Human Capital Constraints in South Africa: A Firm-Level Analysis

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This paper examines human capital constraints in the South African economy, and the austerity of these constraints on firms in the country. The two key human capital constraints explored in this article are the inadequately educated workforce and labour market distortions. Regression analysis was applied to examine determinants of increased labour productivity in manufacturing firms. Education and labour market distortions were found to have a varying influence on output per worker. Principal Component Analysis (PCA) of the explanatory variables achieved similar results. This study found that the highest percentage of the total variance is explained by latent variables that incorporate education, training, compensation, region and Sector Education Training Authority (SETA) support and effectiveness.

Key Words: human capital constraints, productivity, efficiency, labour, education, manufacturing, South Africa
JEL *Classification:* D24, J24

Introduction

Since 1998, the government has shown a renewed commitment to improve human capital in South Africa. Investment in education has since received more funding than any other function in government (National Treasury 1999–2010). Recent Global Competitiveness Reports reveal, however, that an inadequately educated workforce and restrictive labour regulations are the biggest threats to South Africa's competitiveness (Schwab, Porter and Lopez-Claros 2006, 334). Fedderke (2006, 26) also states that in South Africa, human capital accumulation contributes less towards economic growth than in several other countries, and that the lack of quality education plays a major role in this phenomenon.

Gary Becker, Murphy and Tamura (1990, s13) regard human capital as embodied knowledge and skills. The accumulation of human capi-

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tal leads to economic development because economic development depends on advances in technological and scientific knowledge. Human capital can also be defined as all acquired characteristics of workers, as units of labour, which make them more productive (Filler, Hamermesh and Rees 1996, 64). For the purpose of this study, the concept of human capital is depicted as both the unequal quality of labour between competing firms and constraints within the labour market. Some economic growth accountants, like Fabricant and Solow (as quoted by Griliches 1997, 331), suggest that economic growth is not only explained by conventional labour and capital measures, but also by the changing quality of the labour force. Similarly, this current study argues that 'human capital' is responsible for changes in total factor productivity and ultimately output among competing manufacturing firms.

The South African labour market is characterised by sharp segmentation, high levels of unemployment and relatively low informal employment. Rogerson (2008, 75) states that the reason for this could be that South Africa's regulatory compliance cost is higher than in other developing countries. The main problem is the perception that over-protective labour regulations deter employees from employing additional workers, and that this increases the costs associated with employment. International experience also indicates that flexible labour market characteristics and sufficient state support are some of the main determinants of employment and productivity (Natrass 2003, 15). This paper aims to determine the impact that the above-mentioned constraints have on firms in the South African manufacturing sector.

The next will review the relevant literature and motivate the perspective of this study, while the third discusses the survey and its analysis, describing the severity of these constraints. In the fourth section, regression analysis will be estimated on enterprise survey data collected by the World Bank. The fourth will also contain a Principal Component Analysis (PCA) to determine underlying trends in the explanatory variables used in the regression analysis. The last section will contain concluding remarks and a summary on all the relevant findings of this paper.

Literature Study and Theoretical Rationale

In economic theory, the Solow growth model explains that increases in savings and technological innovation lead to higher levels of output, investment and capital per person (Colander and Gamber 2002, 142). The endogenous growth theory differs from the Solow model in that inputs

are defined more broadly in order to encompass accumulated capital supply and 'human' capital.

According to Cypher and Dietz (2009, 224), the 1950s and 1960s were periods of optimism in terms of global convergence. Economic models suggested that slower population growth and rapid investment in physical and human capital could in the long run contribute to convergence. However, Barro and Sala-I-Martin (1992, 242) found a divergence between countries from the nineteen seventies and eighties onward.

To explain how investment in education forms part of human capital, Schultz (1960, 571) proposed that education should be treated as an investment in man and the consequences as a form of capital, in other words 'human capital'. Efforts by government to promote small and medium-sized businesses (SMMEs) have mainly three pillars: to promote entrepreneurship, to create a fertile environment and to increase competitiveness and capacity (Rogerson 2008, 61). Improvements in human capital underlie all three these pillars, and explain the importance of human capital in business development.

Survey work done by Chandra et al. (2001, iv) revealed that in 1999, 30 to 45 per cent of SMMEs indicated a skills shortage. Only 24 to 30 per cent of firms with more than five workers had formal skills training, and ten per cent of firms with fewer than five workers had formal skills training. Kraak (2003, 678) explains that the number of specialised skilled graduates (e. g. engineers and technicians) is extremely low when taken into account that enrolment has shown dramatic increases.

While most studies on human capital focus on the supply and demand trends of skilled individuals and government programmes, this study considers the influence that human capital development has on productivity (output per worker) in South African firms. The following section describes the survey and the data that were utilised in the current study.

Analysis of Firms in the World Bank Survey

This analysis is based on data gathered by the World Bank enterprise survey on productivity and investment climate in South Africa. The survey targeted establishments located in the cities of Johannesburg, Cape Town, Port Elizabeth and Durban in the following industries (according to ISIC revision 3.1): all manufacturing, construction, retail, hospitality, transport, storage, communication and computer-related activities. After careful consideration, four industries were eliminated for the pur-

TABLE 1 Labour regulations and workforce education as obstacles

	Workforce education			Labour regulation		
	Small	Medium	Large	Small	Medium	Large
No	67	49	41	75	59	47
Minor	20	23	25	15	23	30
Moderate	5	19	20	5	10	18
Major	5	7	11	5	6	4
Severe	3	2	3	0	2	1

NOTES Based on World Bank survey and authors' own calculations.

pose of this study. The analysis will focus on manufacturing establishments and therefore wholesale, retail, hotel and IT establishments have been eliminated from the dataset. For the purpose of this study, a sample of 720 establishments will be used to analyse constraints and developments among South African manufacturers. Next, the severity of these constraints will be considered along with human capital development.

The requirement for establishments to be included in the survey was a minimum of five full-time paid employees. To further distinguish between small, medium and large companies, scales were introduced. Small-sized companies ranged between five and 19 employees, medium-sized between 20 and 99 employees and large-sized companies with 100 or more employees. Small establishments formed 34.5 per cent of the sample population, while medium and large-sized establishments represented 39.9 per cent and 25.6 per cent respectively.

The survey determined obstacles that firms face in doing business. Table 1 shows that firms in the survey did not experience immense problems with labour regulations or labour force education. The majority of small, medium and large firms indicated that these two aspects serve as either no or as minor constraints. These categories of constraints are based on perception, with the variables either having no constraint (or impact), or a limiting negative impact on firms in the survey. Regression analysis revealed that the quality of the workforce (measured as educational attainment) has a positive relationship with output per worker in manufacturing firms. The coefficients for labour regulations are not statistically significant and will receive attention later.

Although the global competitiveness index, as well as other authors like Kleynhans (2006, 58), indicated that labour regulations and inadequately educated workers are the biggest obstacles facing South Africa,

TABLE 2 The top six obstacles

Obstacles	Firm Size		
	Small	Medium	Large
Crime	26	35	32
Access to finance	8	6	3
Corruption	5	7	6
Electricity	25	16	16
Poor educated workforce	3	10	10
Labour legislation	6	5	8

NOTES Based on World Bank survey and authors' own calculations.

this survey found slightly different evidence. Further evidence revealed that crime and electricity costs are the biggest threats to firms in the survey (see table 3). Next were inadequately educated workers and labour regulations. In the following section, human capital development will be assessed via training and SETA (Sector Education and Training Authority) initiatives.

HUMAN CAPITAL DEVELOPMENT: TRAINING AND SETA SUPPORT

The biggest problem in analysing the effectiveness of human capital development initiatives, such as Sector Education Training Authority (SETA), is the lack of quality data. Rogerson (2004, 769) explains that discrepancies between national and provincial sources make findings and analysing data difficult. The majority of studies on human capital have been done by using survey data on a firm level across the country. This section compared findings from this study with evidence from other relevant studies on human capital development and training.

Large firms enjoyed more support from SETA, according to table 3, and are more likely to have official training programmes. Of small firms in the survey, only 27.4 per cent have formal training programmes, while for medium and large establishments, the figure is 47.4 and 70.8 per cent respectively. The majority of firms indicated that they spend between one and two per cent of their total sales on training. Seventy per cent of large establishments have formal training programmes, but only 26.5 per cent enjoyed SETA support. For small and medium-sized establishments, the figure was 4.8 and 11.8 per cent respectively.

The need for 'learning led' competitiveness has become a global phe-

TABLE 3 Average training programme and SETA support (percentage)

Item	Small	Medium	Large
Training programme(s)	27.4	47.4	70.8
Cost of training programme (as 1 to 2 % of sales)	19.4	35.2	50.2
SETA support	4.8	11.8	26.5

NOTES Based on World Bank survey and authors' own calculations.

nomenon, and changing ideas and environments pose as the biggest challenge to establishments. Education, training and experience form the most important aspects of competitiveness for all types and sizes of firms (Rogerson 2008, 61). The World Bank assessment of national SMME (Small, Medium and Micro Enterprises) programmes in 2006 indicated that it has not been successful in South Africa. Findings in this report identified an absence of training and education as the main stumbling blocks (World Bank 2006, 4).

Survey work done by Chandra et al. (2001, iv) revealed that during 1999, 30 to 45 per cent of SMMES indicated a skills shortage. Only 24 to 30 per cent of firms larger than five workers had formal skills training, and ten per cent of firms with fewer than five workers had formal skills training. The most worrying aspect is that the amount spent on crime prevention was bigger than the amount spent on training. Establishments did not experience labour regulations as a constraint, as they just reduced their number of permanent employees. Chandra et al. (2001, 41) also found usage and awareness rates of national training assistance programmes to be five and eighteen per cent respectively.

Bhorat and Lundall (2004, 1039) found evidence that in-house training schemes were preferred above outside training schemes. Eighty-four per cent of firms in this survey invest in in-house training programmes, while the figure for outside training was twenty-six per cent. The lack of formal evaluation in these programmes also generates questions about the quality of these training practices.

Firms that obtained SETA support were asked to describe the effectiveness of the support they received, and this will next be reported.

Table 4 indicates mixed reactions to SETA's effectiveness and on average it seems that SETA support has very little influence, which is neither effective nor ineffective. Large firms experience more support from SETA; however, close to twelve per cent of the respondents reported that SETA was in fact ineffective or very ineffective.

TABLE 4 SETA effectiveness

	Small	Medium	Large
Very effective	3.0	3.9	3.8
Effective	1.6	5.9	11.1
Neither effective nor ineffective	3.0	5.8	14.0
Ineffective	0.7	1.0	6.5
Very Ineffective	0.0	2.0	5.0

NOTES Based on World Bank survey and authors' own calculations.

Results from the regression analysis also indicate that SETA support has no significant influence on output levels in manufacturing firms in the survey. Evidence from this paper and work done in other studies show that SETA is an ineffective vehicle for promoting workplace education and training.

Empirical Analysis of the Quality of Human Capital

A variety of approaches can be found in the literature that explains human capital and its role in economic growth. Two main features that surface in the majority of the studies surrounding human capital include the quality of education and labour market distortions. Those studies that focus on education identify four aspects that influence human capital, which include quantity, quality, inequality and institutional differences. Work done by Barro (2001), Checchi (2006) and Dessus (2001) explains each one of these aspects.

Labour market distortions, on the other hand, can also be divided into four categories that influence human capital, namely labour market rigidity, inappropriate bargaining, industry concentration and the mispricing of labour. These are the four key aspects that explain the role that labour market distortions may have on human capital. Authors who have all described these aspects intensively are, for example, Fedderke (2005), Griliches (1997), Kingdon and Knight (2007) and Moll (1996), to name a few.

This section aims to determine the influence that the above-mentioned constraints have on manufacturing firms in South Africa. The following sections will establish the influence that these human capital constraints have on productivity and output in manufacturing firms. Firstly, the estimation of the regression equation will be explained, followed by the regression results and a Principal Component Analysis.

ESTIMATION OF THE MULTIPLE REGRESSION EQUATION ON HUMAN CAPITAL

This section of the study aims to determine to what extent variations of the contributors to human capital can explain the variations in the output per worker. The dependent variable (Y) in this regression represents output per worker (total sales/total workforce). The independent or explanatory variables (Xs) will coincide with variables that are found in the broad literature on human capital as described in the fourth section above. Variables that represent educational attainment and labour market distortions will be created and used in the regression analysis. Some of the explanatory variables can also further be divided into categories, and dummy coding will be used to distinguish between them.

Equation (1) includes all ten of the explanatory variables selected for the regression equation. To obtain the best possible fit, the equation has been transformed into a Log-linear functional form. This type of model is widely applied in the human capital literature (Asteriou and Hall 2007, 164).

$$\begin{aligned}\ln Y\ (\text{output-per-worker}) &= \beta_1 + \beta_2\ (\text{managers'-education}) \\ &+ \beta_3\ (\text{production-workers'-education}) + \beta_4\ (\text{labour-regulations}) \\ &+ \beta_5\ (\text{training}) + \beta_6\ (\text{SETA-support}) + \beta_7\ (\text{SETA-effectiveness}) \\ &+ \ln\beta_8\ (\text{compensation-production-workers}) \\ &+ \ln\beta_9\ (\text{compensation-managerial-workers}) \\ &+ \beta_{10}\ (\text{competition}) + \beta_{11}X\ (\text{location}) + \varepsilon_i. \qquad (1)\end{aligned}$$

Multiple regression analysis estimates a line that best fits the data and has the smallest possible residual values. The model, as indicated in equation 1, was estimated in the following way. In the SPSS software programme, the backward mode of the stepwise method of regression was selected. This mode is preferable to the forward mode due to its suppressor effects (Field 2005, 161). This method yielded the following results; there is a less than 0.1 per cent chance that the large F-ratio (20.08) happened by chance alone, because $p < 0.001$ (Field 2005, 190). The coefficient of determination (R^2) indicates that 48 per cent of the variability of output per worker is explained by the explanatory variables in this model. The adjusted R^2 value of 45.6 per cent is close to the model's R^2, and indicates that this model is a good generalisation of the dependent variable.

Field (2005, 189) suggests that a Durbin Watson value (in this case 1.685) close to two satisfies the Classical Linear Regression Model (CLRM)

assumption of independent errors. Next, the regression coefficients of table 5 will be discussed, and the significance of each variable will be explained.

REGRESSION RESULTS

Table 5 is a summary of the regression coefficients. The *b*-values (B) will be used to explain the results obtained from this regression. Variables with an asterisk (*) next to them indicate that the specific variable is significant at a five per cent level (or $p < 0.05$). This shows that the *b*-value is significantly different from zero, and not equal to zero as described in the null hypothesis. The Variance Inflation Factor scores (VIF) in the last column indicate whether an explanatory variable has a strong linear relationship with other explanatory variables. This measure is used to detect multicollinearity in the model. This model does not suffer from multicollinearity, as the VIF scores are all less than ten (Field 2005, 175).

Managers' education: For this variable, dummies were included. This was to distinguish clearly between the different levels of education. The *b*-values show that, compared to managers with primary education, secondary education and training is negatively related to the dependent variable (output per worker). Higher education seems to be positively related to the dependent variable, although only the MBA (Master's of Business Administration degree in South Africa) dummy is significant.

Production workers' education: The survey analysis found that on average, production workers have between seven and twelve years of education. This might explain why, relative to the reference group of zero to three years of education, production workers with between seven and twelve years of education have a positive relationship with output per worker. None of the dummies were statistically significant though.

Labour regulation as an obstacle: in the third section, it was shown that on average labour regulations do not pose a major obstacle. The coefficients suggest that when labour regulations pose a minimal or moderate obstacle, the dependent variable decreases. Large firms were also shown to experience more difficulty with labour regulations than small and medium-sized firms. The positive relationship between labour regulations as a major or severe obstacle and the dependent variable might be explained by the fact that large firms are better equipped to deal with labour regulations. However, none of these variables are significant at the five per cent level and these assumptions are made without absolute cer-

TABLE 5 Regression coefficients

Item	B	Std error	VIF
Constant	1.904	0.214	—
Managers' education			
Secondary education	−0.073	0.077	3.976
Training	−0.022	0.073	5.409
Some university	0.066	0.077	3.954
Graduate	0.136	0.074	5.667
MBA (South Africa)	0.191*	0.082	3.489
MBA (foreign)	0.097	0.102	1.907
Post-graduate (South Africa)	0.157	0.110	1.762
Post-graduate (foreign)	0.341	0.215	1.139
Labour regulations			
Minimal obstacle	−0.025	0.035	1.190
Moderate obstacle	−0.059	0.048	1.178
Major obstacle	0.039	0.064	1.078
Severe obstacle	0.052	0.136	1.065
Production workers education			
4 to 6 years	−0.006	0.070	3.196
7 to 12 years	0.044	0.064	4.878
≥13 years	−0.057	0.075	2.745

Continued on the next page

tainty. The reference group for this variable is labour regulations as no obstacle.

Training programme and Sector Education Training Authority (SETA) support: The existence of training programmes has a negative relationship with the dependent variable, while SETA support has a positive relationship. These variables are both statistically insignificant. It is therefore not clear whether the presence of training programmes or SETA support influences the dependent variable.

SETA effectiveness: SETA support was on average insignificant, being neither effective nor ineffective. The coefficients show that SETA effectiveness varies much. SETA support contributes to the biggest increase in the dependent variable. An interesting point is that SETA support that is very effective has a negative relationship with the dependent variable, and is statistically significant. SETA support that is ineffective also has a negative relationship with worker output, but this coefficient is not statistically significant. The influence of SETA effectiveness on the dependent variable is therefore unclear, as the reference group for this variable is SETA support that is very ineffective.

TABLE 5 *Continued from the previous page*

Item	B	Std error	VIF
Training			
Yes	−0.013	0.034	1.588
SETA *support*			
Yes	0.116	0.087	4.610
SETA *effectiveness*			
Very effective	−0.273*	0.116*	2.486
Effective	0.044	0.106	3.141
Neither effective nor ineffective	0.074	0.061	1.411
Ineffective	−0.063	0.100	1.370
Compensation			
Production workers	0.635*	0.056*	1.800
Managerial workers	0.254*	0.055*	1.823
Location/Region			
CAPE TOWN	0.117*	0.053*	2.147
JOHANNESBURG	0.216*	0.044*	2.432
PORT ELIZABETH	0.112	0.063	1.624
Competition			
1	0.178*	0.070*	1.510
2 to 5	0.085	0.048	2.838
>5	0.115*	0.046*	2.948

NOTES $R^2 = 48\%$, * $p < 0.005$.

Compensation of production and managerial workers: Both these variables have a positive relationship with the dependent variable, and are statistically significant. A one unit increase in the compensation of production workers yields a greater increase in output per worker than that of managerial workers. The study also found a large compensation differential between production workers and managerial workers in the survey.

Competition: The coefficients for this variable suggest two scenarios. Firstly, firms that have a single competitor have the highest positive relationship with the dependent variable. This may represent firms that are monopolistic, as the reference group refers to firms with no competitors. Secondly, where there are more than five competitors in the same market, a positive relationship exists with the dependent variable. This implies that increased competition has a positive impact on productivity, as sales output per worker increases. This relationship is also statis-

tically significant, but smaller than in the first scenario. Where competition takes place between two to five firms, the coefficient is positive but not statistically significant.

Location (Region): This variable shows that compared to Durban, firms in Johannesburg and Cape Town have a greater relationship with the dependent variable. These dummies are also statistically significant. For Port Elizabeth, the relationship is also positive but the coefficient is not statistically significant. Manufacturing output in this survey is also location biased. Manufacturing firms in Johannesburg achieve much greater levels of output per worker than those in the other three cities.

This corresponds well with findings about increased industry concentration in the South African economy. Fedderke and Szalontai (2005, 9) found that the top five per cent of firms produce an increasing fraction of total output in various industries (up to 85 per cent in some industries). In a separate study, Naudé and Gries (2004) found that in South Africa, eighty-five per cent of manufactured exports come from twenty-two out of the possible three-hundred-and-fifty-four magisterial districts. In a study done by Naudé (2006, 14), it was found that only KwaZulu-Natal (Durban area) and Gauteng (Johannesburg) were export orientated, and that the ability to successfully manufacture goods in only a few areas caused migration to these areas where industries are more densely situated.

In explaining this anomaly, international and national studies have indicated several potential contributing factors towards increased industry concentration. These factors include transport cost, infrastructure, specialisation, ports, technological spill-overs, resource endowments and other location essentials (Naudé 2006, 2).

The following section will apply Principal Component Analysis to generate more information on the subject matter regarding the quality of human capital in South Africa.

Principal component analysis (PCA)

Factor analysis is used to measure aspects that cannot be directly measured. This analysis determines whether different variables are driven by the same underlying trend (latent variable). This section applies the same variables used in the previous section, and aims to identify groups or clusters of variables. These groups of variables (also called factors) will then also be used in a regression analysis. The dependent variable (output per worker) in this regression analysis will be exactly the same as in

the previous section. It should be noted that variables, which measure the same underlying dimension or different aspects of the same dimension, should not be entered into the analysis simultaneously. Instead, only one variable should be entered into the analysis. Therefore, the following two variables have been omitted from the analysis: production workers' level of education and production workers' compensation. It is assumed that these variables measure the same underlying trend as the variables that measure the managers' level of education and compensation.

After running the Principal Component Analysis in SPSS, the KMO and Bartlett's test produced a score of 0.677. Field (2005, 648) suggests a minimum score of zero point five, and that a score close to point seven is a good score for this test. This test is also significant at the five per cent level ($p < .005$), and indicates that there is some relationship between the variables. After factor extraction, the rotation sums of squared loadings indicate that three factors are present. These three factors also cumulatively explain 60.7 per cent of the total variance. Factor 1 explains 29.6 per cent of the total variance, while Factors 2 and 3 explain 18.5 per cent and 12.6 per cent of the total variance respectively. After selecting an Orthogonal rotation (varimax) the rotated component matrix was estimated (table 6).

This matrix shows the factor loadings for each variable onto each factor. There are two things to consider about this matrix. Firstly, factor loadings of less than 0.4 are not displayed. This is the reason why there is no factor loading for the variable labelled 'labour regulations'. This variable does not load onto any of the three factors, and has little or no connection with the other variables. Secondly, the variables are listed according to the size of their factor loadings. Note that these variables can either have a positive or negative loading, and the number of variables that load onto each factor differs.

The next step is to identify common themes for all three factors. The variables that load onto Factor 1 all seem to relate to training and SETA involvement. Variables that load onto Factor 2 relate to the level of the managers' education, compensation as well as the number of competitors. Only one variable loads onto Factor 3, and this involves region. Next, the nature of the underlying themes for each factor will be labelled. Factor 1 can be labelled as 'training,' Factor 2 as 'management's competitiveness' and the third factor as 'region.'

Now that the explanatory variables have been reduced to three factors that measure three different underlying dimensions, a regression analysis

TABLE 6 Rotated component matrix

Item	Factors		
	1	2	3
Training supported by SETA	0.930		
Formal training	–0.861		
SETA effectiveness	0.833		
Managers' education		0.732	
Managers' compensation		0.664	
Number of competitors		–0.592	
Labour regulations			
Region			0.964

NOTES KMO and Bartlett's test = 0.677.

TABLE 7 Regression analysis with factor scores

Item	B	Std error	β	VIF
Constant	5.425	0.016		
Factor score 1 'training'	0.106*	0.016	0.221*	1.000
Factor score 2 'management's competitiveness'	0.190*	0.016	0.397*	1.000
Factor score 3 'region'	–0.077*	0.016	–0.160*	1.000

NOTES $R^2 = 23\%$, * $p < 0.005$.

is estimated. Again, the method of ordinary least squares (OLS) estimates a line that best fits the data. This line lies closest to all data points, and has the smallest possible residual values. Low Variance Inflation Factor (VIF) scores and a Durban-Watson score of 1.6 indicate that the model satisfies the Classical Linear Regression Model (CLRM) criteria. Table 7 shows the results obtained from this regression.

Both Factors 1 and 2 have a positive relationship with the dependent variable that is statistically significant. Factor 3 has a negative relationship with the dependent variable, and is also statistically significant. A one unit change in management's competitiveness (Factor 2) will lead to the greatest increase in the dependent variable (output per worker). This regression model has an R^2 of 23 per cent; therefore 23 per cent of the variability of output per worker is explained by the explanatory variables in this model. This model is to some extent inferior to the model in the previous section, which had an R^2 of 48 per cent, and explained 48 per cent of the variability of output per worker. The bottom line is that prin-

cipal component analysis showed that output per worker in manufacturing firms in the survey can be explained by three underlying factors. These are 'training,' 'management's competitiveness' and 'region.' Next, concluding remarks will highlight the findings of this paper.

Conclusion

This paper explored potential human capital constraints in the South African economy. Human capital constraints are aspects of human capital that limit the productivity and effectiveness of the workforce. The first section indicated that an inadequately educated workforce and restrictive labour regulations are the two major human capital constraints facing the South African economy. The consequences of investing in education were shown to be a form of capital, namely human capital. Empirical evidence in the fourth indicated that there is a positive relationship between educational attainment and output per worker and therefore productivity. Managers with higher levels of education achieved higher levels of output per worker from their labour force. The study also found that the existence of training programmes and the South African Sector Education and Training Authority (SETA) support had no significant influence on output levels among firms in the survey. SETA support was also shown to have minimal effect – neither effective nor ineffective influence on firms in the survey. Small and medium-sized firms also experienced very little SETA support compared to large firms.

The influence of labour regulations on manufacturing firms in the survey was shown to be diminutive in the third section. In the Global Competitiveness Report, the World Economic Forum describes South African labour regulations as restrictive. Formal sector employment is over protected. However, this study found no significant evidence that suggests that labour regulations have an influence on the level of output among manufacturing firms in the survey. Other labour market distortions also exist in the South African economy. These include high levels of unemployment, an oversupply of semi-skilled production workers and a concentration of industries and firms that are location biased. Firms situated in the city of Johannesburg were shown to have the highest output per worker figures.

For South Africa to achieve higher levels of growth and output, a new approach to human capital development is needed. The current global market is one that is 'learning led' and the demand for newer, more advanced products and services is very large. Recent initiatives to develop

human capital in South Africa have proven to be unsuccessful. Government initiatives as well as labour unions are more focussed on the redistribution of wealth and improved working conditions than on increased competitiveness, efficiency and productivity. This leads to a decreasing marginal productivity as employment increases.

Results from a Principal Component Analysis (PCA) revealed that the explanatory variables used in the regression analysis measure three underlying dimensions, namely training, management's competitiveness and region. The first two latent variables (underlying dimensions) explain the majority of the total variance. The importance of quality human capital measures, such as the level of education, compensation and training, therefore highlights the importance of quality human capital development in the South African manufacturing sector.

Scope for further research on human capital and its influence on productivity will depend greatly on the availability of improved measures to define the quality aspect of human capital. Countries, firms and even individuals possess different levels of financial and human capital, and it is the mixture of these two forms of capital that brings forth productivity. Policy recommendations include:

- A restructuring of SETA to improve support to manufacturing firms in South Africa. The consequence of discriminatory policies in South Africa's past has led to inequalities in the country's labour market. This paper proposes that SETA investigates a two-fold approach that distinguishes between low-skilled (unemployed), and highly-skilled professional employment. Such an approach would not only be more targeted, but could also deal with the issues of unemployment and skills shortages at the same time. To address the effectiveness of these bodies, authorities should explore the link between sectoral training and productivity. This could be done via the inclusion of targets of a qualitative nature, and not merely quantitative measures such as the number of candidates that complete training and development;
- Additional measures to create a more flexible bargaining process in sectors that are sensitive to changes in labour legislation. This includes a general decentralisation of bargaining in the manufacturing sector; and
- Implementing structures to evaluate and regulate human capital development initiatives that incorporate training, education and business development.

A final aspect that needs attention is the unavailability of reliable data on human capital development, and the absence of measures to assess developments in human capital formation and quality education.

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