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An Econometric Analysis of Labour Demand at an Industry Level in South Africa

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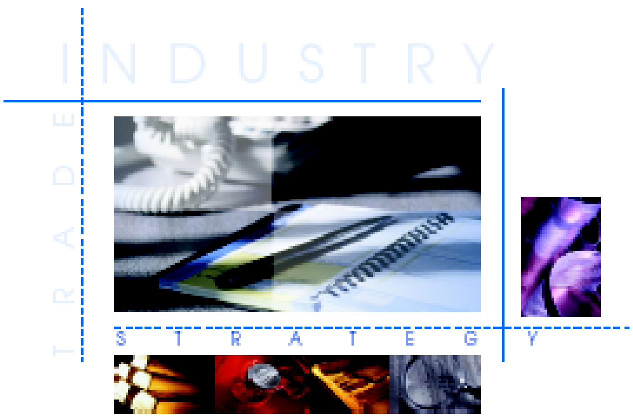

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ACRONYMS

IT	Information Technology
OLS	Ordinary Least Squares
SA	South Africa
SAM	Social Accounting Matrix

EXECUTIVE SUMARY

Policy-makers in the public sector are often faced with requests for financial and other support for investment projects and incentive schemes. Frequently, such requests are accompanied by or require economic impact analyses of some sort. Economic impact assessment of investment projects can be undertaken at various levels. At one level, decision-makers are interested in the financial viability of the investment project – in other words a comparison of income and expenditure. Taking a broader view, the challenge is to assess the impact of the proposed investment on the economy in which it takes place.

The impact of an economic stimulus on specific institutions or industries can usefully be analysed with models based on input-output analysis or the social-accounting matrix (SAM). These models use a database or snapshot picture of the economy, and then multiply the stimulus with the relevant institution's or industry's output multiplier. However, these analyses rely on strict assumptions, for example, that production technologies remain constant (which ignores any dynamic effects such as substitution between labour and capital), and a non-substitutability between different types of labour such as skilled and unskilled.

More specifically, in terms of employment it is often assumed that the average employment-output ratios of the relevant industry apply for all sectors that will indirectly receive a boost as a result of the production activities at hand. If substantial evidence exists of economies of scale (many economic observers have noted the recent phenomenon of 'jobless growth'), an alternative specification of the relationship between a change in output and the associated change in employment becomes critical.

Therefore, a time series regression analysis approach is followed in this paper to analyse the impact of output on labour demand or employment. Apart from generating employment-output elasticities – so necessary for a more appropriate application of input-output or first-generation SAM-based modelling – with this approach it is possible to allow for phenomena such as input substitution and 'jobless growth', as well as other structural changes.

The analysis was undertaken at an industry level, for total employment as well as the different levels of skills – highly skilled, skilled, and semi- and unskilled employment. The results show that two trends characterise the SA labour market: capital deepening and a change in the composition of labour demand from semi- and unskilled to skilled and highly skilled employment. Capital deepening, or increasing capital-intensity, is reflected in the coefficients of output in the total employment equations. Most of these coefficients are less than one, which means that a 1% increase in output results in a less than 1% increase in employment. This implies that the employment-output ratio is falling over time.

The coefficients of output in the different skill categories of employment capture the change in the composition of labour demand. In most industries, the output coefficient in the highly skilled category is close to or greater than one, compared to a coefficient in the semi- and unskilled labour of more often than not less than one. This means that, over time, firms are increasing the proportion of highly skilled employment at the cost of semi- and unskilled employment. The output coefficients in the skilled category vary: in some industries skilled employment is becoming an increasing proportion of total employment, while in others it is becoming a smaller proportion of total employment.

Two factors that impact negatively on the demand for labour is the increasing labour market rigidity as measured by the power of unions, and the introduction of affirmative action legislation.

1. INTRODUCTION

Policy-makers in the public sector are often faced with requests for financial and other support for investment projects and incentive schemes. Frequently, such requests are accompanied by or require economic impact analyses of some sort. Economic impact assessment of investment projects can be undertaken at various levels. At one level, decision-makers are interested in the financial viability of the investment project – in other words a comparison of income and expenditure. Taking a broader view, the challenge is to assess the impact of the proposed investment on the economy in which it takes place. Often, rather wild statements as to such impacts is found in the media where it is argued, for example, that one job is created for every 12 foreign visitors or a certain amount of Rands invested. Although such statements are appealing to the general public, decision-makers need to go beyond these aggregate effects and extend the analysis to a more disaggregated level. For example, what will the effects be on the different economic industries? Will these jobs be created for highly skilled or unskilled labour?

The impact of an economic stimulus on specific institutions or industries can usefully be analysed with models based on input-output analysis or the social-accounting matrix (SAM). These models use a database or snapshot picture of the economy, and then multiply the stimulus with the relevant institution's or industry's output multiplier. However, these analyses rely on strict assumptions, for example, that production technologies remain constant (which ignores any dynamic effects such as substitution between labour and capital), and a non-substitutability between different types of labour such as skilled and unskilled (Holub and Tappeiner, 1989).

More specifically, in terms of employment it is often assumed that the average employment-output ratios of the relevant industry apply for all sectors that will indirectly receive a boost as a result of the production activities at hand. If substantial evidence exists of economies of scale (many economic observers have noted the recent phenomenon of 'jobless growth'), an alternative specification of the relationship between a change in output and the associated change in employment becomes critical.

Therefore, a time series regression analysis approach will be followed in analysing the impact of output on labour demand or employment. Apart from generating employment-output elasticities – so necessary for a more appropriate application of input-output or first-generation SAM-based modelling – with this approach it is possible to allow for phenomena such as input substitution and 'jobless growth', as well as other structural changes.

The study is outlined as follows: Section two summarises the economic determinants of labour demand, Section three explains the methodology followed in the study, and Section four briefly describes the econometric techniques used. Section five describes labour demand in South Africa (SA), while Section six presents the results of the empirical analysis. Section seven provides some conclusions.

2. THEORY

2.1 Determinants of Labour Demand

According to economic theory, labour demand should be driven in the long run by output, the (relative) cost of labour and capacity utilisation. When output increases, more units of the inputs have to be used. If the production structure is fixed, inputs will grow at the same rate as output, so that each input remains a constant ratio to output.

In addition to output, employment can also be determined by the (relative) price of labour and capacity utilisation. Although an increase in output is generally associated with an increase in inputs, this is not necessarily always the case. For example, it is possible that agriculture might not expand their production to meet additional demand, but rather divert exports to an expanding domestic market. An industry that is already operating at full capacity might simply find it impossible to expand production.

If we assume a well-functioning labour market, the demand of labour is inversely related to its price. The higher the price of labour, the lower the demand for labour will be. The relative price of labour – the price of labour relative to that of other inputs such as capital – can also change the demand for labour by motivating the more intensive use of the relatively cheapest input. In other words, relatively cheap capital will motivate firms to use more capital-intensive technology, while relatively cheap labour will warrant more intensive-intensive technology. Similarly, firms will rather use more of the relatively cheap skill category, which means that a change in the relative wages of different skills categories might also cause a change in the mix of skills used by firms. For example, if increased unionisation amongst unskilled or semi-skilled workers causes their wages to increase relatively more than that of skilled or highly skilled workers, firms might decide to use less unskilled and semi-skilled labour and more highly skilled labour.

However, it is not only the direct cost of labour that influences the demand for labour, but also the indirect costs. The increased labour market rigidity in SA raises the indirect cost of labour for firms, since more time and money have to be spent negotiating with unions, and an increasing amount of time and money is lost due to strikes. High indirect costs may warrant a substitution of labour with capital, which means that labour will grow slower than output.

2.2 Structural Changes in Labour Demand

Economic growth and development never impact symmetrically on all occupational groups, and the proportions with which different occupational groups are used to produce total output change dramatically over time (Bhorat and Hodge, 1999). These shifts in the structure of labour demand usually occur as a result of two factors – changes in the production methods used in each industry so that input substitution takes place, and changes in the structure of the economy itself (Bhorat and Hodge, 1999).

The global trend in the first factor, that is, changes in production methods such that it causes input substitution, is towards becoming more capital-intensive. Capital deepening – the process of increasing capital-intensive production – usually causes a decline in the demand for unskilled and low-skilled labour which is being replaced by new capital equipment, while it causes an increase in the demand for more skilled labour that has to operate the new capital equipment (Hamermesh, 1993:351; Bhorat and Hodge, 1999). A factor that has contributed substantially to capital deepening is the increased use of information technology (IT). IT has reduced the demand for less skilled labour while increasing the demand for highly skilled labour by shifting the emphasis from production towards planning, design and software skills. These aspects require higher skills than before, implying a shift in the composition of labour demand from lower- to higher-skilled labour.

The second factor – changes in the structure of the economy – refers to the global trend of economies to move away from primary production. Since different industries in the economy use different proportions of the different skill levels, changes in the contributions of the industries to total output will change the composition of total labour demand. Similarly, if there is a change in the structure of a particular sector, it will cause a change in its labour demand composition. For example, in SA growth in manufacturing has been biased towards more capital-intensive sub-sectors, which has raised the capital-intensity of the manufacturing sector as a whole (Bhorat and Hodge, 1999).

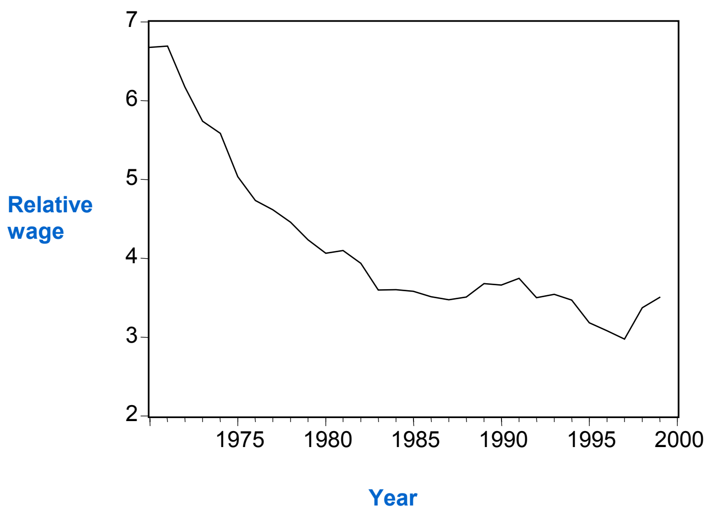
3. THE SA LABOUR MARKET

Apart from the global trends in labour markets, such as capital deepening and a shift towards more skilled labour, the SA labour market has been characterised by several distinct phenomena that have additional influences on the labour intensity of the economy as well as the composition of labour demand. Changes in labour legislation, such as the introduction of affirmative action legislation, and so-called 'jobless growth' have had a substantial impact on the labour market. These issues are briefly discussed in this section.

Following the trend in global labour markets, the SA economy experienced a substantial capital deepening over the last 30 years or so. The SA industries in which capital deepening occurred most are mining, agriculture, construction and manufacturing (Bhorat and Hodge, 1999). Service industries such as transport, finance and community services experienced the least capital deepening.

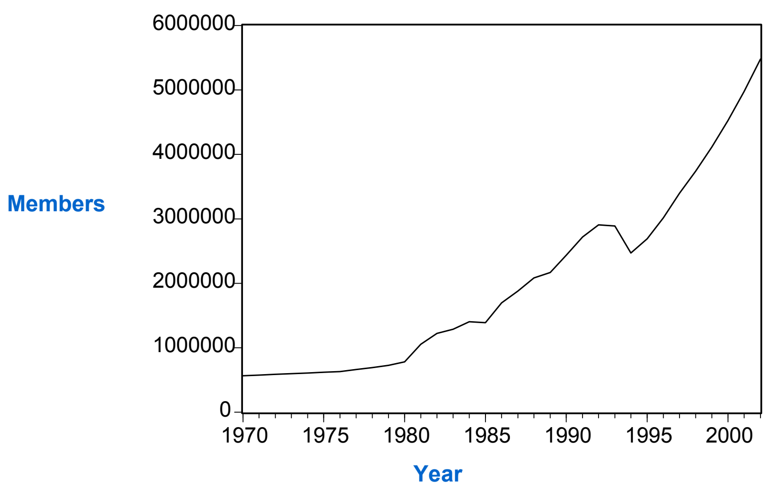
Although capital deepening is a global trend, certain distortions enhanced this trend in the SA economy. For example, increased unionisation may have contributed to the dramatic rise in the nominal wages of unskilled labour (*see Figure 1*), especially in the mining industry. Consequently, capital became relatively less expensive, which caused a shift towards more capital-intensive mining methods (Bhorat and Gelb, 1999). A graph of the number of union members (*see Figure 2*) shows that unions have become an increasingly important role player in the SA labour market, and this may have contributed to the indirect cost of labour and the labour market rigidity. In addition, the introduction of affirmative action increased labour market rigidity by forcing firms to employ from a smaller pool of potential labour. Rather than facing these problems, firms may resort to capital deepening. In general, since lower skilled employees are more likely to participate in union activity such as strikes, increased unionisation potentially contributed in a shift from lower- to higher-skilled labour.

Figure 1: Skilled Wages Relative to Unskilled Wages



[Source: Reserve Bank Quarterly Bulletin, various issues]

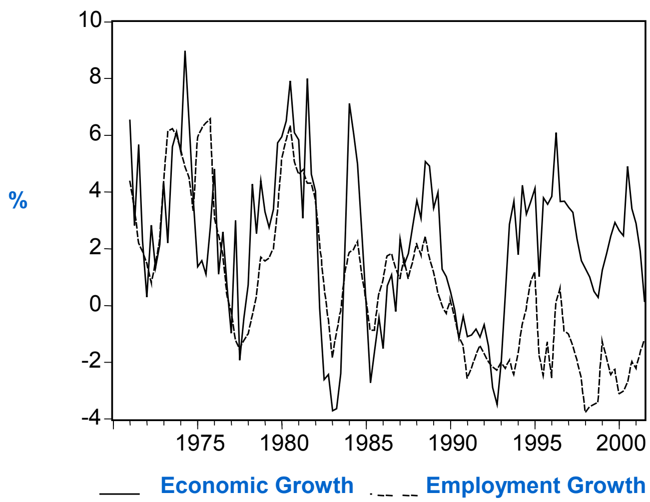
Figure 2: Union Members in SA



[Source: Reserve Bank Quarterly Bulletin, various issues]

Another prominent feature of the SA economy since the early 1990s is the phenomenon of 'jobless growth', which refers to the situation where the economy grows without creating additional jobs (*see Figure 3*). During the 1970s and 1980s, employment and output growth were more or less in line. During this period, positive economic growth rates were often coupled with slightly lower employment growth rates, while negative growth rates also tended to be coupled with higher employment growth rates. However, it is clear from Figure 3 that the employment growth rate was substantially lower than the economic growth rate since the early 1990s. Some argue that this might be due to economies of scale, while others claim that it reflects a change in the production structure where labour is substituted with capital – capital deepening. In the next section we will attempt to quantify such relationships for SA empirically at the industry level.

Figure 3: Jobless Growth



[Source: Reserve Bank Quarterly Bulletin, various issues]

4. METHODOLOGY

In this analysis, employment is estimated as a function of output, amongst other variables. This will allow us to determine the impact of an output stimulus on employment. If the variables are used in logarithmic form, the estimated coefficients can be interpreted as elasticities.

In other words, in *Equation 1*, β_j^i is the elasticity of employment (E) with respect to changes in output (X) for industry j and skill category i. Put differently, a 1% increase in output in industry j will result in a β_j^i % increase in employment in this industry.

Equation 1:

$$\log(E_j^i) = \log(\alpha_j^i) + \beta_j^i \log(X_j) + \varepsilon_j^i \qquad (1)$$

If β_j^i =1, it means that output and employment grow at the same rate, so that the employment-output ratio will remain constant at its average.

On the other hand, if β_j^i <1, it means that employment is growing at a slower rate than output, so that the employment-output ratio will decline over time.

Similarly, if β_j^i >1, it means that employment is growing at a faster rate than output, so that the employment-output ratio will increase over time.

If total employment in a particular industry grows slower than output (β_j^i <1), it would imply that the industry is becoming less intensive-intensive. This is usually caused by capital deepening or technological change. If one of the skills categories is growing faster than output, it means that the industry is becoming more intensive in using labour of that particular skill category, usually since the composition in which it mixes the skills categories changes. For example, the use of IT generally warrants a shift towards using more skilled and less unskilled labour.

Different combinations of the effects described above are possible. For example, capital deepening or new technology in a particular industry might cause a decline in the labour intensity of the industry, which implies a fall in the total employment-output ratio. This will in turn cause all the skills categories to have lower employment-output ratios. However, at the same time it might necessitate the use of more skilled and less unskilled and semi-skilled labour to operate the new technology. In other words, two effects are impacting simultaneously on the elasticity of each skill category of labour.

The model of *Equation 1* assumes that the elasticities (β_j^i) remain constant over time, which means structural changes in the demand for labour is not captured in *Equation 1*. For example, if affirmative action legislation caused firms to become less intensive-intensive, the model does not capture this structural change unless a dummy variable is added as an explanatory variable. It is crucial to capture any such structural changes, since omission of structural changes will bias the estimated employment / output elasticities. It can also be very meaningful to measure the exact impact of these structural changes on labour demand. In addition to output (X) and dummy variables (to capture structural changes), other variables such as capacity utilisation and the (relative) cost of labour might also be added to the model as specified in *Equation 1*.

5. THE ECONOMETRIC TECHNIQUE: COINTEGRATION

Trends in the regression variables, either stochastic or deterministic, cause ordinary least squares (OLS) estimation to yield spurious regression results. Intuitively, the problem is that OLS picks up the trends in the variables and mistakenly sees that as a structural relationship when, in fact, there might be no relationship between the variables except for the mere coincidence that both are growing over time. This is the so-called 'spurious regression problem'. Statistically, the additional problem is that the standard *t*- and *F*-tests becomes invalid in regressions with non-stationary variables. The grim fact is that most economic time series are subject to some type of trend. It is therefore important to employ cointegration techniques which avoids the spurious regression problem.

Through cointegration, economic data series – although non-stationary – can be combined (through a linear combination) into a single series which is stationary. Series that exhibit such a property are said to be cointegrated. The idea of cointegration is that if the explanatory variables are driving the dependent variable in the long run, the unexplained part (that is, the residuals) will be random. In other words, the residuals will be stationary if the series are cointegrated.

The process of testing for cointegration is as follows: First, the order of integration of all the variables has to be tested (it has to be determined whether the variables are stationary or non-stationary). A series is stationary if it has a constant mean and variance, and non-stationary if not. Usually, most economic series are non-stationary since they grow over time. If the variables are stationary, OLS can be employed in estimating the regressions, and all the normal inferences will be valid. If the variables are non-stationary, they have to be tested for cointegration. If the variables are cointegrated (if the regression's residuals are stationary), the explanatory variables are driving the dependent variable in the long run. The combination of the variables that yields stationary residuals is called the cointegration vector. In the case of non-stationary variables, the usual *t*- and *F*-tests and R^2 are invalid, regardless of whether they are cointegrated or not. If the variables are cointegrated, OLS yields super-consistent estimates of the parameters.

The purpose of cointegration is to determine the variables that are driving the dependent variable in the long run. This has two important implications. First, the estimated coefficients are long-run elasticities, and this approach models the long-run equilibrium level of the dependent variable. Secondly, it is more important to have a sample that spans a long period than to have a high number of observations that spans only a short period. For example, it would be better to have 30 annual observations than 60 monthly observations, since the annual observations span a longer period and hence capture the long-run behaviour of the variables better. In this study, 30 annual observations were available, which span a sufficient period to capture the long-run trend in the variables. In addition, a sample size of 30 is generally regarded in the literature as a large enough sample to utilise cointegration techniques (see Koekemoer, 1999; Du Toit, 1999; Jefferis and Okeahalam, 2000; Schoeman et al., 2000; Blignault and De Wet, 2001; Auret and De Villiers, 2000; Koekemoer 2001; and De Wet, 2002).

In a study such as this, the use of panel data techniques may be beneficial, since the pooling of the observations increases the power of the cointegration tests. However, an inspection of the data series and the individual cointegration relationships shows that the employment-output relationships are too heterogeneous to justify the use of panel data techniques. In particular, the occurrence of structural breaks in many of the series and relationships that are different in nature and timing implies that the cointegration vectors are different. This makes the use of panel data techniques, such as used by Fedderke and Mariotti (2002), inappropriate.

6. ESTIMATION RESULTS

6.1 Data and Definitions

In this study, employment refers to the number of paid employees, including casual and seasonal workers. Employment is divided into three categories – highly skilled, skilled, and semi-and unskilled labour. Highly skilled labour includes the following occupation groups: professional, semi-professional and technical occupations; managerial, executive and administrative occupations; and certain transport occupations such as pilot navigators. Skilled labour comprises the following occupation groups: clerical, sales, transport, delivery, communications and service occupations; farmers and farm managers; artisan, apprentice and related occupations; and production foremen and supervisors. The semi- and unskilled occupation category is the residual category and consists of all the occupations not included in the highly skilled or skilled categories.

6.2 Dummy Variables

Table 1 provides a list of the dummy variables that has been used in this analysis. These dummy variables are used to capture structural changes, such as a decline in employment due to the introduction of affirmative action legislation. Table 2 lists the variables other than dummy variables used in this study.

Table 1: List of Dummy Variables

Dummy	Construction
Dum85	1 since 1985, 0 otherwise
Dum87	1 since 1987, 0 otherwise
Dum88	1 since 1988, 0 otherwise
Dum90	1 since 1990, 0 otherwise
Time	1 in 1970, 2 in 1971, 3 in 1972 etc.
AA	Affirmative Action dummy: 1 since introduction of affirmative action laws, 0 otherwise.
Dum78_80	1 for 1978-1980, 0 otherwise

Table 2: List of Variables

Variable	Explanation
Y	Output
W	Wage
WR	Wage rate relative to user cost of capital
E	Employment
CU	Capacity utilisation
UP	Union power: Ratio of union members to total labour demand
UM	Union members: Number of union members

6.3 The Industries

Due to the poor results obtained in some industries with estimation on an industry basis, some of the industries have been aggregated (*see Table 3*). Where available, the results for the individual industries are given in addition to the aggregate results. For example, although industries SIC 311-312 to SIC 317 have been aggregated (SIC 311-317), the individual results for industries SIC 313-315 and SIC 317 are also presented.

Table 3: Aggregated Industries

Industries Aggregated	Aggregated Industry
SIC 61-63, SIC 64	SIC 61-64: Trade & catering and accommodation
SIC 51, SIC 52-53	SIC 52-53: Construction & civil engineering
SIC 371-373, SIC 374-376	SIC 371-376: TV, radio and communications equipment & scientific equipment
SIC 21, SIC 23, SIC 22/24/25/29	SIC 21-29: All mining
SIC 301-304, SIC 305, SIC 306	SIC 301-306: Food processing, beverages and tobacco
SIC 93, SIC 94-96, SIC 98, SIC 99	SIC 93-99: All other services and other producers
SIC 71-74, SIC 75	SIC 71-75: Transport, storage and communication
SIC 41, SIC 42	SIC 41-42: All utilities (electricity, gas and water)
SIC 321-322, SIC 323, SIC 324-326	SIC 321-326: Wood & paper products and printing
SIC 311-312, SIC 313-315, SIC 316, SIC 317	SIC 311-317: Textiles, clothing, leather products and footwear
SIC 331-333, SIC 334, SIC 335-336, SIC 337, SIC 338	SIC 331-338: All chemicals, rubber and plastics
SIC 351, SIC 352, SIC 353-355, SIC 356-359	SIC 351-359: Basic metals, metal products & non-electrical machinery

A list with the explanation of the industry codes is presented in Appendix 1.

6.4 Empirical Results

Since the variables were all non-stationary (*see Appendix 3 and 4*), cointegration techniques had to be employed in the analysis. The cointegration vectors are presented in Tables 4 to 7. All the vectors were cointegrated at least at a 10% level of significance. The Augmented

Dickey–Fuller test statistic for testing the null hypothesis of no cointegration is presented in Appendix 2.

In addition to output, variables such as capacity utilisation, the (relative) price of labour, union membership and power, and several dummy variables were considered. The dummy variables were used to represent structural changes, while the union membership and union power were used to capture labour market rigidity. The small coefficients on union membership and union power reflect the scale of the variables relative to the employment numbers.

Table 4: Total Employment

Industry (SIC)	Model
1	Log(E) =13.88-0.00572UP
21*	Log(E) = 6.53+0.63log(Y)-0.071452UP-0.098411AA
23*	Log(E) = 6.53+0.63log(Y)-0.071452UP-0.098411AA
22/24/25/29*	Log(E) = 6.53+0.63log(Y)-0.071452UP-0.098411AA
301-304*	Log(E) = 7.59+0.43log(Y)-0.21AA
305	Log(E) = 7.51+0.31log(Y)-0.24AA.log(Y)
306*	Log(E) = 7.59+0.43log(Y)-0.21AA
311-312*	Log(E) = 7.69+0.49log(Y)-0.006UP
313-315	Log(E) = 8.42+0.37log(Y)
316*	Log(E) = 7.69+0.49log(Y)-0.006UP
317	Log(E) = 5+0.67log(Y)-0.04AA.log(Y)
321-322	Log(E) = 6.75+0.5log(Y)
323*	Log(E) = 6.67+0.51log(Y)
324-326	Log(E) = 4.37+0.71log(Y)-0.88log(CU)
331-333*	Log(E) = 5.83+0.58log(Y)-0.12AA
334	Log(E) = 4.78+0.59log(Y)-0.03 AA.log(Y)
335-336	Log(E) = 6.21+0.5log(Y)-0.13AA
337*	*Log(E) = 5.83+0.58log(Y)-0.12AA*
338	*Log(E) = 3.08+0.86log(Y)*
341	Log(E) = 7.04+0.28log(Y)-0.24AA
342	Log(E) = 6.77+0.49log(Y)-0.05AA.log(Y)
351*	Log(E) = 5.01+0.7log(Y)-0.000883UM-0.02AA.log(Y)
352*	Log(E) = 5.01+0.7log(Y)-0.000883UM-0.02AA.log(Y)
353-355	Log(E) = 5.88+0.59log(Y)-0.02AA.log(Y)
356-359*	Log(E) = 5.01+0.7log(Y)-0.000883UM-0.02AA.log(Y)
361-366	Log(E) = 7.44+0.61log(Y)-0.02AA.log(Y)+0.28Dum90
371-373	Log(E) = 4.92+0.55log(Y)
374-376*	Log(E) = 5.88+0.47log(Y)
381-383*	Log(E) = 4.60+0.70log(Y)-0.038AA.log(Y)-9.55E-07UP
384-387	Log(E) = 4.60+0.70log(Y)-0.038AA.log(Y)-9.55E-07UP
391	Log(E) = 5.13+0.64 log(Y)
392-393	Log(E) = 2.94+0.82log(Y)-0.3AA-0.86log(CU)
41*	Log(E) = 7.39+0.88log(Y)-0.45log(w)
42*	Log(E) = 7.39+0.88log(Y)-0.45log(w)
51*	Log(E) = 10.81+1.34log(Y)-1.22log(w)

Industry (SIC)	Model
52-53*	Log(E) = 10.81+1.34log(Y)-1.22log(w)
61-63*	Log(E) = 9.59+0.36log(Y)
64*	Log(E) = 9.59+0.36log(Y)
71-74*	Log(E) = 19.9+0.43log(Y)-1.08log(w)
75*	Log(E) = 19.9+0.43log(Y)-1.08log(w)
81-82	Log(E) = 5.34+0.62log(Y)
83-88	Log(E) = -8.96+1.94log(Y)-0.05AA.log(Y)
93	Log(E) = 8.14+0.31log(Y)
94-96	Log(E) = 12.63+0.73log(Y)-0.63log(w)
98	Log(E) = 6.66+0.61log(Y)
99	Log(E) = 1.72+1.07log(Y)

** results estimated with aggregate data*

Table 5: High-Skilled Employment

Industry (SIC)	Model
1	Log(E) =-8.45+1.69log(Y)
21*	Log(E) = 4.25+0.43log(Y)+0.0182UP
23*	Log(E) = 4.25+0.43log(Y)+0.0182UP
22/24/25/29*	Log(E) = 4.25+0.43log(Y)+0.0182UP
301-304	Log(E) = 0.43+0.78log(Y)+0.04Dum85.log(y)
305	Log(E) = -3.67+1.21log(Y)
306*	Log(E) = -1.02+0.92log(Y)+0.04Dum87.log(Y)
311-312*	Log(E) = -0.83+1.78log(Y)-0.94log(w)
313-315	Log(E) = 3.27+0.53log(Y)+0.04Dum90.log(Y)
316*	Log(E) = -0.83+1.78log(Y)-0.94log(w)
317	Log(E) = -2.72+1.18log(Y)
321-322	Log(E) = -1.46+1.03log(Y)
323*	Log(E) = 3.68+1.4log(Y)-0.99log(w)
324-326	Log(E) = -0.93+1.06log(Y)-1.56log(CU)
331-333*	Log(E) = -0.54+0.96log(Y)
334	Log(E) = -0.02+0.86log(Y)
335-336	*Log(E) = 1.68+0.76log(Y)*
337*	Log(E) = -0.54+0.96log(Y)
338	Log(E) = -4.46+1.42*log(Y)
341	Log(E) = -5.46+1.52log(Y)
342	Log(E) = -6.93+1.66log(Y)
351*	Log(E) = 11.33+1.51log(Y)-1.67log(w)
352*	Log(E) = 11.33+1.51log(Y)-1.67log(w)
353-355	Log(E) = -1.73+1.24*log(Y)-0.17log(WR)
356-359*	Log(E) = 11.33+1.51log(Y)-1.67log(w)
361-366	Log(E) = -6.07+1.64log(Y)+0.45Dum90-2.14log(CU)
371-373	Log(E) = 3.21+0.45log(Y)+0.85Dum90
374-376*	Log(E) = 3.22+0.47log(Y)+0.80Dum87

Industry (SIC)	Model
381-383*	Log(E) = 1.54+0.69log(Y)-0.07AA.log(Y)+0.0234UP
384-387	Log(E) = 1.54+0.69log(Y)-0.07AA.log(Y)+0.0234UP
391	Log(E) = -2.3+1.16log(Y)
392-393	Log(E) = 0.99+0.73log(Y)
41*	Log(E) = -17.10+2.63log(Y)-0.34AA
42*	Log(E) = -17.10+2.63log(Y)-0.34AA
51*	Log(E) = 9.37+1.42log(Y)-1.51log(w)+0.002 time.log(Y)
52-53*	Log(E) = 9.37+1.42log(Y)-1.51log(w)+0.002 time.log(Y)
61-63*	Log(E) = -2.1+1.16log(Y)
64*	Log(E) = -2.1+1.16log(Y)
71-74*	Log(E) = 3.26+0.59log(Y)+0.0112UP-0.37AA
75*	Log(E) = 3.26+0.59log(Y)+0.0112UP-0.37AA
81-82	Log(E) = 1.33+0.8log(Y)+0.05Dum87
83-88	Log(E) = -23.14+3.07log(Y)-0.07AA.log(Y)
93	Log(E) = 6.28+0.42log(Y)
94-96*	Log(E) = -1.32+1.23log(Y)
98	Log(E) = -6.57+1.75log(Y)
99	Log(E) = -2.93+1.38log(Y)

** results estimated with aggregate data*

Table 6: Skilled Employment

Industry (SIC)	Model
1	Log(E) = 8.61+0.16log(Y)
21*	Log(E) = 5.93+0.485log(Y)-0.00144UP
23*	Log(E) = 5.93+0.485log(Y)-0.00144UP
22/24/25/29*	Log(E) = 5.93+0.485log(Y)-0.00144UP
301-304	Log(E) = 0.87+0.92log(Y)+0.03Dum85.log(Y)
305	Log(E) = 4.16+0.53log(Y)
306*	Log(E) = 1.81+0.82log(Y)+0.03Dum87.log(Y)
311-312*	Log(E) = -0.83+1.78log(Y)-0.94log(w)
313-315	Log(E) = 8.55+0.14log(Y)
316*	Log(E) = -0.83+1.78log(Y)-0.94log(w)
317	Log(E) = -0.86+1.11log(Y)-0.06Dum90.log(Y)
321-322	Log(E) = -1.67+1.32log(Y)
323*	Log(E) = 0.48+1.02log(Y)
324-326	Log(E) = 4.12+0.66log(Y)-0.88log(CU)+0.15Dum90
331-333*	Log(E) = 1.63+0.85log(Y)-0.19AA
334	Log(E) = 0.5+0.92log(Y)-0.04 AA.log(Y)
335-336	*Log(E) = 6.38+0.43log(Y)-0.2AA*
337*	Log(E) = 1.63+0.85log(Y)-0.19AA
338	Log(E) = -0.82+1.12log(Y)
341	Log(E) = 1.88+0.73log(Y)-0.26AA
342	Log(E) = -0.42+1.09log(Y)-0.05AA.log(Y)

Industry (SIC)	Model
351*	Log(E) = 1.11+0.93log(Y)-0.03AA.log(Y)
352*	Log(E) = 1.11+0.93log(Y)-0.03AA.log(Y)
353-355	Log(E) = 3.45+0.69log(Y)
356-359*	Log(E) = 1.11+0.93log(Y)-0.03AA.log(Y)
361-366	Log(E) = 4.54+0.58log(Y)-0.02AA.log(Y)+0.09Dum90
371-373	Log(E) = 3.13+0.6log(Y)
374-376*	Log(E) = 4.3+0.49log(Y)
381-383*	Log(E) = 2.49+0.79log(Y)-0.08AA.log(Y)
384-387	Log(E) = 2.49+0.79log(Y)-0.08AA.log(Y)
391	Log(E) = 5.73+0.42log(Y)
392-393	Log(E) = 1.54+0.85log(Y)
41*	Log(E) = 1.39+1.86log(Y)-0.91log(w)+0.63Dum78_80
42*	Log(E) = 1.39+1.86log(Y)-0.91log(w)+0.63Dum78_80
51*	Log(E) = 6.68+1.46log(Y)-1.10log(w)
52-53*	Log(E) = 6.68+1.46log(Y)-1.10log(w)
61-63*	Log(E) = 7.14+0.53log(Y)
64*	Log(E) = 7.14+0.53log(Y)
71-74*	Log(E) = 19.12+0.58log(Y)-1.2log(w)
75*	Log(E) = 19.12+0.58log(Y)-1.2log(w)
81-82	Log(E) = 6.26+0.51log(Y)-0.006Dum87
83-88	Log(E) = -10.75+2.06log(Y)-0.05AA.log(Y)
93	Log(E) = 7.23+0.33log(Y)
94-96*	Log(E) = 7.23+0.33log(Y)
98	Log(E) = 6.22+0.64log(Y)
99	Log(E) = -3.70+1.46log(Y)

** results estimated with aggregate data*

Table 7: Semi- and Unskilled Employment

Industry (SIC)	Model
1	Log(E) =13.86-0.00647UP
21*	Log(E) = 6+0.67log(Y)-0.12AA-0.00816UP
23*	Log(E) = 6+0.67log(Y)-0.12AA-0.00816UP
22/24/25/29*	Log(E) = 6+0.67log(Y)-0.12AA-0.00816UP
301-304	Log(E) = 8+0.36log(Y)-2.12Dum85.log(Y)
305	Log(E) = 8.85+0.12log(Y)-0.04AA.log(Y)
306*	Log(E) = 8.64+0.31log(Y)-0.02Dum87.log(Y)-0.31AA
311-312*	Log(E) = 4.71+0.58log(Y)-0.02Dum90.log(Y)
313-315	Log(E) = 8.06+0.39log(Y)
316*	Log(E) = 4.71+0.58log(Y)-0.02Dum90.log(Y)
317	Log(E) = 4.96+0.66log(Y)-0.04 AA.log(Y)
321-322*	Log(E) = 9.92+0.14log(Y)
323*	Log(E) = 9.92+0.14log(Y)
324-326	Log(E) = 7.37+0.26log(Y)-0.23Dum90

Industry (SIC)	Model
331-333*	Log(E) = 7.13+0.4log(Y)-0.14AA
334*	Log(E) = 7.13+0.4log(Y)-0.14AA
335-336	Log(E) = 7.37+0.3log(Y)
337*	Log(E) = 7.13+0.4log(Y)-0.14AA
338	Log(E) = 3.83+0.73log(Y)
341	Log(E) = 8.08+0.11log(Y)-0.26AA
342	Log(E) = 8.23+0.3log(Y)-0.06AA.log(Y)
351*	Log(E) = 6.77+0.51log(Y)-0.00172UM
352*	Log(E) = 6.77+0.51log(Y)-0.00172UM
353-355	Log(E) = 6.35+0.51log(Y)-0.03AA.log(Y)
356-359*	Log(E) = 6.77+0.51log(Y)-0.00172UM
361-366	Log(E) = 7.99+0.3log(Y)-0.02AA.log(Y)+0.26Dum90
371-373	Log(E) = 5.37+0.44log(Y)
374-376*	Log(E) = 7.19+0.25log(Y)+0.14dum87
381-383*	Log(E) = 2.93+0.85log(Y)-0.04AA.log(Y)-0.0136UP
384-387	Log(E) = 2.93+0.85log(Y)-0.04AA.log(Y)-0.0136UP
391	Log(E) = 4.2+0.71log(Y)
392-393	Log(E) = 6.9+0.29log(Y)-0.04AA.log(Y)
41*	Log(E) = 12.95+0.4log(Y)-0.6log(w)
42*	Log(E) = 12.95+0.4log(Y)-0.6log(w)
51*	Log(E) = 15.18+0.99log(Y)-1.27log(w)-0.0007log(Y)
52-53*	Log(E) = 15.18+0.99log(Y)-1.27log(w)-0.0007log(Y)
61-63*	Log(E) = 5.53+0.63log(Y)-0.02Time
64*	Log(E) = 5.53+0.63log(Y)-0.02Time
71-74*	Log(E) = 9.31+0.28log(Y)-0.0199UP-0.08AA
75*	Log(E) = 9.31+0.28log(Y)-0.0199UP-0.08AA
81-82	Log(E) = -0.57+0.85log(Y)
83-88	Log(E) = -0.18+1.01log(Y)-0.04AA.log(Y)
93	Log(E) = 9.79-0.15log(Y)-0.08Dum88.log(Y)
94-96	Log(E) = 14.04-0.00373UP
98	Log(E) = 17.03-0.75log(w)
99	Log(E) = 10.15+0.21log(Y)-0.2AA

** results estimated with aggregate data*

Table 8: Interpretation of Models

Industry (SIC)	Interpretation
1	In the agriculture, forestry and fishing industries, a 1% increase in output will increase highly skilled employment by 1.69% and skilled employment by 0.16%, with no increase in semi- and unskilled employment. An increase of 1% in the percentage of workers that are members of unions will cause a 0.00572% decline in total employment as well as a 0.00647% decline in semi- and unskilled employment.
21	In the coal mining industry, a 1% increase in output will cause a 0.64% increase in total labour; a 0.43% increase in high skilled labour; a 0.485% increase in skilled labour; and a 0.67% increase in semi- and unskilled labour. An increase in union power will cause a decline in total, skilled, semi- and unskilled employment, while it will cause an increase in highly skilled employment. In other words, increased union power will cause a substitution of skilled, semi- and unskilled employment with highly skilled employment. An increase of 1% in the percentage of workers that are members of unions will cause a 0.00926% decline in total employment, a 0.00144% decline in skilled employment, a 0.00816% decline in semi- and unskilled employment, as well as a 0.0182% increase in highly skilled employment.
23	In the gold and uranium ore mining industry, a 1% increase in output will cause a 0.64% increase in total labour; a 0.43% increase in high skilled labour; a 0.485% increase in skilled labour; and a 0.67% increase in semi- and unskilled labour. An increase in union power will cause a decline in total, skilled, semi- and unskilled employment, while it will cause an increase in highly skilled employment. In other words, increased union power will cause a substitution of skilled, semi- and unskilled employment with highly skilled employment. An increase of 1% in the percentage of workers that are members of unions will cause a 0.00926% decline in total employment, a 0.00144% decline in skilled employment, a 0.00816% decline in semi- and unskilled employment, as well as a 0.0182% increase in highly skilled employment.
22/24/25/29	In this industry, a 1% increase in output will cause a 0.64% increase in total labour; a 0.43% increase in high skilled labour; a 0.485% increase in skilled labour; and a 0.67% increase in semi- and unskilled labour. An increase in union power will cause a decline in total, skilled, semi- and unskilled employment, while it will cause an increase in highly skilled employment. In other words, increased union power will cause a substitution of skilled, semi- and unskilled employment with highly skilled employment. An increase of 1% in the percentage of workers that are members of unions will cause a 0.00926% decline in total employment, a 0.00144% decline in skilled employment, a 0.00816% decline in semi- and unskilled employment, as well as a 0.0182% increase in highly skilled employment.
301-304	In the food, beverage and tobacco industry, a 1% increase in output used to cause a 0.43% increase in total labour; a 0.92% increase in high skilled labour; a 0.82% increase in skilled labour; and a 0.31% increase in semi- and unskilled labour. Since 1987, there was a significant change in the composition of employment in this sector, such that more highly skilled and skilled employment was used per unit of output and less semi- and unskilled employment. Since 1987, a 1% increase in output will cause a 0.96% increase in highly skilled employment, a 0.85% increase in skilled employment, and a 0.29% increase in semi- and unskilled employment.
305	A 1% increase in output in the beverages industry used to cause a 0.31% increase in total employment, 1.21% increase in highly skilled employment, 0.53% increase in skilled employment, and 0.12% increase in semi- and unskilled employment. Since the introduction of affirmative action laws, 1% increase in output caused a 0.02% less increase in total employment and 0.04% less increase in semi- and unskilled labour per percent increase in output than before. In other words, since the introduction of affirmative action laws, 1% increase in output causes a 0.45% increase in total employment and a 0.08% increase in semi- and unskilled employment.
306	In the food, beverage and tobacco industry, a 1% increase in output used to cause a 0.43% increase in total labour; a 0.92% increase in high skilled labour; a 0.82% increase in skilled labour; and a 0.31% increase in semi- and unskilled labour. Since 1987, there was a significant change in the composition of employment in this sector, such that more highly skilled and skilled employment was used per unit of output and less semi- and unskilled employment. Since 1987, a 1% increase in output will cause a 0.96% increase in highly skilled employment, a 0.85% increase in skilled employment, and a 0.29% increase in semi- and unskilled employment.
311-312	In this industry, a 1% increase in output will cause a 0.49% increase in total labour; a 1.78% increase in high skilled labour; a 0.58% increase in skilled labour; and a 0.41% increase in semi- and unskilled labour. An increase of 1% in the percentage of workers that are members of unions will cause a 0.006% decline in total employment. An increase of 1% in this industry's wage rate will cause a decline of 0.94% in this industry's highly skilled employment.
313-315	A 1% increase in output of the apparel industry will cause a 0.37% increase in total labour; a 0.53% increase in high skilled labour; a 0.14% increase in skilled labour; and a 0.39% increase in semi- and unskilled labour in this industry. Since 1990, this industry used more highly skilled employment and less of the other skill levels of employment per unit of output, so that a 1% increase in output caused a 0.04% additional increase in highly skilled employment. In other words, since 1990 a 1% increase in output will cause a 0.57% increase in highly skilled employment.
316	In this industry, a 1% increase in output will cause a 0.49% increase in total labour; a 1.78% increase in high skilled labour; a 0.58% increase in skilled labour; and a 0.41% increase in semi- and unskilled labour. An increase of 1% in the percentage of workers that are members of unions will cause a 0.006% decline in total employment. An increase of 1% in this industry's wage rate will cause a decline of 0.94% in this industry's highly skilled employment.
317	Since the introduction of affirmative action laws, a 1% increase in output in the footwear industry will cause a 0.63% increase in total labour; a 1.18% increase in high skilled labour; a 1.11% increase in skilled labour; and a 0.62% increase in semi- and unskilled labour. Before the introduction of affirmative action laws, a 1% increase in output would cause a 0.67% increase in total labour; a 1.18% increase in high skilled labour; a 1.11% increase in skilled labour; and a 0.66% increase in semi- and unskilled labour.

Industry (SIC)	Interpretation
321-322	In this industry, a 1% increase in output will cause a 0.5% increase in total labour; a 1.03% increase in high skilled labour; a 1.32% increase in skilled labour; and a % increase in semi- and unskilled labour.
323	A 1% increase in output will cause a 0.51% increase in total labour; a 1.4% increase in high skilled labour; a 1.02% increase in skilled labour; and a 0.14% increase in semi- and unskilled labour in this industry. An increase of 1% in this industry's wage rate will cause a decline of 0.99% in this industry's highly skilled employment.
324-326	A 1% increase in output in this industry will cause a 0.71% increase in total labour; a 1.06% increase in high skilled labour; a 0.66% increase in skilled labour; and a 0.26% increase in semi- and unskilled labour. When capacity utilization increases by 1%, total employment declines by 0.88%, highly skilled employment declines by 1.56%, skilled employment declines by 0.88%.
331-333	A 1% increase in output will cause a 0.57% increase in total labour; a 1.42% increase in high skilled labour; a 1.12% increase in skilled labour; and a 0.73% increase in semi- and unskilled labour.
334	A 1% increase in output in the basic chemicals industry used to cause a 0.59% increase in total employment, 0.86% increase in highly skilled employment, 0.92% increase in skilled employment, and 0.41% increase in semi- and unskilled employment. Since the introduction of affirmative action laws, 1% increase in output caused a 0.03% less increase in total and semi- and unskilled labour and 0.04% less increase in skilled labour per percent increase in output than before. In other words, since the introduction of affirmative action laws, 1% increase in output causes a 0.56% increase in total employment, 0.88% increase in skilled employment and 0.38% increase in semi- and unskilled employment.
335-336	A 1% increase in output will cause a 0.5% increase in total labour; a 0.76% increase in high skilled labour; a 0.43% increase in skilled labour; and a 0.3% increase in semi- and unskilled labour.
337	A 1% increase in output will cause a 0.57% increase in total labour; a 1.42% increase in high skilled labour; a 1.12% increase in skilled labour; and a 0.73% increase in semi- and unskilled labour.
338	A 1% increase in output in the plastic products industry will cause a 0.86% increase in total labour; a 0.96% increase in high skilled labour; a 0.85% increase in skilled labour; and a 0.4% increase in semi- and unskilled labour.
341	A 1% increase in output will cause a 0.28% increase in total labour; a 1.52% increase in high skilled labour; a 0.73% increase in skilled labour; and a 0.11% increase in semi- and unskilled labour.
342	Since the introduction of affirmative action laws, a 1% increase in output in the non-metallic minerals industry will cause a 0.44% increase in total labour; a 1.66% increase in high skilled labour; a 1.04% increase in skilled labour; and a 0.26% increase in semi- and unskilled labour. Before the introduction of affirmative action laws, a 1% increase in output would cause a 0.49% increase in total labour; a 1.66% increase in high skilled labour; a 1.09% increase in skilled labour; and a 0.3% increase in semi- and unskilled labour.
351	A 1% increase in output will cause a 0.7% increase in total labour; a 1.51% increase in high skilled labour; a 0.93% increase in skilled labour; and a 0.51% increase in semi- and unskilled labour. When union membership increases by 1%, total employment declines by 0.00083% and semi- and unskilled employment declines by 0.00172%. An increase of 1% in this industry's wage rate will cause a decline of 1.67% in this industry's highly skilled employment.
352	A 1% increase in output will cause a 0.7% increase in total labour; a 1.51% increase in high skilled labour; a 0.93% increase in skilled labour; and a 0.51% increase in semi- and unskilled labour. When union membership increases by 1%, total employment declines by 0.00083% and semi- and unskilled employment declines by 0.00172%. An increase of 1% in this industry's wage rate will cause a decline of 1.67% in this industry's highly skilled employment.
353-355	In this industry, a 1% increase in output will cause a 0.57% increase in total labour; a 1.24% increase in high skilled labour; a 0.69% increase in skilled labour; and a 0.48% increase in semi- and unskilled labour. An increase of 1% in this industry's wage rate relative to the user cost of capital will cause a decline of 0.17% in this industry's highly skilled employment.
356-359	A 1% increase in output will cause a 0.7% increase in total labour; a 1.51% increase in high skilled labour; a 0.93% increase in skilled labour; and a 0.51% increase in semi- and unskilled labour. When union membership increases by 1%, total employment declines by 0.00083% and semi- and unskilled employment declines by 0.00172%. An increase of 1% in this industry's wage rate will cause a decline of 1.67% in this industry's highly skilled employment.
361-366	A 1% increase in output in the electrical machinery and apparatus industry will cause a 0.41% increase in total labour; a 1.64% increase in high skilled labour; a 0.58% increase in skilled labour; and a 0.3% increase in semi- and unskilled labour. A 1% increase in the capacity utilization in this industry will cause a 2.14% decline in its highly skilled employment.
371-373	In the television, radio and communication equipment industry, a 1% increase in output will cause a 0.55% increase in total labour; a 0.45% increase in high skilled labour; a 0.60% increase in skilled labour; and a 0.44% increase in semi- and unskilled labour.
374-376	A 1% increase in output will cause a 0.47% increase in total labour; a 0.47% increase in high skilled labour; a 0.49% increase in skilled labour; and a 0.25% increase in semi- and unskilled labour.
381-383	A 1% increase in output will cause a 0.70% increase in total labour; a 0.62% increase in high skilled labour; a 0.71% increase in skilled labour; and a 0.81% increase in semi- and unskilled labour. An increase of 1% in the percentage of workers that are members of unions will cause a 0.0234% increase in highly skilled employment at the expense of a 0.0136% decline in semi- and unskilled employment.

Industry (SIC)	Model
384-387	A 1% increase in output will cause a 0.70% increase in total labour; a 0.62% increase in high skilled labour; a 0.71% increase in skilled labour; and a 0.81% increase in semi- and unskilled labour. An increase of 1% in the percentage of workers that are members of unions will cause a 0.0234% increase in highly skilled employment at the expense of a 0.0136% decline in semi- and unskilled employment.
391	In the furniture industry, a 1% increase in output will cause a 0.64% increase in total labour; a 1.16% increase in high skilled labour; a 0.42% increase in skilled labour; and a 0.71% increase in semi- and unskilled labour.
392-393	A 1% increase in output will cause a 0.82% increase in total labour; a 0.73% increase in high skilled labour; a 0.85% increase in skilled labour; and a 0.29% increase in semi- and unskilled labour. When capacity utilization in this industry increases by 1%, total employment declines by 0.86%.
41	A 1% increase in output will cause a 0.88% increase in total labour; a 2.63% increase in high skilled labour; a 1.86% increase in skilled labour; and a 0.4% increase in semi- and unskilled labour. An increase of 1% in the total wage rate of this industry will cause a 0.45% decrease in total employment, a 0.91% decrease in skilled employment and a 0.6% decrease in semi- and unskilled employment.
42	A 1% increase in output will cause a 0.88% increase in total labour; a 2.63% increase in high skilled labour; a 1.86% increase in skilled labour; and a 0.4% increase in semi- and unskilled labour. An increase of 1% in the total wage rate of this industry will cause a 0.45% decrease in total employment, a 0.91% decrease in skilled employment and a 0.6% decrease in semi- and unskilled employment.
51	A 1% increase in output will cause a 1.34% increase in total employment; 1.42% increase in high skilled employment; 1.46% increase in skilled employment and 0.99% employment in semi- and unskilled employment. In the case of high skilled employment, this increases annually by 0.002% and in the case of semi- and unskilled employment it annually decreases by 0.007%. In other words, in 1970 a 1% increase in output would have increased total employment by 1.342%, in 1971 by 1.344%, in 1972 by 1.346% and so on. In 1970, a 1% increase in output would have increased semi- and unskilled employment by 0.99%, in 1971 by 0.983%, in 1971 by 0.976%, in 1972 by 0.969 and so on. This captures the shift from unskilled to highly skilled labour, which is most likely caused by changes in technology. An increase of 1% in the total wage rate of this industry will cause a 1.22% decline in total employment, a 1.51% decline in highly skilled employment, a 1.1% decline in skilled employment and a 1.27% decline in semi- and unskilled employment.
52-53	A 1% increase in output will cause a 1.34% increase in total employment; 1.42% increase in high skilled employment; 1.46% increase in skilled employment and 0.99% employment in semi- and unskilled employment. In the case of high skilled employment, this increases annually by 0.002% and in the case of semi- and unskilled employment it annually decreases by 0.007%. In other words, in 1970 a 1% increase in output would have increased total employment by 1.342%, in 1971 by 1.344%, in 1972 by 1.346% and so on. In 1970, a 1% increase in output would have increased semi- and unskilled employment by 0.99%, in 1971 by 0.983%, in 1971 by 0.976%, in 1972 by 0.969 and so on. This captures the shift from unskilled to highly skilled labour, which is most likely caused by changes in technology. An increase of 1% in the total wage rate of this industry will cause a 1.22% decline in total employment, a 1.51% decline in highly skilled employment, a 1.1% decline in skilled employment and a 1.27% decline in semi- and unskilled employment.
61-63	In this industry, a 1% increase in output will cause a 0.36% increase in total labour; a 1.16% increase in high skilled labour; a 0.53% increase in skilled labour; and a 0.63% increase in semi- and unskilled labour.
64	In this industry, a 1% increase in output will cause a 0.36% increase in total labour; a 1.16% increase in high skilled labour; a 0.53% increase in skilled labour; and a 0.63% increase in semi- and unskilled labour.
71-74	A 1% increase in output will cause a 0.43% increase in total labour; a 0.59% increase in high skilled labour; a 0.58% increase in skilled labour; and a 0.28% increase in semi- and unskilled labour. An increase in the wage rate in this industry will cause a 1.08% decline in total employment and a 1.2% decline in skilled employment. An increase of 1% in the percentage of workers that are members of unions will cause a 0.0112% decline in highly skilled employment.
75	A 1% increase in output will cause a 0.43% increase in total labour; a 0.59% increase in high skilled labour; a 0.58% increase in skilled labour; and a 0.28% increase in semi- and unskilled labour. An increase in the wage rate in this industry will cause a 1.08% decline in total employment and a 1.2% decline in skilled employment. An increase of 1% in the percentage of workers that are members of unions will cause a 0.0112% decline in highly skilled employment.
81-82	In the finance and insurance industry, a 1% increase in output will cause a 0.62% increase in total labour; a 0.8% increase in high skilled labour; a 0.51% increase in skilled labour; and a 0.85% increase in semi- and unskilled labour.
83-88	Since the introduction of affirmative action laws, a 1% increase in output in the business services industry will cause a 1.89% increase in total labour; a 3% increase in high skilled labour; a 2.01% increase in skilled labour; and a 0.97% increase in semi- and unskilled labour. Before the introduction of affirmative action laws, a 1% increase in output would cause a 1.94% increase in total labour; a 3.07% increase in high skilled labour; a 2.06% increase in skilled labour; and a 1.01% increase in semi- and unskilled labour.
93	In the medical, dental and veterinary services industry, a 1% increase in output will cause a 0.31% increase in total labour; a 0.42% increase in high skilled labour; a 0.33% increase in skilled labour; and a 0.15% increase in semi- and unskilled labour.
94-96	In this industry, a 1% increase in output will cause a 0.73% increase in total labour; a 1.23% increase in high skilled labour; a 1.28% increase in skilled labour; and no increase in semi- and unskilled labour. An increase in this industry's wage rate by 1% will cause a decline in this industry's total employment by 0.63%, while skilled employment will decline by 0.89%.

Industry (SIC)	Interpretation
98	A 1% increase in output in this industry will cause a 0.61% increase in total labour; a 1.75% increase in high skilled labour; a 0.64% increase in skilled labour; and no increase in semi- and unskilled labour.
99	A 1% increase in output of the general government services will cause a 1.07% increase in total labour; a 1.38% increase in high skilled labour; a 1.46% increase in skilled labour; and a 0.21% increase in semi- and unskilled labour in this industry.

6.5 Some Remarks on Selected Industries

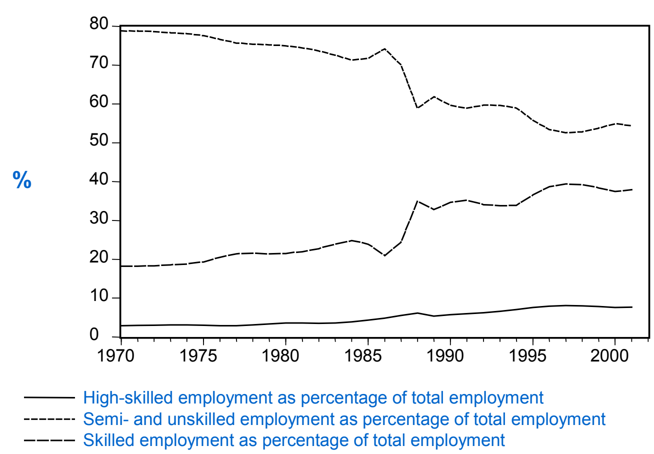
In this section, a couple of brief remarks will be made on two import aspects of the models described in the previous section – how they capture jobless growth and the role of the dummy variables. The models capture jobless growth in two ways. First, if the elasticity (β^i_j) is less than one, it means that employment (if industry is growing industry *j* and skill category *i*) is growing at a slower rate than output. Secondly, the interaction between output and time is included in some of the models as an explanatory variable. The coefficient of this term is usually negative, capturing the substitution of the particular skill in that industry with either a different skill category or capital. To the extent that either of these measures reflects a trend in that industry to become less labour intensive, there will be jobless growth since the growth in employment will be less than the growth in output.

In general, dummy variables were used to capture two types of changes: changes in the labour demand decomposition, for example shifts from semi- and unskilled employment to highly skilled employment, and the effect of affirmative action on employment. Where the interaction between the affirmative action dummy variable (*AA*) and output (*Y*) were significant, it means that the intensity-intensity of the particular industry changed when affirmative action legislation was introduced in SA. If the coefficient of this interaction term is negative, it means that the industry has become less intensive-intensive since the introduction of affirmative action legislation. Changes in the composition of labour demand are captured with individual dummy variables such as *Dum87*, *Dum90*, etc. These variables reflect a shift from lower- to higher-skilled employment if the output coefficient in the lower-skilled model is negative and/or the output coefficient is positive in the higher-skilled model. Some of the industries where this occurred are discussed below.

Industry SIC 301-306: Food, Beverages and Ttobacco

The dummy variable, *Dum87*, captures the dramatic shift around 1987 from semi- and unskilled labour to skilled and highly skilled labour. This shift is illustrated in Figure 4, where the proportion of each skill category of total employment is graphed. The proportion of semi- and unskilled employment out of total employment fell from an average of 80% prior to 1987 to an average of 50% thereafter. At the same time, skilled employment as a percentage of total employment increased from about 18% before 1987 to roughly 40%.

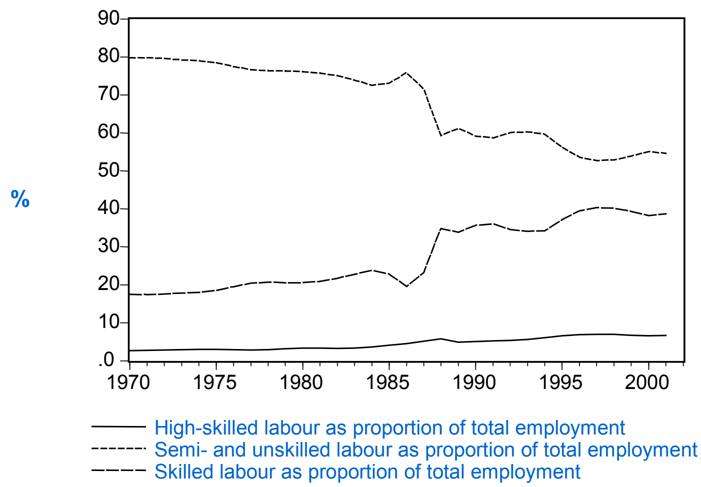
Figure 4: Labour Demand Composition in Industry SIC 301-306: Food, Beverages and Tobacco



Industry SIC 301-304: Food Processing

The dummy variable, *Dum85*, captures the dramatic shift shortly after 1985 from semi- and unskilled labour to skilled and highly skilled labour. Skilled employment used to be about 18% of total employment before 1985, and roughly 38% thereafter. This happened at the cost of semi- and unskilled employment that used to be 80% of total employment before 1985, but only about 50% thereafter. This shift is illustrated in Figure 5, where the proportion of each skill category of total employment is graphed.

Figure 5: Labour Demand Composition in Industry SIC 301-304: Food Processing



Industry SIC 313-315: Textiles

The dummy variable, *Dum90*, in the model for high-skilled employment captures the shift around 1990 from skilled labour to highly skilled labour. This shift is illustrated in Figure 6, where the proportion of each skill category of total employment is graphed. Highly skilled labour used to be on average 2.5% of total employment in this industry, but since 1990 this almost doubled to an average of 4%. At the same time, skilled labour as a proportion of total employment declined from an average of 16% to an average of 14%. However, this 2% decline did not turn out to be significant in the regression analysis.

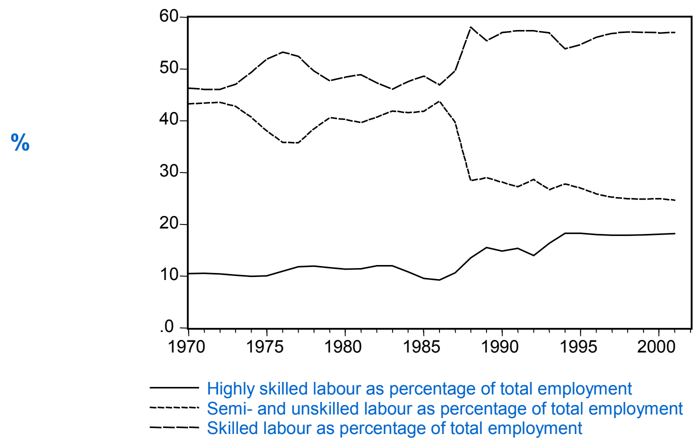
Figure 6: Labour Demand Composition in Industry SIC 313-315: Textiles

Industry SIC 324-326: Clothing

Around 1990 this industry experienced a dramatic shift from semi- and unskilled employment to skilled and highly skilled employment (*see Figure 7*). Skilled labour used to be 46% of total labour prior to 1990, but almost 58% thereafter. On the other hand, semi- and unskilled labour used to be more than 40% of total employment before 1990, but less than 30% thereafter.

Highly skilled labour increased from 10% of total employment to almost 20%. This is captured in the models by the dummy variable, Dum90.

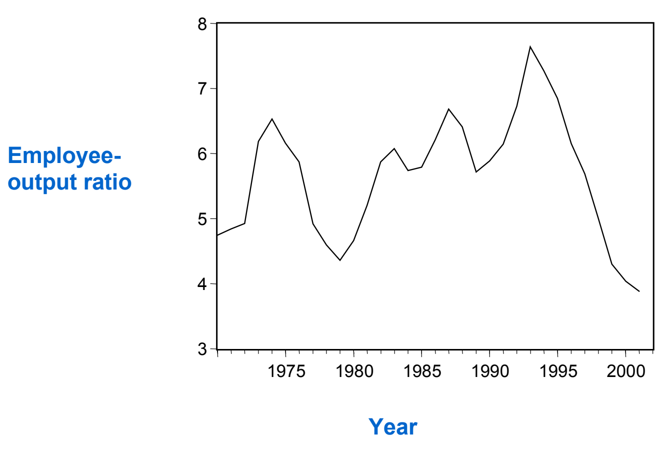
Figure 7: Labour Demand Composition in Industry SIC 324-326: Clothing



Industry SIC 51, 52-53: Construction and Civil Engineering

Total employment in this industry (construction and civil engineering) appears to be growing faster than output, *ceteris paribus*. This means that this industry is one of the few that is becoming increasingly intensive-intensive. This result is consistent with the rising employment-output ratio for this industry plotted in Figure 8, which shows that the employment-output ratio increased from about 5 to about 7.5. The sharp fall in the employment-output ratio after 1990 is due to the dramatic decline in total employment caused by a significant increase in the wage rate of this industry.

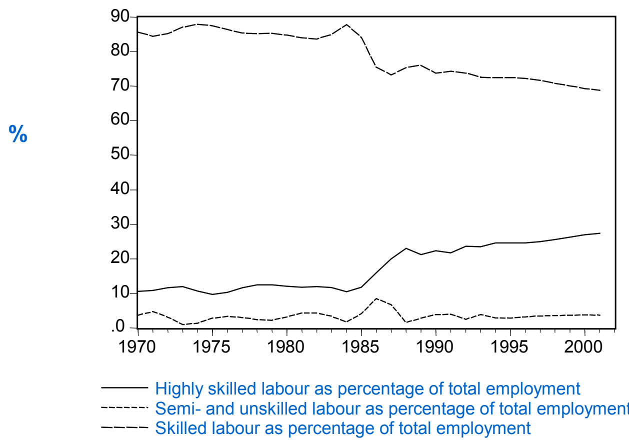
Figure 8: Employment-Output Ratio in Industry SIC 51, 52-53: Construction and Civil Engineering



Industry SIC 81-82: Finance and Insurance

The dummy variable, *Dum87*, captures the substantial shift in this industry from skilled to highly skilled labour that appeared to occur in 1987 (*see Figure 9*). The proportion of highly skilled employment increased substantially, mainly at the expense of skilled labour.

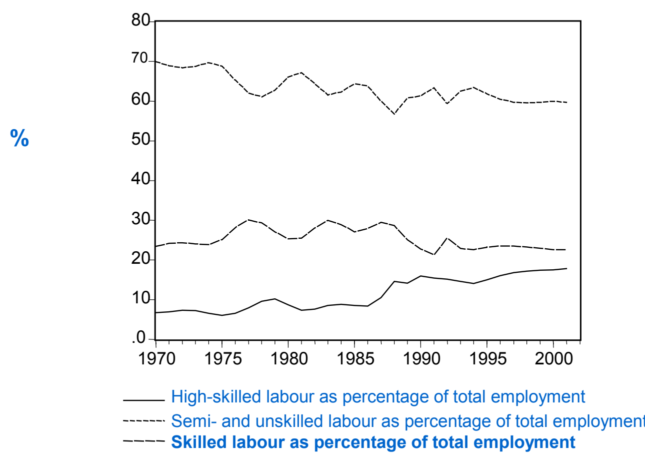
Figure 9: Labour Demand Composition in Industry 51



Industry SIC 371-373: Television, Radio and Communication Equipment

The dummy variable, *Dum90*, captures the substantial shift in this industry towards highly skilled labour that occurred in 1990 (*see Figure 10*). Highly skilled labour as a proportion of total employment more than doubled from an average of 8% to an average of 18%.

Figure 10: Labour Demand Composition in Industry SIC 371-373: Television, Radio and Communication Equipment



Industry SIC 317: Footwear

The dummy variable, *Dum90*, captures the substantial shift in this industry towards skilled labour that occurred around 1990 (*see Figure 11*). Skilled labour as a proportion of total employment almost halved from an average of 10% to an average of 6% of total employment in this industry. At the same time, semi- and unskilled employment increased since 1990 from a minimum of 87.5% to an average of 90.5%, but this increase turned out to be insignificant in the regression analysis.

Figure 11: Labour Demand Composition in Industry SIC 317: Footwear

7. CONCLUSION

In this study, the impact of changes in output on employment has been analysed in a time-series context. The analysis was undertaken at an industry level, for total employment as well as the different levels of skills – highly skilled, skilled, and semi- and unskilled employment. The results show that two trends characterise the SA labour market: capital deepening and a change in the composition of labour demand from semi- and unskilled to skilled and highly skilled employment. Capital deepening, or increasing capital-intensity, is reflected in the coefficients of output in the total employment equations. Most of these coefficients are less than one, which means that a 1% increase in output results in a less than 1% increase in employment. This implies that the employment-output ratio is falling over time.

The coefficients of output in the different skill categories of employment capture the change in the composition of labour demand. In most industries, the output coefficient in the highly skilled category is close to or greater than one, compared to a coefficient in the semi- and unskilled labour of more often than not less than one. This means that, over time, firms are increasing the proportion of highly skilled employment at the cost of semi- and unskilled employment. The output coefficients in the skilled category vary: in some industries skilled employment is becoming an increasing proportion of total employment, while in others it is becoming a smaller proportion of total employment.

Two factors that impact negatively on the demand for labour is the increasing labour market rigidity as measured by the power of unions, and the introduction of affirmative action legislation.

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APPENDICES

Appendix 1: List of Industries

Industry	Description
SIC 1	Agriculture, forestry and fishing
SIC 21	Coal mining
SIC 23	Gold and uranium ore mining
SIC 22/24/25/29	Other mining
SIC 301-304	Food
SIC 305	Beverages
SIC 306	Tobacco
SIC 311-312	Textiles
SIC 313-315	Wearing apparel
SIC 316	Leather and leather products
SIC 317	Footwear
SIC 321-322	Wood and wood products
SIC 323	Paper and paper products
SIC 324-326	Printing, publishing and recorded media
SIC 331-333	Coke and refined petroleum products
SIC 334	Basic chemicals
SIC 335-336	Other chemicals and man-made fibres
SIC 337	Rubber products
SIC 338	Plastic products
SIC 341	Glass and glass products
SIC 342	Non-metallic minerals
SIC 351	Basic iron and steel
SIC 352	Basic non-ferrous metals
SIC 353-355	Metal products excluding machinery
SIC 356-359	Machinery and equipment
SIC 361-366	Electrical machinery and apparatus
SIC 371-373	Television, radio and communication equipment
SIC 374-376	Professional and scientific equipment
SIC 381-383	Motor vehicles, parts and accessories
SIC 384-387	Other transport equipment
SIC 391	Furniture
SIC 392-393	Other manufacturing
SIC 41	Electricity, gas and steam
SIC 42	Water supply
51	Building construction
52-53	Civil engineering and other construction
61-63	Wholesale and retail
64	Catering and accommodation services
SIC 71-74	Transport and storage

Industry	Description
SIC 75	Communication
SIC 81-82	Finance and insurance
SIC 83-88	Business services
SIC 93	Medical, dental and veterinary services
SIC 94-96	Excluding medical, dental and veterinary services
SIC 98	Other producers
SIC 99	General government services

Appendix 2: Augmented Dickey Fuller Cointegration Test Statistics

Labour Group	Total		High		Skilled		Semi-, unskilled	
Industry	ADF	Lags	ADF	Lags	ADF	Lags	ADF	Lags
SIC 1	4.17	0	4.77	0	3.75	0	4.23	0
SIC 21-29	3.15	1	3.72	1	6.58	1	3.86	1
SIC 301-306	3.42	3	3.38	2	3.46	0	4.2	0
SIC 305	4.68	0	3.08	1	2.68	0	3.6	0
SIC 311-317	3.88	1	3.53	0	3.93	1	3.78	1
SIC 313-315	3.02	0	3.66	0	2.78	1	3.12	0
SIC 317	4.06	2	5.72	1	4.00	0	3.87	2
SIC 321-322	3.89	0	3.89	0	2.96	1	2.96	1
SIC 321-326	2.95	0	3.85	1	4.35	1	5.49	1
SIC 334	4.11	2	3.1	1	4.0	2	4.06	0
SIC 335-336	3.2	0	3.3	1	3.82	1	4.55	0
SIC 338	2.93	0	3.39	0	3.01	0	3.37	1
SIC 331-338	4.16	0	3.3	1	3.24	0	4.3	0
SIC 341	3.88	3	3.4	1	4.52	1	3.76	3
SIC 342	4.15	3	2.90	0	3.66	1	3.72	1
SIC 353-355	3.9	2	4.02	1	4.12	0	3.89	0
SIC 351-359	3.72	1	3.61	0	3.74	0	3.84	1
SIC 361-366	4.96	0	4.48	1	4.49	1	5.05	0
SIC 371-373	2.95	0	3.56	0	4.36	0	3.04	0
SIC 371-376	2.73	0	3.73	0	5.22	0	3.50	0
SIC 384-387	4.01	0	4.88	1	3.84	1	4.68	1
SIC 391	4.39	0	2.88	0	3.4	1	5.05	2
SIC 41-42	3.6	1	4.39	0	3.83	0	4.48	1
SIC 51, 52-53	4.34	1	3.9	1	3.4	1	3.94	1
61-63, 64	2.64	1	3.38	1	3.53	1	4.26	1
SIC 71-75	4.48	0	5.0	2	3.27	0	4.57	1
SIC 81-82	3.24	2	3.87	0	3.86	1	6.73	1
SIC 83-88	3.24	2	3.47	1	3.75	1	3.14	0
SIC 93	3.09	1	3.27	1	3.4	1	3.41	0
SIC 98	3.21	3	3.32	1	2.69	1	2.75	0
SIC 99	3.8	1	3.6	1	3.14	1	3.4	0
SIC 93-99	3.8	1	2.94	30	3.61	0	3.8	1

All these statistics are significant at least at a 10% level of significance.

Appendix 3: Phillips-Perron Test for Non-Stationarity, Levels

	Output	Employment				
Industry		**Total**	**High skilled**	**Skilled**	**Semi-, unskilled**	**Wages**
SIC 1	-0.68	-0.02	8.47	1.17	0.32	
SIC 301-306	-1.92	-1.78	-1.21	-1.53	-0.05	
SIC 301-304	-1.84	-1.78	-1.32	-1.40	-0.06	
SIC 305	-1.42	-2.18	-0.93	-2.43	-0.97	
SIC 311-317	-1.77	-1.58	-1.43	-1.84	-1.44	-2.13
SIC 313-315	-1.38	-2.33	-0.48	-2.39	-2.26	
SIC 317	-1.23	-0.73	-2.04	-1.07	-0.14	
SIC 321-322	-0.65	-0.94	-1.34	-1.53	-2.81	
SIC 324-326	-1.30	-0.49	-0.42	-0.31	-1.99	
SIC 321-326	-0.54	-1.25	-0.02	-0.89	-3.34	-1.04
SIC 334	-0.15	-2.81	-2.33	-2.48	-2.32	
SIC 335-336	-0.57	-1.87	-2.59	-2.14	-2.53	
SIC 338	-0.29	-0.06	-0.60	-0.24	-0.42	
SIC 331-338	-0.97	-2.51	-2.21	-2.30	-1.94	
SIC 341	-1.17	-1.61	-1.64	-2.81*	-1.09	
SIC 342	-2.64*	-1.36	-1.63	-1.52	-1.61	
SIC 353-355	-2.18	-1.65	-2.66*	-4.08	-1.25	1.19
SIC 351-359	-1.39	-0.72	-2.05	-2.15	-0.18	1.75
SIC 371-373	-2.01	-2.80*	-1.02	-3.80***	-3.02*	
SIC 371-376	-1.96	-2.60	-0.93	-3.74*	-2.73**	
SIC 384-387	-1.46	-0.18	-2.92	-0.10	-0.23	
SIC 391	-0.96	-1.04	-1.08	-1.89	-1.15	
SIC 392-393	-0.33	-2.23	-2.21	-2.09	-1.76	
SIC 41-42	-0.34	-2.22	-0.11	-2.00	-0.64	0.67
SIC 51, 52-53	-1.15	-1.11	-2.35	-1.46	-0.95	1.84
61-63, 64	-1.02	-2.93*	-1.53	-2.09	-0.90	
SIC 71-75	-1.50	-0.06	-1.73	-0.64	-0.69	3.07*
SIC 81-82	-0.87	-1.44	-0.21	-1.84	-2.58	
SIC 83-88	-3.29**	-1.00	-0.02	-0.70	-1.85	
SIC 93	-0.46	-2.20	-2.20	-1.62	-0.46	
SIC 98	-1.83	-1.65	-1.65	-1.15	-1.83	
SIC 99	-2.44	-1.61	-1.61	-1.16	-2.44	
SIC 93-99	-1.70	-1.64	-1.64	-1.27	-2.42	1.59

**** significant at a 1% level of significance*

*** significant at a 5% level of significance*

** significant at a 10% level of significance*

Appendix 4: Phillips-Perron Test for Non-Stationarity, First Differences

	Output	Employment				
Industry		**Total**	**High skilled**	**Skilled**	**Semi-, unskilled**	**Wages**
SIC 1	-10.46***	-7.49***	-2.22	-5.35***	-7.22***	
SIC 301-306	-4.34***	-2.90*	-4.28***	-4.70***	-4.74***	
SIC 301-304	-3.77***	-3.08**	-4.43***	-4.35***	-4.48***	
SIC 305	-4.71***	-4.48***	-3.66*	-6.03***	-6.20***	
SIC 311-317	-5.72***	-3.45***	-4.20***	-3.64**	-3.31**	4.02***
SIC 313-315	-5.41***	-4.56***	-4.99***	-4.13***	-4.46***	
SIC 317	-5.38***	-2.72*	-3.48**	-6.17***	-3.26**	
SIC 321-322	-5.16***	-7.35***	-5.74***	-4.98***	-5.46***	
SIC 324-326	-4.76***	-3.5**	-3.69***	-4.94***	-4.08***	
SIC 321-326	-5.93***	-5.04***	-3.54**	-6.38***	-6.79***	3.65**
SIC 334	-3.86***	-5.49***	-6.72***	-6.99***	-6.16***	
SIC 335-336	-5.83***	-7.23***	-6.80***	-8.10***	-7.81***	
SIC 338	-3.90***	-7.02***	-6.70***	-7.03***	-5.97***	
SIC 331-338	-8.34***	-5.74***	-6.69***	-7.40***	-7.02***	
SIC 341	-4.25***	-4.87***	-4.36***	-6.90***	-4.58***	
SIC 342	-5.44***	-3.25**	-3.58**	-5.80***	-3.95***	
SIC 353-355	-3.27**	-4.99***	-5.19***	-9.49***	-6.95***	3.74***
SIC 351-359	-3.76***	-3.26***	-5.06***	-6.57***	-4.83***	5.24***
SIC 371-373	-5.82***	-3.97***	-6.59***	-6.94***	-6.36***	
SIC 371-376	-5.90***	-7.12***	-6.02***	-7.64***	-6.04***	
SIC 384-387	-4.29***	-3.68***	-5.58***	-3.54**	-3.46***	
SIC 391	-5.26***	-4.08***	-5.25***	-4.03***	-3.97***	
SIC 392-393	-6.68***	-3.98***	-5.06***	-4.66***	-6.36***	
SIC 41-42	-6.26***	-2.20	-4.69***	-2.98***	-3.22**	4.75***
SIC 51, 52-53	-3.85***	-2.80**	-3.88***	-3.17***	-2.86	3.57***
61-63, 64	-4.25***	-3.82***	-4.79***	-4.27***	-5.44***	
SIC 71-75	-3.29***	-3.02**	-6.33***	-3.69***	-4.91***	4.82***
SIC 81-82	-4.34***	-2.38***	-4.11***	-2.79*	-6.10***	
SIC 83-88	-3.75***	-4.13***	-4.07***	-5.32***	-4.60***	
SIC 93	-5.11***	-2.75*	-4.75***	-3.60***	-5.11***	
SIC 98	-5.20***	-3.03**	-3.63**	-3.54**	-5.20***	
SIC 99	-5.91***	-4.70***	-4.13***	-5.62***	-5.91***	4.82***
SIC 93-99	-4.56***	-4.58***	-3.45***	-4.76***	-5.51***	

**** significant at a 1% level of significance*

*** significant at a 5% level of significance*

** significant at a 10% level of significance*

Appendix 5: Models Ordered According to Coefficient of Income

Total Employment

Industry (SIC)	Model
1	Log(E) =13.88-0.00572UP
341	Log(E) = 7.04+0.28log(Y)-0.24AA
305	Log(E) = 7.51+0.31log(Y)-0.24AA.log(Y)
93	Log(E) = 8.14+0.31log(Y)
61-63	Log(E) = 9.59+0.36log(Y)
64	Log(E) = 9.59+0.36log(Y)
313-315	Log(E) = 8.42+0.37log(Y)
301-304	Log(E) = 7.59+0.43log(Y)-0.21AA
306	Log(E) = 7.59+0.43log(Y)-0.21AA
71-74	Log(E) = 19.9+0.43log(Y)-1.08log(w)
75	Log(E) = 19.9+0.43log(Y)-1.08log(w)
374-376	Log(E) = 5.88+0.47log(Y)
342	Log(E) = 6.77+0.49log(Y)-0.05AA.log(Y)
311-312	Log(E) = 7.69+0.49log(Y)-0.00636UP
316	Log(E) = 7.69+0.49log(Y)-0.00636UP
321-322	Log(E) = 6.75+0.5log(Y)
335-336	Log(E) = 6.21+0.5log(Y)-0.13AA
323	Log(E) = 6.67+0.51log(Y)
371-373	*Log(E) = 4.92+0.55log(Y)*
331-333	Log(E) = 5.83+0.58log(Y)-0.12AA
337	Log(E) = 5.83+0.58log(Y)-0.12AA
334	Log(E) = 4.78+0.59log(Y)-0.03 AA.log(Y)
353-355	Log(E) = 5.88+0.59log(Y)-0.02AA.log(Y)
361-366	Log(E) = 7.44+0.61log(Y)-0.02AA.log(Y)+0.28Dum90
98	Log(E) = 6.66+0.61log(Y)
81-82	Log(E) = 5.34+0.62log(Y)
21	Log(E) = 6.53+0.63log(Y)-0.071452UP-0.098411AA
23	Log(E) = 6.53+0.63log(Y)-0.071452UP-0.098411AA
22/24/25/29	Log(E) = 6.53+0.63log(Y)-0.071452UP-0.098411AA
391	Log(E) = 5.13+0.64 log(Y)
317	Log(E) = 5+0.67log(Y)-0.04AA.log(Y)
351	Log(E) = 5.01+0.7log(Y)-0.000883UM-0.02AA.log(Y)
352	Log(E) = 5.01+0.7log(Y)-0.000883UM-0.02AA.log(Y)
356-359	Log(E) = 5.01+0.7log(Y)-0.000883UM-0.02AA.log(Y)
384-387	Log(E) = 4.60+0.70*log(Y)-0.04AAlog(Y)-9.55E-07UP
381-383	Log(E) = 4.60+0.70*log(Y)-0.04AAlog(Y)-9.55E-07UP
324-326	Log(E) = 4.37+0.71log(Y)-0.88log(CU)
94-96	Log(E) = 12.63+0.73log(Y)-0.63log(w)
392-393	Log(E) = 2.94+0.82log(Y)-0.3AA-0.86log(CU)
338	Log(E) = 3.08+0.86log(Y)

Industry (SIC)	Model
41	Log(E) = 7.39+0.88log(Y)-0.45log(w)
42	Log(E) = 7.39+0.88log(Y)-0.45log(w)
99	Log(E) = 1.72+1.07log(Y)
51	Log(E) = 10.81+1.34log(Y)-1.22log(w)
52-53	Log(E) = 10.81+1.34log(Y)-1.22log(w)
83-88	Log(E) = -8.96+1.94log(Y)-0.05AA.log(Y)

High-Skilled Employment

Industry (SIC)	Model
93	Log(E) = 6.28+0.42log(Y)
21	Log(E) = 4.25+0.43log(Y)+0.0182UP
23	Log(E) = 4.25+0.43log(Y)+0.0182UP
22/24/25/29	Log(E) = 4.25+0.43log(Y)+0.0182UP
371-373	Log(E) = 3.21+0.45log(Y)+0.85Dum90
374-376	Log(E) = 3.22+0.47log(Y)+0.80Dum87
313-315	Log(E) = 3.27+0.53log(Y)+0.04Dum90.log(Y)
71-74	Log(E) = 3.26+0.59log(Y)+0.0112UP-0.37AA
75	Log(E) = 3.26+0.59log(Y)+0.0112UP-0.37AA
384-387	Log(E) = 1.54+0.69log(Y)-0.07AA.log(Y)+0.0234UP
381-383	Log(E) = 1.54+0.69log(Y)-0.07AA.log(Y)+0.0234UP
392-393	Log(E) = 0.99+0.73log(Y)
335-336	Log(E) = 1.68+0.76log(Y)
301-304	Log(E) = 0.43+0.78log(Y)+0.04Dum85.log(y)
81-82	Log(E) = 1.33+0.8log(Y)+0.05Dum87
334	Log(E) = -0.02+0.86log(Y)
306	Log(E) = -1.02+0.92log(Y)+0.04Dum87.log(Y)
331-333	Log(E) = -0.54+0.96log(Y)
337	Log(E) = -0.54+0.96log(Y)
321-322	Log(E) = -1.46+1.03log(Y)
324-326	Log(E) = -0.93+1.06log(Y)-1.56log(CU)
61-63	Log(E) = -2.1+1.16log(Y)
64	Log(E) = -2.1+1.16log(Y)
391	Log(E) = -2.3+1.16log(Y)
317	Log(E) = -2.72+1.18log(Y)
305	Log(E) = -3.67+1.21log(Y)
94-96	Log(E) = -1.32+1.23log(Y)
353-355	Log(E) = -1.73+1.24log(Y)-0.17log(WR)
99	Log(E) = -2.93+1.38log(Y)
323	Log(E) = 3.68+1.4log(Y)-0.99log(w)
338	Log(E) = -4.46+1.42log(Y)
51	Log(E) = 9.37+1.42log(Y)-1.51log(w)+0.002 time.log(Y)
52-53	Log(E) = 9.37+1.42log(Y)-1.51log(w)+0.002 time.log(Y)
351	Log(E) = 11.33+1.51log(Y)-1.67log(w)
352	Log(E) = 11.33+1.51log(Y)-1.67log(w)
356-359	Log(E) = 11.33+1.51log(Y)-1.67log(w)
341	Log(E) = -5.46+1.52log(Y)
361-366	Log(E) = -6.07+1.64log(Y)+0.45Dum90-2.14log(CU)
342	Log(E) = -6.93+1.66log(Y)
1	Log(E) =-8.45+1.69log(Y)
98	Log(E) = -6.57+1.75log(Y)

Industry (SIC)	Model
311-312	Log(E) = -0.83+1.78log(Y)-0.94log(w)
316	Log(E) = -0.83+1.78log(Y)-0.94log(w)
41	Log(E) = -17.10+2.63log(Y)-0.34AA
42	Log(E) = -17.10+2.63log(Y)-0.34AA
83-88	Log(E) = -23.14+3.07log(Y)-0.07AA.log(Y)

Skilled Employment

Industry (SIC)	Model			
313-315	Log(E)	=	8.55+	0.14log(Y)
1	Log(E)	=	8.61+	0.16log(Y)
93	Log(E)	=	7.23+	0.33log(Y)
391	Log(E)	=	5.73+	0.42log(Y)
335-336	Log(E)	=	6.38+	0.43log(Y)-0.2AA
21	Log(E)	=	5.93+	0.485log(Y)-0.00144UP
23	Log(E)	=	5.93+	0.485log(Y)-0.00144UP
22/24/25/29	Log(E)	=	5.93+	0.485log(Y)-0.00144UP
374-376	Log(E)	=	4.3+	0.49log(Y)
81-82	Log(E)	=	6.26+	0.51log(Y)-0.006Dum87
305	Log(E)	=	4.16+	0.53log(Y)
61-63	Log(E)	=	7.14+	0.53log(Y)
64	Log(E)	=	7.14+	0.53log(Y)
361-366	Log(E)	=	4.54+	0.58log(Y)-0.02AA.log(Y)+0.09Dum90
71-74	Log(E)	=	19.12+	0.58log(Y)-1.2log(w)
75	Log(E)	=	19.12+	0.58log(Y)-1.2log(w)
98	*Log(E)*	=	*6.22+*	*0.64log(Y)*
324-326	Log(E)	=	4.12+	0.66log(Y)-0.88log(CU)+0.15Dum90
353-355	Log(E)	=	3.45+	0.69log(Y)
371-373	Log(E)	=	3.13+	0.6log(Y)
341	Log(E)	=	1.88+	0.73log(Y)-0.26AA
384-387	Log(E)	=	2.49+	0.79log(Y)-0.08AA.log(Y)
381-383	Log(E)	=	2.49+	0.79log(Y)-0.08AA.log(Y)
306	Log(E)	=	1.81+	0.82log(Y)+0.03Dum87.log(Y)
392-393	Log(E)	=	1.54+	0.85log(Y)
331-333	Log(E)	=	1.63+	0.85log(Y)-0.19AA
337	Log(E)	=	1.63+	0.85log(Y)-0.19AA
301-304	Log(E)	=	0.87+	0.92log(Y)+0.03Dum85.log(Y)
334	Log(E)	=	0.5+	0.92log(Y)-0.04 AA.log(Y)
351	Log(E)	=	1.11+	0.93log(Y)-0.03AA.log(Y)
352	Log(E)	=	1.11+	0.93log(Y)-0.03AA.log(Y)
356-359	Log(E)	=	1.11+	0.93log(Y)-0.03AA.log(Y)
323	Log(E)	=	0.48+	1.02log(Y)
342	Log(E)	=	-0.42+	1.09log(Y)-0.05AA.log(Y)
317	Log(E)	=	-0.86+	1.11log(Y)-0.06Dum90.log(Y)
338	Log(E)	=	-0.82+	1.12log(Y)
94-96	Log(E)	=	7.76+	1.28log(Y)-0.89log(w)
321-322	Log(E)	=	-1.67+	1.32log(Y)
99	Log(E)	=	-3.7+	1.46log(Y)
51	Log(E)	=	6.68+	1.46log(Y)-1.10log(w)
52-53	Log(E)	=	6.68+	1.46log(Y)-1.10log(w)

Industry (SIC)	Model			
311-312	Log(E)	=	-0.83+	1.78log(Y)-0.94log(w)
316	Log(E)	=	-0.83+	1.78log(Y)-0.94log(w)
41	Log(E)	=	1.39+	1.86log(Y)-0.91log(w)+0.63Dum78_80
42	Log(E)	=	1.39+	1.86log(Y)-0.91log(w)+0.63Dum78_80
83-88	Log(E)	=	-10.7+	2.06log(Y)-0.05AA.log(Y)

Semi- and Unskilled Employment

Industry (SIC)	Model			
1	Log(E)	=	13.86-	0.00647UP
94-96	Log(E)	=	14.04-	0.00373UP
341	Log(E)	=	8.08+	0.11log(Y)-0.26AA
305	Log(E)	=	8.85+	0.12log(Y)-0.04AA.log(Y)
321-322	Log(E)	=	9.92+	0.14log(Y)
323	Log(E)	=	9.92+	0.14log(Y)
93	Log(E)	=	9.79-	0.15log(Y)-0.08Dum88.log(Y)
99	Log(E)	=	10.15+	0.21log(Y)-0.2AA
374-376	Log(E)	=	7.19+	0.25log(Y)+0.14dum87
324-326	Log(E)	=	7.37+	0.26log(Y)-0.23Dum90
71-74	Log(E)	=	9.31+	0.28log(Y)-0.0199UP-0.08AA
75	Log(E)	=	9.31+	0.28log(Y)-0.0199UP-0.08AA
392-393	Log(E)	=	6.9+	0.29log(Y)-0.04AA.log(Y)
306	Log(E)	=	8.64+	0.31log(Y)-0.02Dum87.log(Y)-0.31AA
301-304	Log(E)	=	8+	0.36log(Y)-2.12Dum85.log(Y)
313-315	Log(E)	=	8.06+	0.39log(Y)
335-336	Log(E)	=	7.37+	0.3log(Y)
361-366	Log(E)	=	7.99+	0.3log(Y)-0.02AA.log(Y)+0.26Dum90
342	Log(E)	=	8.23+	0.3log(Y)-0.06AA.log(Y)
371-373	Log(E)	=	5.37+	0.44log(Y)
331-333	Log(E)	=	7.13+	0.4log(Y)-0.14AA
334	Log(E)	=	7.13+	0.4log(Y)-0.14AA
337	Log(E)	=	7.13+	0.4log(Y)-0.14AA
41	Log(E)	=	12.95+	0.4log(Y)-0.6log(w)
42	Log(E)	=	12.95+	0.4log(Y)-0.6log(w)
353-355	Log(E)	=	6.35+	0.51log(Y)-0.03AA.log(Y)
351	Log(E)	=	6.77+	0.51log(Y)-0.00172UM
352	Log(E)	=	6.77+	0.51log(Y)-0.00172UM
356-359	Log(E)	=	6.77+	0.51log(Y)-0.00172UM
331-312	Log(E)	=	4.71+	0.58log(Y)-0.02Dum90.log(Y)
316	Log(E)	=	4.71+	0.58log(Y)-0.02Dum90.log(Y)
61-63	Log(E)	=	5.53+	0.63log(Y)-0.02Time
64	Log(E)	=	5.53+	0.63log(Y)-0.02Time
317	Log(E)	=	4.96+	0.66log(Y)-0.04 AA.log(Y)
21	Log(E)	=	6+	0.67log(Y)-0.12AA-0.00816UP
23	Log(E)	=	6+	0.67log(Y)-0.12AA-0.00816UP
22/24/25/29	Log(E)	=	6+	0.67log(Y)-0.12AA-0.00816UP
391	Log(E)	=	4.2+	0.71log(Y)
338	Log(E)	=	3.83+	0.73log(Y)
98	Log(E)	=	17.03-	0.75log(w)
81-82	Log(E)	=	-0.57+	0.85log(Y)

Industry (SIC)	Model			
384-387	Log(E)	=	2.93+	0.85log(Y)-0.04AA.log(Y)-0.0136UP
381-383	Log(E)	=	2.93+	0.85log(Y)-0.04AA.log(Y)-0.0136UP
51	Log(E)	=	15.18+	0.99log(Y)-1.27log(w)-0.0007log(Y)
52-53	Log(E)	=	15.18+	0.99log(Y)-1.27log(w)-0.0007log(Y)
83-88	Log(E)	=	-0.18+	1.01log(Y)-0.04AA.log(Y)