_{it} v_{is}) \neq 0$ for $s \prec t$ and zero otherwise, then only $\left(x_{i1}', x_{i2}', \ldots\ldots, x_{is-1}'\right)$ are valid instruments in the differenced equation for period s. If (x_{it}) are strictly exogenous such that $E(x_{it} v_{is}) = 0$ for t, s, then it is possible for all the $\left(x_{i1}', x_{i2}', \ldots\ldots, x_{iT}'\right)$ to be used as valid instruments for all the equations. This suggests that it is possible for explanatory variables to include a combination of both predetermined and strictly exogenous variables. This estimator can be further utilised by replacing Δv with the differenced residuals obtained in the one step consistent estimator to obtain a two step Arrellano and Bond (1991) GMM estimator (Baltagi, 2001:132). In essence, the Arrellano and Bond (1991) approach uses lags of endogenous variables as instruments and is efficient, because it expands the instrument set as the panel progresses and the number of potential lags increases[50]. The resulting estimated equation would be unbiased, while consistent estimates of the regression coefficients will be generated, so long as the difference equation is free of higher order serial correlation. It is recommended that if the validity of the instrument set employed is to be relied upon, a check for serial correlation between the instruments and the residuals from the model should be implemented using the Sargan test[51].

4.4 DATA AND DESCRIPTIVE STATISTICS

A data set of South African manufacturing industries from 1988 to 2002 is available at the three digit level of disaggregation making it possible to implement dynamic labour demand equations. For this sample period of concorded data, a longitudinal data set of 420 observations (28 industries in 15 years) at the three-digit level is used. This detailed data set is important for an appreciation of the response of South African employment to international exposure and competition. The analysis incorporates imports by origin at the three digit SIC level to determine the originating region from which, the stronger efficiency effects emanated.

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[50] It should be pointed out that this GMM estimator that exploits only the orthogonality conditions valid for first differenced equations can be limited. It does not allow for the identification of time invariant variable effects and it also doesn't take into consideration the orthogonality conditions valid for equations in levels.

[51] Sargan (1964) tests for the absence of second order serial correlation in the first differenced residuals. The results of this test should be reported see Doornik et al (2001).

The data set that is employed is specifically assembled using a diversity of sources to allow for the construction of an integrated database of industrial, labour and trade statistics. The panel consists of 28 manufacturing industrial sectors corresponding to the three digit ISIC level of aggregation, from 1988 to 2002. The data contains information on inputs, output, industry characteristics and a number of policy variables.

The key variables are N which is the total number of employees in each industry; W is the average real wage in each industry; Y is real output in each industry; import penetration MZ is equal to imports divided by domestic demand, and export share EX is measured as the ratio of exports to output. For the origin of imports, the analysis concentrates on five regions: America, Europe, Asia, Oceania and Africa. Table 22 shows the summary statistics for the variables used in the employment analysis. Imports from Europe are the most important, followed by those from Asia and the Americas. Some industries are very open to imports, recording a maximum export to output ratio of 96.5 per cent. The average market share in the industrial sector is 3.6 per cent, while largest sector represents 15.9 per cent of domestic sales.

Table 22: Summary statistics for employment variables

Variable	Definition	Obs	Mean	SD	Minimum	Maximum
N	Number of Employees	644	51948.0	43619.0	2092.0	207068.0
Y	Output	644	11608.3	10168.7	928.7	58197.1
W	Real wage	644	49246.3	24431.2	16359.6	178821.2
K	Capital	644	5653.3	8786.9	96.5	56357.3
Ex	Export output ratio	644	14.5	14.9	0.2	76.5
Mz	Imports penetration ratio	644	21.2	18.4	0.4	96.5
Ms	Market share	644	3.6	3.2	0.2	15.9
africa_mz	Imports from Africa	420	59.0	85.4	0.0	741.5
america_mz	Imports from America	420	593.9	1030.3	2.7	7503.3
Asia_mz	Imports from Asia	420	898.1	1613.5	0.0	12600.0
europe_mz	Imports from Europe	420	1745.9	3311.9	5.7	26700.0
oceania_mz	Imports from Oceania	411	82.0	280.3	0.0	3154.2

Notes: Variables measured in millions of Rand.
Source: www.reservebank.co.za, www.statsa.gov.za, www.tips.org.za, http.trade@easydata.co.za,

As part of the exploratory data analysis, an investigation of the correlation between variables in our employment function is implemented. This is to gain some initial view regarding the types of associations that may obtain between the variables of interest. Both parametric and non-parametric tests of hypothesis are computed. Table 23, shows the results of the non-parametric covariance matrix for labour, output, real wages, capital input, export pressure, import penetration and market share. The results show that employment, output, capital input and market share are positively correlated, while employment, real wages, export pressure and import penetration have a negative association.

Table 23: Correlation between employment and determinants

Employment	Employment	Total output	Real wages	Capital stock	Export pressure	Import pressure	Market share
Employment	1.0000						
Output	0.7120	1.0000					
Real wages	-0.4038	0.1876	1.0000				
Capital stock	0.5075	0.8219	0.2206	1.0000			
Export pressure	-0.1129	0.0533	0.1060	0.1406	1.0000		
Import penetration	-0.1355	0.0346	0.1536	0.2255	0.5365	1.0000	
Market share	0.6901	0.9207	0.0725	0.8046	0.0273	0.0400	1.0000

Note: Computed by the author
Source: : www.reservebank.co.za, www.statsa.gov.za, www.tips.org.za, http.trade@easydata.co.za

Table 23 presents the non-parametric test results. The results show that employment and output, capital stock and market share have strong and significant positive correlation while employment and export pressure as well as import penetration have a significant negative association. This is an early indicator, although not necessarily a confirmation, of the efficiency effects on labour that arise due to increases in trade volumes. The test results in Table 24, are relevant, in the sense that they confirm whether the computed correlation between variables is actually statistically significant at the conventional levels.

Table 24: Non parametric tests for employment and its determinants

Employment	Total output	Real wages	Capital stock	Export pressure	Import pressure	Market share
Spearman's rho	0.6827	-0.3771	0.4975	-0.1674	-0.2016	0.6984
Prob > |t|	0.000	0.000	0.000	0.000	0.000	0.000
Kendal's tau-a	0.4928	-0.2577	0.3344	-0.1106	-0.1358	0.4985
Prob > |z|	0.000	0.000	0.000	0.000	0.000	0.000

Note: Spearmans and Kendall's statistics computed using stata software
Source : www.statsa.gov.za, www.tips.org.za, http.easydata.co.za

4.5 ECONOMETRIC RESULTS

The results are presented in two parts. The first part describes the estimated equations while the second presents the interpretation attached to the results.

4.5.2 Labour demand equation results

The results of the estimation exercise are presented in Tables 25, and 26 below. The first table reports the baseline regression. In the baseline specification, derived labour demand is a function of real output, real wages and market size. This model is augmented by the impact of trade volumes and some interactions between trade and wage effects. However, because the literature suggests that there are some reasons to believe *a priori* that origin of imports may matter, this effect is also investigated. The main trading regions are divided into the Americas, Europe, Asia, the rest of Africa and Oceania. The impact of region of origin on derived labour demand is investigated in Table 26.

In Table 25, three baseline regressions for derived labour demand in South African manufacturing are reported. In column 2 of this Table, where the results from regression 1 are presented, output and wages have the expected impacts. An increase in output leads to a rise in the level of derived labour demand, in both the short-run and in the long-run, while increases in wages, on the other hand, have the expected negative effect on labour demand in the short-run. Industrial sectors with a large share of the domestic market had a significant impact on employment determination. The positive coefficient on lagged employment in the models suggests some persistence in both the wage and output effects. The baseline specification performs well in the conventional statistical sense, with no reported second order serial correlation, suggesting that a valid instrument set consisting of lags of output, wages, and market share has been employed and the residuals are not correlated.

Column 3 of Table 25 reports the second regression's results. Here, import and export penetration ratios are introduced into the underlying baseline equation. The first thing to note is that not much change occurs to the performance of the basic model most of the variables are broadly similar in magnitude, yet the specification remains largely robust. An increase in output leads to a rise in the level of derived labour demand, while increases in wages, on the other hand, have a negative effect on labour demand. Turning to trade shares, the export share exerts a positive impact on derived labour demand that is significant at the 1 per cent level. This indicates that an increase in the demand for manufactured exports has a positive impact on derived labour demand. These results suggest that export growth appears to exert pressure for industries to hire more units of the labour input. The current import penetration ratio is negative and significant at the one per cent level as expected. These results suggest that import pressure makes industries to shed some of their employees in order to remain competitive.

The results presented in column 4 of Table 25 are the last augmentation to the baseline regression. Even in this last augmentation, an increase in output still leads to a rise in the level of derived labour demand and an increases in wages, leads to a decrease in labour demand in manufacturing. The focus here however, is on the impact of trade on the slope of the labour demand function. It has been argued that increased openness makes it easier to substitute foreign for domestic workers (Borgas and Ramey, 1994). This hypothesis is examined by interacting import and export volumes with the real wage rate. For the export share, the effect is positive but not significant; however, for import penetration the effect is negative and significant at the 1 per cent level. Since the effect of the interaction between current import penetration and real wage is significant at the conventional levels, some labour substitution in manufacturing appears to be taking place as trade openness increases.

Table 25: Baseline labour demand models for South African manufacturing

Model Number	1		2		3	
Dependent Variable	$\Delta \log n$		$\Delta \log n$		$\Delta \log n$	
Variable	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
Constant	-0.0292	-3.45	0.0023	0.22	-0.0319	-7.27
$\Delta \log n_{t-1}$	0.0128	2.11	0.0677	2.19	0.0005	0.04
$\Delta \log n_{t-2}$	0.0063	0.73	-0.0092	-0.35	-0.0157	-1.20
$\Delta \log y_t$	0.0942	3.91	0.2208	3.23	0.1708	3.04
$\Delta \log y_{t-1}$	0.0199	0.67	0.0143	0.32	0.0622	1.17
$\Delta \log y_{t-2}$	0.0508	3.03	-0.1205	-2.49	-0.0855	-1.75
$\Delta \log(w/r)_t$	-0.0288	-2.00	-0.1242	-2.26	-0.1044	-2.32
$\Delta \log(w/r)_{t-1}$	0.0009	0.05	-0.0446	-0.75	0.0621	1.53
$\Delta \log(w/r)_{t-2}$	0.0068	0.22	-0.0557	-0.64	-0.0415	-0.73
$\Delta \log marketshare_t$	0.0308	1.98	0.0012	0.07	0.0085	0.53
$\Delta \log marketshare_{t-1}$	-0.0534	-3.16	-0.0432	-1.85	-0.0562	-2.60
$\Delta \log marketshare_{t-2}$	0.0053	0.59	0.0112	1.08	0.0049	0.56
$\Delta \log \exp ort_t$			0.0713	3.79	0.0343	2.89
$\Delta \log \exp ort_{t-1}$			0.0070	0.38	-0.0096	-0.72
$\Delta \log \exp ort_{t-2}$			0.0151	0.92	0.0072	0.53
$\Delta \log import_t$			-0.2111	-2.62	0.0355	2.86
$\Delta \log import_{t-1}$			-0.0139	-0.38	-0.0168	-1.04
$\Delta \log import_{t-2}$			0.0479	1.93	0.0125	0.81
$\Delta \log(w/r)_t \times \Delta \log \exp ort_t$					0.0002	0.07
$\Delta \log(w/r)_{t-1} \times \Delta \log \exp ort_{t-1}$					0.0021	1.45
$\Delta \log(w/r)_{t-2} \times \Delta \log \exp ort_{t-2}$					0.0031	1.29
$\Delta \log(w/r)_t \times \Delta \log import$					-0.0058	-2.45
$\Delta \log(w/r)_{t-1} \times \Delta \log import_{t-1}$					-0.0030	-0.98
$\Delta \log(w/r)_{t-2} \times \Delta \log import_{t-2}$					-0.0045	-1.65
Wald (joint)	χ^2 (11)=42.62 [0.000]**		χ^2 (17)=93.09[0.000]**		χ^2 (23)=415.5[0.000]**	
Wald (dummy)	χ^2 (140)=2865 [0.000]**		χ^2 (140)=171.90[0.034]*		χ^2 (47) =2643[0.000]**	
Wald(time)	χ^2 (12)=63.56 [0.000]**		χ^2 (12)=174.2[0.000]**		χ^2 (20) =506.6[0.000]**	
Second order serial correlation	N(0,1)=-0.5875[0.557]		N(0,1)=-0.041[0.97]		N(0,1) =1.41[0.16]	

Note: All models estimated in differences by instrumental variables and coefficients on time dummies are not reported. Source: computed by the author: **www.statssa.gov.za**, www.tips.org.za, http.trade@easydata.co.za

In Table 26, an examination of the region specific impact of trade on derived demand for labour is investigated. The first column in the table lists disaggregated imports, into those originating from America, Europe, Asia, Africa and Oceania. In Europe, South Africa's key trading partners include UK, Germany, France, Netherlands and Italy. Trade with America as a region is dominated by the USA, Canada, Mexico, Brazil and Argentina. The main countries in Asia that trade with South Africa are Japan, China, Hong Kong, Singapore, Taiwan, Korea and Malaysia. For Oceania and Africa, the key countries involved are Australia, New Zealand and Egypt.

Results from regression 4 in column 2 of Table 26 are based on the impact of imports from the most technologically advanced of the partner regions namely Europe and America. The results indicate a significant positive impact on derived labour demand of imports from both America and Europe. In regression 5, imports from Asia are introduced. The results reported in column 3 indicate a significant positive association between imports originating from Europe and a strongly negative and significant association between manufacturing labour demand with imports from Asia. In regression 6, results of which are reported in the last column of Table 26, imports from Oceania and Africa are introduced. Findings indicate a positive impact from Oceania and a weak impact from the African region. In a nutshell, imports from Asia lead to the most noticeable loss in demand for labour in South African manufacturing.

Table 26: Import origin and manufacturing labour demand

Model Number	4		5		6	
	$\Delta \log n$		$\Delta \log n$		$\Delta \log n$	
Variable	**Coefficient**	**t-ratio**	**Coefficient**	**t-ratio**	**Coefficient**	**t-ratio**
Constant	-0.0218	-4.09	-0.0278	-9.60	-0.0236	-6.28
$\Delta \log n_{t-1}$	0.0003	0.20	-0.0033	-0.29	0.0043	2.02
$\Delta \log n_{t-2}$	0.0040	0.50	-0.0232	-2.33	-0.0001	-0.06
$\Delta \log y_t$	0.0164	3.06	0.0926	3.85	0.0109	2.64
$\Delta \log y_{t-1}$	0.0018	0.22	0.0679	1.33	-0.0002	-0.06
$\Delta \log y_{t-2}$	0.0078	0.77	-0.0809	-1.57	-0.0028	-1.11
$\Delta \log(w/r)_t$	-0.0135	-2.37	-0.1323	-3.10	0.0069	0.98
$\Delta \log(w/r)_{t-1}$	0.0004	0.07	0.0473	1.69	-0.0089	-1.75
$\Delta \log(w/r)_{t-2}$	-0.0031	-0.93	-0.0009	-0.04	0.0035	1.02
$\Delta \log marketshare_t$	0.0407	2.22	0.0189	0.91	0.0188	0.97
$\Delta \log marketshare_{t-1}$	-0.0545	-3.57	-0.0474	-1.87	-0.0336	-1.91
$\Delta \log marketshare_{t-2}$	0.0152	1.11	0.0126	1.13	0.0008	0.07
$\Delta \log amer\_imp_t$	0.0291	2.04	0.0283	1.73	0.0086	0.62
$\Delta \log amer - imp_{t-1}$	0.0039	0.31	-0.0009	-0.07	0.0114	0.79
$\Delta \log amer\_imp_{t-2}$	-0.0159	-1.12	-0.0005	-0.29	-0.2175	-1.16
$\Delta \log euro\_imp_t$	0.0193	2.11	0.306	2.02	0.0295	2.26
$\Delta \log euro - imp_{t-1}$	0.0166	1.17	0.0207	1.12	0.0102	0.78
$\Delta \log euro\_imp_{t-2}$	-0.0142	-1.45	0.0182	1.63	0.0284	2.00
$\Delta \log asia\_imp_t$			-0.0021	-2.33	-0.0110	-1.16
$\Delta \log asia\_imp_{t-1}$			-0.0297	-2.02	-0.0429	-3.95
$\Delta \log asia\_imp_{t-2}$			-0.0347	-3.90	-0.0209	-1.73
$\Delta \log oceania\_imp_t$					0.0089	2.00
$\Delta \log oceania\_imp_{t-1}$					-0.0000	-0.02
$\Delta \log oceania\_imp_{t-2}$					-0.0085	-2.05
$\Delta \log africa\_imp_t$					0.0109	1.00
$\Delta \log africa\_imp_{t-1}$					-0.0083	-1.29
$\Delta \log africa\_imp_{t-2}$					-0.0002	-0.02
Wald (joint)	χ^2 (17)=51.4[0.000]**		χ^2 (20)=232.4[0.000]**		χ^2 (26)=748.6[0.000]**	
Wald (dummy)	χ^2 (140)=255.2[0.000]**		χ^2 (39)=7950[0.000]**		χ^2 (38)=748.6[0.000]**	
Wald (time)	χ^2 (12)=52.7[0.000]**		χ^2 (12)=280.6[0.000]**		χ^2 (12)=121.9[0.00]**	
Second order serial correlation	N(0,1)=--0.27 [0.786]		N(0,1)=-0.647 [0.51]		N(0,1)=-0.258 [0.796]	

Note: Estimates in differences by instrumental variables. The variables are as defined in table 24.
Source: computed by the author: **www.statssa.gov.za**, www.tips.org.za, http.trade@easydata.co.za

4.5.2.2 Role of product and time specific effects

As indicated in equation 38 it is possible to model the impact of the product-specific and time-specific effects. Product specific-effects are time-invariant characteristics such as the degree of market competition in different industries, information asymmetry in the industrial sector[52] and the degree of product differentiation. Other product specific characteristics are related to government influences that apply to specific industries, unobservable entrepreneurial and managerial skills in different industries and the language and business culture. These effects are captured by product specific dummies as data for these variables is unavailable.

Time-specific effects capture the effects of policy interventions and trade policy shifts. These shifts include the impact of policies such as the General Export Incentive Scheme, the impact of membership in the WTO, the effect of sanctions or the role of the government of national unity since 1994, where conditions that cut across all industrial sectors were created. Time effects can also capture significant changes in productivity due to innovation or to other noticeable effects such as the impact of the depreciation of the Rand in 2002. The impact of global crises[53]can also be classified as time specific. Again, since data on these key changes is unavailable, their effects are captured using time-specific dummies. For simplicity, it is assumed that product-specific and time-specific effects are fixed parameters to be estimated and all the remainder of the disturbances are stochastic, independent and identically distributed. An

[52] Availability of information to enable exporters or importers of commodities in South Africa and the rest of the world differs from product to product.

[53] Such as crises include the East Asian and Russian financial crisis of 1997 and 1998 respectively as well as the September 11 crisis in the US.

extension of equation 5 from Table 26 is done to provide results indicating the impact of these effects in Table 27.

Table 27: Product and time specific effects in manufacturing

Variable/Model Number	5	
Product specific effects	**Coefficient**	**t-ratio**
Food	-0.0176	-2.66
Beverages	0.0224	2.15
Tobacco	0.0021	0.40
Textiles	-0.0142	-2.58
Wearing apparel	0.0002	0.03
Leather & leather products	-0.0323	-4.41
Footwear	-0.0023	-0.41
Wood & wood products	0.0036	0.80
Paper & paper products	-0.0259	-2.37
Printing, publishing & recorded media	0.0061	1.19
Coke & refined petroleum products	0.0122	1.64
Basic chemicals	0.0039	0.56
Other chemicals & man-made fibres	0.0077	1.55
Rubber products	0.0138	2.89
Plastic products	-0.0051	-0.67
Glass & glass products	-0.0221	-2.60
Non-metallic minerals	-0.0169	-1.44
Basic iron & steel	0.0029	0.34
Basic non-ferrous metals	-0.0038	-2.57
Metal products excluding machinery	0.0057	1.26
Machinery & equipment	0.0378	1.76
Electrical machinery	-0.0221	-1.74
Television & communication equipment	0.0169	1.34
Professional & scientific equipment	0.0285	2.94
Motor vehicles, parts & accessories	-0.0143	-0.97
Other transport equipment	-0.0103	-1.53
Furniture	0.0061	0.83
Time specific effects	**Coefficient**	**t-ratio**
1992	0.0099	0.98
1993	0.0038	0.33
1994	0.0082	0.65
1995	0.0201	2.48
1996	0.0205	1.64
1997	-0.0098	-0.84
1998	0.0087	0.42
1999	0.0099	0.53
2000	-0.0121	-0.83
2001	-0.0593	-2.74
2002	0.0593	3.23

Source: computed by the author:

The results in Table 27 show that food, textiles, leather and leather products, paper and paper products, glass and glass products and basic non ferrous metals exerted negative and statistically significant product specific effects. This suggests that there are some unique characteristics in these products that tend to reduce derived labour demand in the manufacturing sector. There is need to identify these characteristics using firm level surveys targeting these industry chapters. Positive and significant product specific effects were also recorded in beverages, rubber products and the professional & scientific equipment sectors. Regarding the time specific effects, the impacts over the period under review were generally positive, with statistically significant impacts recorded in 1995 and 2002. The only negative time specific impact on manufacturing employment is recorded in 2001. This suggests that the question of the decline in employment in manufacturing over the period under review can be unravelled by looking more closely at the product specific characteristics.

4.5.2.3 Interpretation of the overall results

These results can be explained in a number of ways in terms of the existing trade theories. More intuitively, the debate on employment effects of trade lies also on the question of whether trade between South Africa and the rest of the world is of inter-industry or intra-industry type. Inter-industry trade refers to international exchange of widely dissimilar goods. Such trade between South Africa and its trading partners stems from differences in the rankings of sectoral comparative advantage. Explanations for inter-industry trade in the context of South African trade should, therefore, be consistent with the Ricardian and Heckscher-Ohlin models.

Intra-industry trade, on the other hand, is the simultaneous importing and exporting of similar products. For South African manufacturing, intra-industry exchange should produce extra gains from international trade over and above those associated with comparative advantage, because it allows firms to take advantage of larger markets. Indeed, new trade models provide simple explanations for observed intra-industry patterns by linking it to imperfect competition, consumer preferences and other features of industrial organisation.

Trade models argue that there is increased efficiency, through achievement of scale economies, and welfare gains, due to a larger choice of varieties for consumers (Petersson, 2002). In addition, moving from one industry to another owing to inter-industry adjustment is expensive, because workers' capital depreciates necessitating retraining. However, intra-industry trade makes human capital portable across firms, so that, even though some firms exit the market, adjustment costs will be smaller.

South African trade with Europe and the America's appears to be based on fairly long established trade links. An increasing share of South African trade with Europe and America is likely to be of the intra-industry type. The impact of import trade with Europe and the Americas on derived labour demand in South African manufacturing is positive.

Isemonger (2000) finds an upward trend in the overall level of intra-industry trade manifested at all levels in South African industry. In the same vein, Peterson (2002), using South African data, also finds an increase in trade following liberalisation in 1994 and that large differences in intra-industry trade existed among sectors, while trade with the European Union was dominated by differentiated and skill-intensive industries. Motor vehicles and machinery represent more than half of this expansion in trade with the European Union. The level of intra-industry trade with Europe in equipment and machinery has played an important role in the industrialisation of South Africa, because machinery and equipment producing sectors lie at the heart of production and technical change (Sichei and Harmse, 2004). Europe is also one of South Africa's most important sources of imports, particularly for capital goods and technology. Major investment in South Africa's automobile, chemical, mechanical and electrical engineering industries are from Europe. There are also strong links between Europe and South Africa regarding foreign direct investment. Inward

FDI has a positive relationship with imports, because FDI and trade complement each other (Markusen and Venables, 2000). If intra-industry trade is increasing or is dominating inter-industry trade in some sectors, then industrial and trade policies for products should be designed in a way to reap maximum trade benefits.

While trade between South Africa and Asia has been growing rapidly, it appears to have reduced demand for South African labourers in the import competing industries. While import penetration from Asia exerts a largely negative impact on derived labour demand for South African manufacturing that with Oceania exerts a positive impact. Products from Asia that are similar to those made in South African industries tend to displace South African products and labour. Indeed, the textile industry in South Africa is facing competition from textiles from Asia. The average impact of imports from Africa was largely insignificant.

4.6 CONCLUDING REMARKS

South Africa has, over the last quarter of a century, experienced the effects of globalisation and the growth in trade that comes along with it. Naturally, the impact of expanding trade volumes on manufacturing labour markets in particular, has generated a fair amount of debate. More specifically, there has been concern that the impact of trade on the country would be reflected largely in job losses, because the South African manufacturing sector was assumed to be unable to adjust or compete with those in the north and East Asia. Other arguments have posited that since the country has a low wage base, it would experience rapid expansion as firms relocated to South Africa from the rest of the world. The interest in labour adjustment in manufacturing is profound in South

Africa, because of the continued stagnation or decline in manufacturing employment (and employment, in general).

Chapter 4 investigated the impact of trade on industry level outcomes for the entire South African manufacturing industry. A dynamic labour demand equation was built incorporating imports and exports and is estimated in a panel that uses a constructed rich database. The baseline equation appears properly specified, and adequately accommodates changes in specification as well. The results show that import volumes generally caused reductions in the level of derived labour demand. The reductions in derived labour demand results from the fact that increased trade and openness serves to increase the efficiency with which labour is utilised in an industry. In a nutshell, increased import penetration serves to reduce inefficiency and encourages the use of new technology. The positive impact of export expansion on derived labour demand supports results from efficiency estimates that indicate the importance of skilled labour. Increased trade requires emphasis on skill development for the labour force, because intra-industry trade benefits can only arise in an environment in which the skill competencies of labour are improved. The results uncover some evidence of foreign labour substituting for South African workers in the manufacturing sector.

Some of the trade flows between South Africa and its trading partners is of the inter-industry type, stemming largely from differences in sectoral comparative advantage, while some of the trade flows are increasingly of an intra-industry type. Some of the products entering South Africa are produced at lower cost abroad than can obtain for similar products in South Africa; such commodities have tended to displace South African products and labour. The analysis presented here shows that trade has the potential to exact factor adjustment. It is, therefore, important to take into account possible factor adjustments in all products and in all the key spheres of policy. These spheres of policy exist at the level of industrial policy, trade policy and in bilateral and multilateral agreements. In this vein, it is important to conduct periodic analysis at industry and firm level to identify product specific factors affecting labour demand.

There are important avenues in which this analysis can be expanded given more finely graded data. For example, it would be useful to explore the relationship for different categories of labour especially given the wealth of literature on the skills gap. Investigating groupings of industries by relative factor intensity is another important area. Most importantly, it is worth pursuing issues related to the speed of adjustment and the importance of intra-industry trade, especially with data broken more frequently, covering a longer period of time. Other extensions will merit the analysis of imperfect competition in the labour market as well as investigating the impact of imports on derived labour demand at bilateral levels.