



The Cost of Rigidity: The Case of the South African Labor Market

Johannes Fedderke

ERSA working paper 290

http://econrsa.org/home/index.php?option=com_docman&task=doc_download&gid=434&Itemid=67

June 2012

Economic Research Southern Africa (ERSA) is a research programme funded by the National Treasury of South Africa.

The views expressed are those of the author(s) and do not necessarily represent those of the funder, ERSA or the author's affiliated institution(s). ERSA shall not be liable to any person for inaccurate information or opinions contained herein.

The Cost of Rigidity: the case of the South African labor market

Johannes Fedderke*

April 2012

Abstract

The South African labor market has been characterized by high and persistent levels of unemployment, and a poor capacity to create jobs. This paper examines existing evidence on what rigidities have generated this outcome. Pricing power in output markets, as well as labor supply and demand side rigidities are all found to have contributed, resulting in excessive increases in real wage costs which under conditions of relatively low economic growth, has produced a stagnant labor market. Policy requirements are the pursuit of stonger economic growth and reductions in real labor costs.

1 Introduction

South African labor market conditions are unusual by international standards. High and persistent unemployment rates do not prevent real labor costs from rising. Job losses are rapid and sustained even in the presence of very mild exogenous shocks. It follows that the labor market faces significant rigidities that prevent clearing from taking place. The purpose of the present discussion is to collate evidence on what the source of these rigidities might be.

The suggestion that South African labor markets suffer from significant rigidities, is rendered immediately plausible by a consideration of the evidence to emerge from the most recent financial crisis. The evidence shows that South African output was negatively impacted by the international financial crisis of 2007, with a decline in real output from the middle of 2008 through the middle of 2009. The decline in real aggregate output in South Africa was of the order of 1.5%, while aggregate employment fell by 6.7%. Thus the negative shock to output was relatively mild, certainly in terms of the international experience surrounding the sub-prime crisis. By contrast, the reaction in the labor market was stronger by several (close to four) orders of magnitude. Employment losses in response to the crisis were immediate, strong, and have proved to be sustained. The rapid recovery of output in the economy has not been associated with an employment recovery. See Figure Figure 1.

Further indication of the presence of significant rigidities in the labor market comes from a consideration of South African unemployment rates, and real unit labor cost. What is striking about the evidence is that during the 1995 - 2005 period in which the unemployment rate was not only high, but rising dramatically (on the narrow definition of unemployment it doubled from 15% to 30%, while on the broad definition of unemployment it increased from 30% to more than 40%), the real cost of labor not only showed no sign of falling, but in fact rose dramatically instead. See Figure 2.

The inference of this descriptive evidence is that the labor market faces severe rigidities that prevent it from adjusting to any exogenous shock to the economy, that prevent the price of labor from adjusting to market clearing levels, and that therefore result in significant levels of unemployment. What is more, the persistence of the unemployment over now more than two decades, suggests that the rigidities, are not only significant, but that little has occurred either structurally in the economy, or by virtue of policy intervention, to address the source of the problem.

*Pennsylvania State University, Economic Research Southern Africa, and University of the Witwatersrand, jwf15@psu.edu

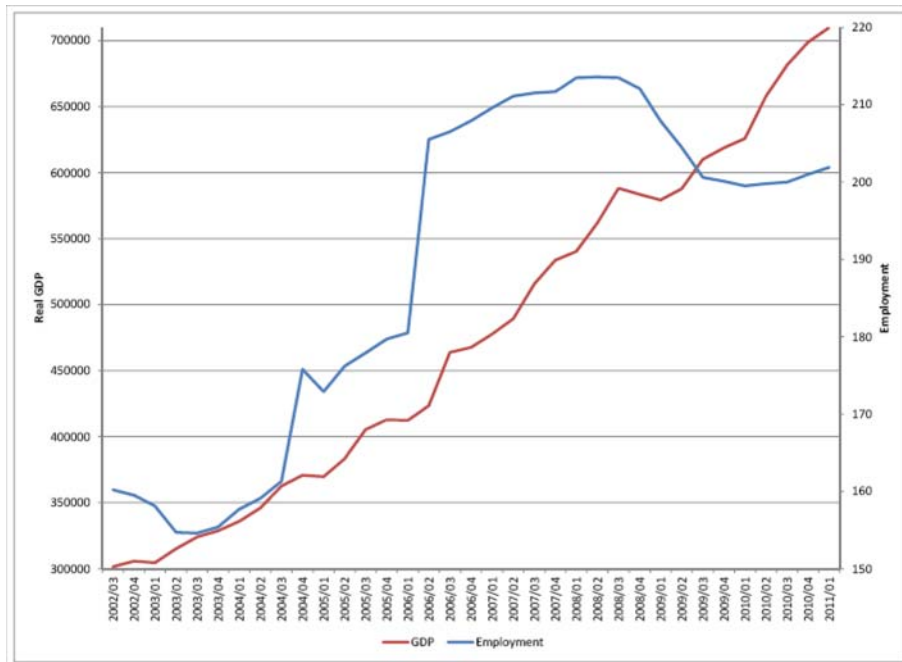


Figure 1: Employment and Real Output – South Africa. Source: SARB.

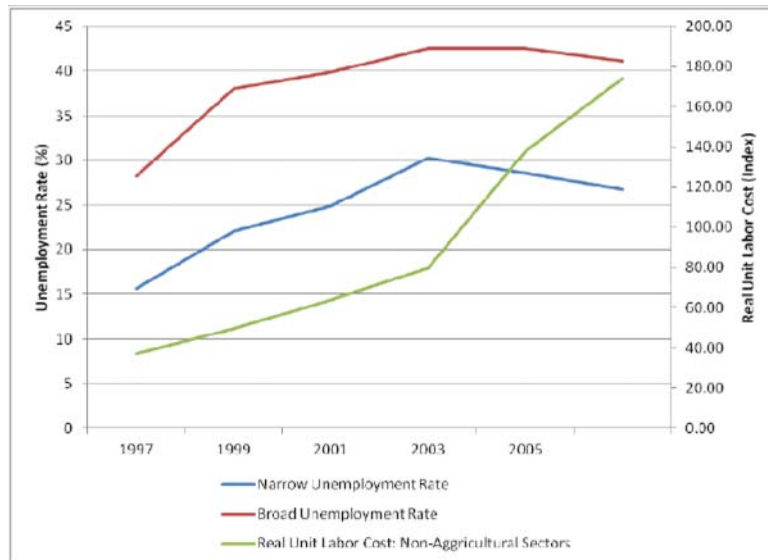


Figure 2: Narrow and Broad Unemployment Rates and Real Unit Labor Cost for the Non-Agricultural Sectors of the South African Economy. : Unemployment Rates from Banerjee et al (2008); unit labor cost from SARB data.

In this paper we consider the evidence that has emerged on the South African labor market, and which has a bearing on the functionality or otherwise of the South African labor market.

Two broad sets of conclusions emerge from a consideration of the evidence. The first is that the South African labor market is subject to strong rigidities, which have their source both in the labor and in the output markets of South Africa. The rigidities interact so as to inhibit the market from clearing - above all by placing constraints on the real cost of labor to adjust so as to generate an increase in labor demand.

The second emerges from the provision in this paper of a theoretical framework, that allows prior work on the labor market to be placed in a unifying framework. Virtually all studies to date have focussed on a narrow aspect of the labor market, or have generated results that are of significance to an understanding of the functioning of the South African labor market but as a by-product of analytical concerns focussed on other questions. As such, it is not obvious how the various pieces of evidence relate to one another. For this reason, in the present paper we begin with the presentation of a theoretical model, that allows the disparate pieces of evidence to be brought into relation to one another, and to be judged for consistency. The model demonstrates that in a labor market model related to underlying output growth, the range of elasticities that South African studies have been concerned with (wage, supply, output), are not independent of one another. This allows us to interpret the accumulated evidence systematically.

Organization of the paper is as follows. In section 2 we present some background structural features of the South African economy, relevant to the labor market. Section 3 presents the theoretical framework through which we interpret the empirical evidence on South Africa. In sections 4 and 5 we review and interpret the evidence on output and on labor markets respectively. Section 6 concludes.

2 Some Relevant Structural Features of the South African Economy

To provide a context for our discussion of the South African labor market, we provide some relevant background evidence on the structure of the South African economy.

The structure of the South African economy is unusual for its level of development. While its real per capita GDP categorizes it as an upper middle income economy, the structure of its output and employment patterns is more akin to either industrialized or post-industrial economies.

Table 1 provides a summary report of the distribution of gross value added at basic prices (GVA) and employment across the major two digit sectors of the economy. The primary commodity producing sectors, Agriculture, forestry and fishing (AFF) and Mining & quarrying (Min.), have declined monotonically from contributing 22.05% to 7.42% of GVA over the 1960-2009 period. Manufacturing (Manuf.) peaked in its contribution to GVA in the early 1980s at 17.38% and has since declined moderately to 14.73% in the 2005-09 period, while the contribution of Electricity, gas & water (EGW) and Construction (Constr.) has remained roughly constant between 4-6% of GVA. Community, social & personal services (CSPS) and Other community, social & personal services (OCSPC) have similarly maintained a constant share of GVA between 21 and 24% over the same period, while General government (GG) has contributed between 11% and 15% of GVA.

Substantial growth in the proportional contribution to South African output has thus occurred in the private sector service sectors of the economy. Collectively, the contribution of the Wholesale & retail trade, catering & accommodation (WRTCA) Transport, storage and communication (TSC) and Finance, insurance, real estate & business service sectors (FIREBS) has increased from 25.53% to 39.86% of South African GVA over the 1960 - 2009 period.

The insight compounds when considering the distribution of employment across the South African economy. While the unemployment rate remains exceptionally high for South Africa regardless of the means by which this is computed (see the data sourced from Banerjee et al 2008 reported in Table 1), reported patterns of employment distribution shows a dramatic increase in employment in the service sector of the economy. By the close of 2008, Financial institutions in the South African economy were responsible for

Gross Value Added											
Date	AFF	Min.	Manuf.	EGW	Constr.	WRTCA	TSC	FIREBS	CSPS	GG	OCSPC
1980-84	2.62	9.17	17.38	1.76	3.42	11.63	5.98	12.88	17.57	13.52	4.06
1985-89	2.92	8.26	16.49	1.99	2.69	11.25	5.75	13.38	18.62	14.28	4.36
1990-94	2.93	7.59	15.42	2.18	2.42	10.87	5.87	13.64	19.58	15.04	4.54
1995-99	2.60	6.80	15.25	2.35	2.17	11.09	7.03	14.66	19.03	14.22	4.81
2000-04	2.55	5.98	15.35	2.11	2.20	12.07	8.50	16.43	17.41	12.42	4.99
2005-09	2.29	5.13	14.73	1.91	3.00	12.80	9.10	17.96	16.54	11.62	4.92
Employment Data											
	Min.	Manuf.	Constr.	Trade	FinInst	GG	PubEnt.	Unemployment Rate			
									Narrow	Broad	
1980-84	16.89	32.66	9.00	4.21	3.06	26.57	7.61	1995	15.6	28.2	
1985-89	16.73	31.54	8.42	4.02	3.43	29.66	6.20	1997	22.1	38	
1990-94	14.16	32.17	7.97	4.10	3.99	32.50	5.11	1999	24.85	39.9	
1995-99	11.87	32.10	6.84	4.62	4.82	35.30	4.44	2001	30.3	42.5	
2000-04	9.48	28.26	5.92	6.21	14.96	32.26	2.92	2003	28.6	42.5	
2005-09	7.91	20.98	7.49	6.77	28.66	26.45	1.72	2005	26.7	41.1	

Table 1: Distribution of Gross Value Added at Basic Prices: 1980 - 2009, and Employment 1980-2008. Source data: South African Reserve Bank and Banerjee et al (2008).

close to 30% of total employment in non-agricultural sectors, with strong rates of increase over the course of 2003:03 - 2008:04, generating a 49.8% increase in employment.¹

The structure of the economy has thus arguably come to resemble the distribution of economic activity of industrialized nations more than that of emerging markets or developing countries. South Africa's output and employment share for industry and agriculture is lower than its most immediate middle income reference groups, while it is higher in the service sectors. By contrast, its output and employment shares are more aligned to those of high income (industrialized) countries. The same inference is also becomes apparent from a comparison of South Africa with the BRIC countries - see Table 2.

This evidence suggests that any analysis concerned with employment creation in South Africa must confront the dilemma that either attention must focus on sectors of the economy that are not traditionally associated with employment intensity, or that close attention will have to be paid to the structural impediments that constrain traditionally labor intensive sectors from realizing higher demand for labor.

Primary commodities as well as manufacturing have been losing significance as sources of employment. Instead, it is sectors such as finance and business services, that are potentially human capital intensive, that have been the major sources of employment growth. Given the constraints in the South African educational system in being able to generate high skills levels, it is not immediately evident how the employment growth in the services sectors will alleviate South Africa's employment creation problem.

Given the supply-side constraints in the educational system, a focus on the source of structural rigidities in the labor market becomes of increased significance. On the other hand, policy interventions designed to remediate the structural constraints in traditionally labor intensive sectors of the economy at present are not receiving close attention by South African policy makers.

3 A Simple Model of Growth and the Labor Market

To help focus the interpretation of the available evidence on the South African labor market, we begin with a simple model of growth and employment.²

¹Note that the jump in the proportion of employment in the Financial institutions during the 2000-4 period is in part due to the inclusion of real estate and business services as of 2002:03.

²Choi (2007) provided useful background in formulating the model.

		Value Added (% of GDP)			Employment (% of GDP)		
		1980-89	1990-99	2000-05	1980-89	1990-99	2000-05
Brazil	Agriculture	10	8	9	27	25	21
	Manufacturing	-	-	-	-	-	-
	Industry	45	35	37	24	20	21
	Services	45	57	54	50	55	58
India	Agriculture	35	29	21	-	67	-
	Manufacturing	16	17	15	-	-	-
	Industry	26	27	26	-	13	-
	Services	39	44	53	-	19	-
Russia	Agriculture	17	9	6	-	15	12
	Manufacturing	-	-	18	-	-	-
	Industry	50	42	36	-	35	30
	Services	33	50	58	-	51	59
China	Agriculture	29	20	13	62	50	45
	Manufacturing	36	33	32	-	-	-
	Industry	45	45	46	21	20	17
	Services	26	34	41	11	12	14
South Africa	Agriculture	5	4	3	-	11	12
	Manufacturing	23	21	19	-	-	-
	Industry	44	35	32	-	25	25
	Services	51	61	65	-	61	63

Table 2: Output and Employment Distribution in the BRICS Countries. Figures are percentages. Source: World Development Indicators.

Let output be given by a standard production function that is homogenous of degree 1:

$$Y = A \cdot F(K, N) \quad (1)$$

where Y denotes output, A is a technology scaling parameter, K denotes the capital, and N the labor input into production.

Then the equilibrium labour demand (N^D) condition requires that the marginal product of labor be equal to the real wage:

$$\frac{\partial Y}{\partial N} = AF_N(K, N^D) = W \quad (2)$$

where W denotes the real wage.

Now let the labor supply (N^S) condition be given by:

$$N^S = N^S(W, \Psi) \quad (3)$$

where Ψ denotes structural determinants of labor supply.

From equations (2) and (3) equilibrium employment then follows as:

$$N = N^S(AF_N(K, N^D), \Psi) \quad (4)$$

This allows us to derive the elasticity of employment with respect to capital (η_{NK}) as:³

$$\eta_{NK} = \frac{\varepsilon_{NW}^S \zeta_{NK}}{1 - \varepsilon_{NW}^S \zeta_{NN}} \quad (5)$$

³Note, the derivations of equations (5) through (7) are provided in Appendix 1.

where ε_{NW}^S denotes the labor supply elasticity with respect to the real wage, ζ_{NK} denotes the elasticity of the marginal product of labor with respect to capital, and ζ_{NN} denotes the elasticity of the marginal product of labor with respect to labor.

Similarly, the employment elasticity with respect to output (η_{NY}) is given by:

$$\eta_{NY} = \frac{\varepsilon_{NW}^S \zeta_{NK} \varepsilon_{KY}}{1 - \varepsilon_{NW}^S \zeta_{NN}} \quad (6)$$

where ε_{KY} denotes the elasticity of output with respect to capital.

Finally, the wage elasticity of output growth (η_{WY}) is given by:

$$\eta_{WY} = \frac{\zeta_{NK} \varepsilon_{KY}}{1 - \varepsilon_{NW}^S \zeta_{NN}} \quad (7)$$

The point of these observations is simple: the elasticity relations associated with the labor market are interdependent, so that findings on one elasticity, carry implications for the remaining elasticities that relate to the labor market. Specifically, we note that:

$$\frac{\partial \eta_{NY}}{\partial \varepsilon_{NW}^S} = \frac{\zeta_{NK} \varepsilon_{KY}}{(1 - \varepsilon_{NW}^S \zeta_{NN})^2} > 0 \quad (8)$$

$$\frac{\partial \eta_{WY}}{\partial \varepsilon_{NW}^S} = \frac{\zeta_{NK} \varepsilon_{KY} \varepsilon_{NW}^S \zeta_{NN} - \zeta_{NK} \varepsilon_{KY}}{(1 - \varepsilon_{NW}^S \zeta_{NN})^2} < 0 \quad (9)$$

$$\text{given } \zeta_{NK} > 0, \varepsilon_{KY} > 0, \zeta_{NN} < 0, \varepsilon_{NW}^S > 0$$

The implications are that with a rising ε_{NW}^S , η_{NY} increases, while η_{WY} declines.

Under the specific case of Cobb-Douglas technology, such that $Y = AK^\alpha N^{1-\alpha}$, $0 < \alpha < 1$, and $\partial Y / \partial N = (1 - \alpha) A (K/N^D)^\alpha = W$, we can simplify these relations to:

$$\eta_{NY} = \frac{\varepsilon_{NW}^S}{1 - \alpha \varepsilon_{NW}^S} \quad (10)$$

$$\eta_{WY} = \frac{1}{1 - \alpha \varepsilon_{NW}^S} \quad (11)$$

$$\varepsilon_{NW}^D = \left(\frac{-1}{\alpha} \right) (1 - \alpha)^{1/\alpha} \left[\frac{A}{W} \right]^{1/\alpha} \left(\frac{K}{N^D} \right) \quad (12)$$

where ε_{NW}^D denotes the wage elasticity of labor demand.

In what follows, we employ these interdependencies between the labor market elasticities, in order to structure the interpretation of the existing labor market findings in South Africa.

4 Output Market Rigidities

Empirical evidence suggests that the South African economy is characterized by a wide range of rigidities which all contribute to a poorly functioning labor market. Of course, rigidities in the labor market have to be a central concern, and in section 5 of the paper we examine these in detail. But in addition, there is also accumulated empirical evidence that suggests that rigidities in the output market have contributed toward the labor market rigidities, as well as to a reduction in the output growth of the economy.

A sequence of studies have reported the existence of significant pricing power in the South African manufacturing sector.

Empirical results indicate the presence of a mark-up of price over the marginal cost of production in the South African manufacturing sector that is two to three times higher than that of the US manufacturing

sector, with counter-cyclical variation.⁴ Moreover, the evidence suggests that this finding of significant pricing power holds over time, regardless of whether the derivation is conducted on firm-level or industry-level data, irrespective of firm size, and across a range of alternative measures or proxies of pricing power.⁵

Implications of these findings for the labor market are two-fold. First, higher mark ups are associated with lower productivity growth rates. Specifically, a ten percent increase in mark-ups would lower productivity growth in South Africa by 1.6% to 2.5% per year, while an increase in the industry Lerner index is associated with a productivity growth cost of 1% per annum.⁶ These results are robust to extensive controls for the impact of any trade liberalization on the manufacturing sector.⁷ It follows that to the extent that employment growth responds positively to output growth, and given the inhibiting impact of pricing power on productivity growth in South African industry, the foregone growth of output markets has also negatively affected employment growth in South Africa.

The second implication emerges from the demonstration that mark-ups of price over marginal cost of production can be linked to labor market rigidities by means of the following expression:⁸

$$\begin{aligned} & \frac{1}{1-\alpha} \left(\frac{\Delta \log \mu - ((\Delta q + \Delta p) - \Delta w)}{\bar{\mu}} - \alpha \Delta l \right) \\ &= \left(\frac{1}{\sigma} - 1 \right) \Delta k - \left(\frac{1}{\sigma} \right) \left(\frac{L}{L - \bar{L}} \right) \Delta l \end{aligned} \quad (13)$$

where $\mu = P/MC$ defines the mark-up of prices over marginal cost, $\alpha = WL/PQ$, denotes the factor share earned by labour, P and Q denotes the price and quantity of value-added respectively, W and L the wage and labour time respectively, K denotes the capital stock, σ denotes the elasticity of substitution between capital and labour, $\bar{\mu}$ the steady-state mark-up and \bar{L} the labour associated with rigidities in the labour market. Lower case notation denotes log transforms. This allows the estimation of:

$$\begin{aligned} y_{it} &= \beta_{0i} + \beta_1 \Delta k_{it} + \beta_2 \Delta l_{it} + \varepsilon_{it} \\ \text{where } y_{it} &= \frac{1}{1-\alpha_{it}} \left(\frac{\Delta \log \mu_{it} - ((\Delta q + \Delta p)_{it} - \Delta w_{it})}{\bar{\mu}_i} - \alpha_{it} \Delta l_{it} \right) \\ \beta_1 &= \left(\frac{1}{\sigma} - 1 \right) \\ \beta_2 &= \frac{1}{\sigma} \frac{L}{L - \bar{L}} \end{aligned} \quad (14)$$

Simple manipulation of the estimated coefficients β_1 and β_2 then allows us to obtain an estimate of the rigidity of labor adjustment coefficient, $L/(L - \bar{L})$:

$$\sigma_{est} = \frac{1}{\beta_1 + 1} \quad (15)$$

$$\left(\frac{L}{L - \bar{L}} \right)_{est} = \sigma \beta_2 = \frac{\beta_2}{\beta_1 + 1} \quad (16)$$

Results for South African manufacturing for the 1970-2004 period imply that labor market rigidity shows a strong increase from the 1980s through the 1990s and 2000s, while (consistently) the associated elasticity of substitution between capital and labor has been rising also - see Figure 3.⁹

Thus output market rigidities in South Africa, have been associated with increased labor market rigidities also. As already discussed in the introduction of the paper, the dramatic quantity adjustments in the South

⁴See the evidence reported in Fedderke et al (2007). Including intermediate input costs in the computation of marginal cost does serve to lower the estimated mark-up, but the South African mark-up continues to be significantly greater than that of US industry, once industry concentration is controlled for in regression.

⁵See the evidence in Aghion et al (2008).

⁶See the reported results in Aghion et al (2008). The evidence also supports the same kind of inverted-U relationship between competition and growth as for the UK and other countries, suggesting the presence of an escape competition effect.

⁷See the evidence reported in Aghion et al (2011).

⁸See the derivation in Fedderke and Hill (2011).

⁹See Fedderke and Hill (2011) for the full results and derivations.

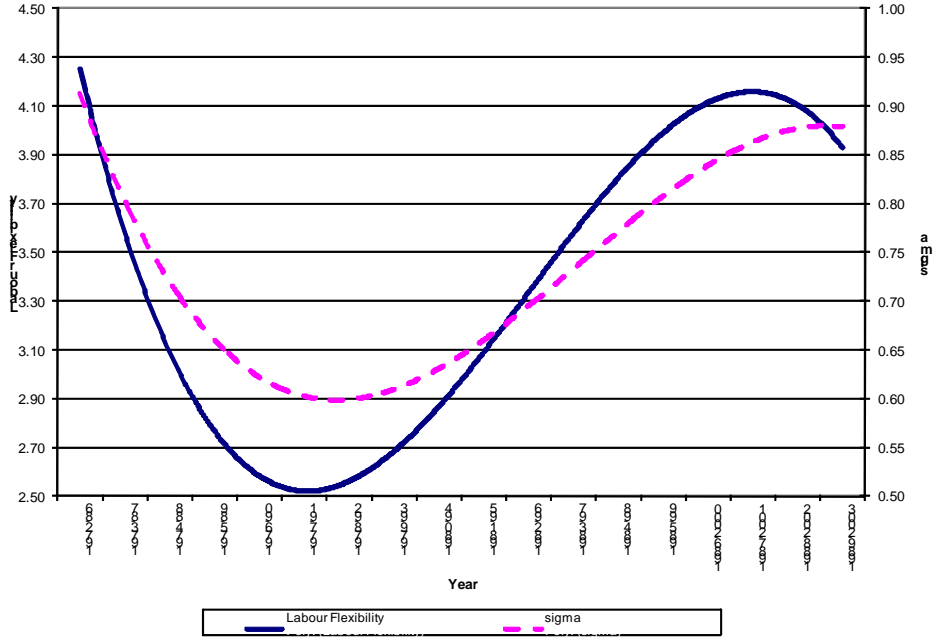


Figure 3: Labor Market Flexibility and Elasticity of Substitution between Capital and Labor (*sigma*). Source: Fedderke and Hill (2011). Note: Labor market flexibility is derived from (4): a rising value is therefore associated with decreased labor market flexibility.

African labor market even to relatively mild recessionary pressure, suggests that the salience of rigidities in the market must be substantial. The failure of real unit labor costs to respond appropriately to labor market disequilibrium further reinforces the point. What the evidence summarized here suggests, is that at least part of the responsibility for such rigidities lies with output markets, rather than labor markets directly.

Given these findings, unfortunately there is little evidence of trends that might suggest that the contribution of output pricing power to labor market rigidities might be diminishing. The trade liberalization of the 1990s does not appear to have significantly affected the level of industry mark-ups.¹⁰ Further, the evidence indicates that reductions in industry concentration serve to lower industry mark-ups, and by inference would contribute to accelerated productivity growth and lower labor market rigidity.¹¹ In this respect, one potentially positive development was the appearance of potentially substantial decreases in industry concentration over the 1996 - 2001 period. On the Rosenbluth concentration index concentration across all manufacturing sectors fell by an average of -0.0232 (-0.0227 if sectors are weighted by output).¹² Unfortunately, consideration of the evidence from the 2005 large sample survey of manufacturing industry, suggests that the apparent downward trend in industry concentration from the 1996 manufacturing census to the 2001 large sample survey, was not sustained - see the evidence of Table 3, which suggests rising industry concentration across the majority of the manufacturing sector.¹³

¹⁰See Aghion et al (2011).

¹¹See Fedderke et al (2007).

¹²The more standard Herfindahl index cannot be computed for South Africa over the full 1972-2001 period. The Gini coefficient of inequality in the distribution of production over the population of firms also falls by 0.176 across all manufacturing sectors (0.146 when sectors are weighted by output). See Fedderke and Naumann (2011) for the derivation. Readers should be alert to the significant data problems that are associated with any comparison between 1996 and subsequent data points - see the more extensive discussion in Section 5.1, which reports data challenges confronting work on the labor market in South Africa.

¹³A more likely explanation is in fact that the lower concentration measures of 2001 compared to 1996 are simply an artefact

Sector:	2001	2005
Production, processing and preserving of meat, fish, fruit, vegetables, oils and fats	43.95	35.37
Dairy Products	75.46	79.98
Grain mill products, starches and starch products and prepared animal feeds	59.94	68.29
Other food products	36.74	73.74
Beverages	72.51	80.73
Spinning, weaving and finishing of textiles	46.94	45.27
Other textiles	30.82	24.84
Leather and leather products	63.18	66.88
Footwear	45.46	48.50
Sawmilling and planing of wood	34.12	57.08
Wood, cork and straw products	21.56	30.31
Paper and paper products	68.83	77.77
Rubber products	69.54	76.35
Plastic products	22.36	24.76
Glass and glass products	56.54	84.50
Non-metallic mineral products, not elsewhere classified	45.47	49.98
Basic precious and non-ferrous metals	74.71	74.33
Structural metal products, tanks, reservoirs and steam generators	25.08	34.16
Other fabricated metal products and metalwork service activities	30.15	21.89
General purpose machinery	16.28	15.53
Special purpose machinery	22.93	41.88
Insulated wire and cable	72.48	88.22
Motor vehicles	86.20	95.21
Bodies (coachwork) for motor vehicles, trailers and semi-trailers	42.95	48.05
Parts and accessories for motor vehicles and their engines	41.16	54.69
Furniture	35.60	33.17

Table 3: Relative contribution of ten largest firms (CR10). Source: Own Calculations.

Given the continued unfavorable developments in industry concentration, it is also worth noting that estimation results for the manufacturing sector suggests direct negative employment consequences that result from industry concentration.¹⁴

Finally, we also note that in terms of the OECD aggregate product-market regulation indicator, South African industry faces more extensive and severe regulatory burdens than all countries monitored by the OECD, with the exception of Poland.¹⁵ Such heavy regulation favors incumbent firms that have achieved productive scale efficiencies, and renders entry particularly by small and medium sized firms less likely. That South Africa has seen relatively little competitive response in the face of trade liberalization, that concentration levels in industry continue to increase, that pricing power continues undiminished, and that productivity growth continues to be sluggish, is therefore not surprising.

5 Labor Market Rigidities

Given the response of employment to the most recent economic downturn, noted in the introduction, the implication is that the demand side of the market has to be the major focus of analysis. The evidence is of labor shedding far out of proportion to the magnitude of the economic downturn. Since the job losses cannot be attributed to supply side search costs (labor market incumbents were losing their jobs), to constraints on labor market outsiders (it is insiders who were losing their employment), or to frictions governing movement between labor market segments (the issue is not of difficulties of moving into the formal sector), attention has to be focussed particularly on the demand side of the market.

A further simple statistic highlights just how crucial the demand side is to an understanding of the South African labor market. From 1970 - 2005 the population grew at 2.7% per annum. Over the same period, employment grew at 1.3 % per annum.¹⁶ It follows immediately that whatever results emerge for the supply side of the market, the demand side of the market has simply not kept pace even with underlying demographic growth rates. A rising unemployment rate follows of necessity. Analytically, an understanding of the labor market demand side is therefore critical.

We have assembled evidence that relates to both the supply and demand side. In considering the evidence, the discussion which follows employs the theoretical framework of section 3 in order to structure the discussion, and in order to provide a systematic interpretation across the range of prior studies we consider.¹⁷

5.1 Data Issues

Evidence on South African labor market conditions is inevitably shaped by the data sources available to researchers.

The period after the 1994 political transition has seen a rapid growth in extensive data sources on the supply side of the labor market. The publication of first the October Household Surveys, then the Labor Force Surveys, and finally the National Income Dynamics Survey has significantly added to the resources available to researchers interested in supply side comparative statics and dynamics of the market.

The situation on the labor demand side is more mixed. South Africa conducted manufacturing censuses on either a biannual or triannual frequency over the full 1917 - 1996 period. It then chose to discontinue the

of the change in methodology in data collection, as discussed in Section 5.1.

¹⁴Fedderke and Szalontai (2009) find that industry concentration has an economically and statistically significant negative impact on employment in manufacturing.

¹⁵See Conway et al (2005).

¹⁶See for instance the discussion in Banerjee et al (2008).

¹⁷We note that there are a wide array of studies on the South African labor market, much of which is not published under conditions of peer review. For the most part, the present review restricts itself to studies that have passed peer review. We make a few exceptions in the case of studies that have been of significance either to the policy in South Africa, that have made a sustained impact of the analytics of papers that have been published, or that are relevant as a data source for the present paper. Finally, this paper does not claim to be a fully detailed review of every nuance and detail of the South African evidence. Instead, it is aiming at providing a coherent synoptic overview, which perforce therefore is selective in the evidence it can consider.

census in favor of a Large Sample Survey of the manufacturing sector, of which three have been conducted, in 2001, 2005 and 2008. Data series are not consistent across the change in data collection methodologies. Consistently, data is available only in aggregated form, and Statistics South Africa has not developed protocols for secure access to the firm level data that underlies the published data. For sectors other than manufacturing, the norm has consistently been that data has only been published at SIC 2-digit and hence highly aggregated levels.

Inevitably, data availability has played a significant role in two features of research conducted on the South African labor market.

First, given the much greater availability of supply side data, and the much greater level of disaggregation of the supply side data, research on the supply side of the market has far outnumbered demand side work.

Second, the work on the demand-side and the supply-side of the market has suffered from a fundamental mismatch. Since the demand-side work has perforce of circumstances employed relatively aggregated (at least SIC three digit) data, while that on the supply side has had access to disaggregated (household or individual) data, it is difficult to reconcile the findings from the two bodies of work.

The result is that work on the South African labor market continues to face a series of controversies and unresolved questions. Given the absence of any likelihood of an expansion of demand-side data, and the access to firm level data, these debates are unlikely to reach a satisfactory scientific resolution.

This structural data determinant of the debate in South Africa is puzzling. Given the very high levels of unemployment in South Africa, the repeated claims in the policy debate that employment creation was, is and remains of the highest priority, are unsurprising. But it is difficult to accept such a commitment to job creation at face value, under the preponderance of attention paid to the supply side of the market, and the failure to develop a serious engagement of the demand side of the market.

5.2 Labor Supply Questions

Under the labor supply side, we consider the implications to emerge from three broad sets of studies. As already indicated, labor supply side on South Africa are relatively numerous, and cover evidence on labor market segmentation, on participation costs in the labor market, and on possible skills mismatches to have emerged in the market.

5.2.1 Market Segmentation

A wide body of literature has come to emphasize labor market segmentation in South Africa.

The first form of segmentation in the literature is the standard one between the formal and the informal labor market.¹⁸ The findings suggest the existence of a rationed formal labor market with a sticky non-clearing wage rate. The result is a substantial formal-informal sector wage differential of an order somewhere between 1.75 - 3.5 : 1, as well as a significant degree of involuntary unemployment and a pool of discouraged workers. In contrast to the rationed formal sector, the informal sector is competitive, and is estimated to constitute between 19% and 24% of the labor force.

An additional segmentation has been identified between the unionized and non-unionized labor market.¹⁹ Again, the evidence points to the existence of more sticky non-clearing wages in the unionized sector, and substantial wage differentials between unionized and non-unionized workers.

The net import of this evidence is that the labor market has a three-tier structure, from unionized formal, to non-unionized formal, to informal.²⁰ In this the South African labor market is not unusual. What

¹⁸This segmentation has been argued for in a sequence of papers by Kingdon and Knight (2004a, 2006a,b).

¹⁹See the discussion in Moll (1993) and Hofmeyr (2000).

²⁰There are a set of papers on the South African labor market that suggest that the informal labor market is also segmented, with substantial barriers to mobility within the informal sector, and substantial earnings differentials across the informal sector. See for instance Casale and Posel (2002), Posel and Casale (2003), and Heintz and Posel (2008). However, since the standard definition of an informal labor market is one that does not face rigidities, and in which earnings differentials reflect underlying productivity differences, it is difficult to interpret this evidence with any clarity, and we do not explore this further in the present context. Given the supposed absence of regulation in the informal sector, it is in any event difficult to understand what the *source* of informal labor market rigidities with any degree of persistence might be.

is unusual is the strength of the implied impact, with levels of wage differentials, unemployment impacts and resultant income inequalities that are high. In order for the labor market segmentation to be the cause of such strong differentials, the strength of the market segmentation would have to be unusually severe.

It is worth noting that there does exist countervailing evidence against this inference. A number of studies utilizing panel data have now highlighted that there exists a high degree of churning in the South African labor market, such that the labor market status of individuals changes with relatively high frequency and probability.²¹ The implication is that the market segmentation that has come to be emphasized by the literature, may be a less binding constraint on finding employment than is often argued.

Nonetheless, the evidence does highlight the existence and impact of labor market rigidities both within the formal sector, and between the formal and informal sectors, and as such serves to identify one potential source of the failure of labor market clearing. Specifically, the evidence is consistent with the presence of rigidities in real wages, that prevent labor market clearing. The most immediate policy responses to follow would be to lower the rigidity of wages that serve to contribute to the market segmentation, and to reduce any information asymmetries that may contribute to the segmentation.

5.2.2 Participation Costs

Participation costs of workers in labor markets has also received considerable attention in the literature, with mixed results.

The studies fall into two broad categories. The first is concerned with the opportunity cost of labor market entry. The second category has focussed on the search costs associated with labor market participation.

Amongst studies concerned with the opportunity cost of labor market entry, one set of authors has been concerned with the impact, if any, of reservation wages on employment.²² The findings of virtually all of these papers has been that reservation wages either are not a significant constraint on labor market participation, or that the findings are inconclusive. The inference from these studies is that the failure of the wage to adjust to market clearing levels, does not stem from supply-side rigidities that would prevent wages from falling - instead, workers would be prepared to accept lower wages in exchange for employment.

There is countervailing evidence in the literature, however. A series of studies has explored the impact of a specific welfare policy intervention, the social pension. Here the finding is that the introduction of the pension *has* lowered labor force participation (thus effectively raising the reservation wage).²³ These findings are difficult to reconcile with the evidence suggesting that there is no reservation wage constraint, since labor market participants are unwilling to enter the market at prevailing wages (given the presence of the pension), let alone at lower wages that would serve to expand the demand for labor.

Findings on the impact of the social pension do not uniformly suggest that the pension has raised labor market rigidities, however. A further set of studies has found instead that the introduction of the social pension has facilitated labor force participation, albeit indirectly, by facilitating migration and hence implicitly access to formal urban labor markets.²⁴ In this instance therefore, the pension has enabled labor market participants to overcome participation costs in the market.

The evidence from these studies carries two quite distinct implications: the studies that find that there is no reservation wage constraint, suggest that the responsiveness of labor supply to changes to the real wage (ε_{NW}^S) is (relatively) high. Since labor supply is not held to be constrained by the wage, any change in the real wage must elicit a (strong) labor supply response. If correct, from the results of equations (10) and (11), it also follows that the elasticity of employment with respect to output (η_{NY}) should be high, while the elasticity of the real wage with respect to output (η_{WY}) should be low. Thus under Cobb-Douglas technology, for the $0.8 \leq \varepsilon_{NW}^S \leq 1$ labor supply with respect to the wage elasticity range, and for a share of capital in value added given by $0.3 \leq \alpha \leq 0.4$, the implied elasticity of employment with respect to output

²¹See for instance Chichello et al (2005) and Banerjee et al (2008).

²²See for instance Kingdon & Knight (2001, 2004a), Natrass & Walker (2005), Heintz & Posel (2008), Banerjee et al (2008), and Klasen & Woolard (2008).

²³See for instance Bertrand et al (2003), Dinkelmann (2004), and Klasen & Woolard (2005).

²⁴See for instance Posel et al (2006) and Ardington et al (2009).

lies in the $0.7 \leq \eta_{NY} \leq 0.8$ range, while the elasticity of the wage with respect to output lies in the range of $0.7 \leq \eta_{WY} \leq 0.8$.

Symmetrically and in contrast, to the extent that the finding that the pension has lowered labor force participation is associated with a lower responsiveness to the real wage (such that reservation wages do become a constraint), this implies that in the South African labor market the low ε_{NW}^S is also associated with a low elasticity of employment with respect to output (η_{NY}), and a high elasticity of the real wage with respect to output (η_{WY}). Thus under Cobb-Douglas technology, for a range of $0.1 \leq \varepsilon_{NW}^S \leq 0.2$ for the labor supply with respect to the wage elasticity, and for a share of capital in value added given by $0.3 \leq \alpha \leq 0.4$, the implied elasticity of employment with respect to output lies in the $0.1 \leq \eta_{NY} \leq 0.2$ range, while the elasticity of the wage with respect to output lies in the range of $0.93 \leq \eta_{WY} \leq 0.97$.

The second set of studies concerned with participation costs in the labor market, has focussed on the search costs associated with finding employment.

A number of studies have pointed out that the probability of finding employment is differentiated across rural and urban job seekers, is affected by the extent of poverty experienced by the job seeker, and the ease of access to transport.²⁵ In related vein, a number of studies have suggested that the "degree" of labor force attachment also varies across rural and urban labor force participants, in the presence of high and low unemployment rates, and in the level of income from either work or remittances of households of which potential labor suppliers are members.²⁶

Location (rural vs. urban), demographic characteristics and structure (male/female composition, presence or not of secondary education, number of pensioners present) of households have also been identified as determinants of search costs in labor markets.²⁷

Finally, insider-outsider labor market structures have also been identified as contributing to the cost of job search, since networks have been found to be important determinants of the probability of finding employment.²⁸

The search cost models do not necessarily reflect directly on the elasticity parameters of the theoretical model we have presented. To the extent that they do, they suggest that the wage elasticity of employment (ε_{NW}^S) is low, and hence that the labor market has a low elasticity of employment with respect to output (η_{NY}), and a high elasticity of the real wage with respect to output (η_{WY}). However, an alternative reading of this evidence is that the high search costs reflect on the structural determinants of labor supply (Ψ), without necessarily influencing the elasticity of labor supply to the real wage directly.

It is important to note that the two broad positions that have emerged in the literature carry distinct policy implications. If ε_{NW}^S is found to be high (no reservation wage constraints apply) it also follows that employment responses to output growth will be high. Employment creation will thus usefully be achieved through the pursuit of policies designed to raise output growth. Conversely, if ε_{NW}^S is found to be low (reservation wage constraints do apply) it also follows that employment responses to output growth will be low, and wages rise steeply in response to output growth. Employment creation will thus usefully be achieved through the pursuit of policies designed to lower real wages.

5.2.3 Skills Mismatches

A relatively consistent body of evidence has pointed to the importance of skills and education to labor market outcomes in South Africa. What is more, this body of evidence is relatively consistent across studies.

First, the estimation results report that rising education levels increase the probability of employment, of labor market participation and job search, as well as the probability of migration (from rural areas to urban job centers).²⁹ The impact of education has however been associated with a strong non-linearity - it emerges with consistent statistical and economic significance only once secondary school matriculation or

²⁵See Kingdon and Knight (2006a).

²⁶See for instance Wittenberg (1999, 2002) and Dinkelman and Pirouz (2002).

²⁷See Bhorat and Leibbrandt (2001) and Chichello et al (2005).

²⁸See Wittenberg (1999, 2002) and Leibbrandt et al (2001).

²⁹See for instance Kingdon and Knight (2007), Bhorat and Leibbrandt (2001), and Klasen and Woolard (2005).

better still, tertiary level training has been attained.³⁰

Second, labor demand has been argued to have shifted increasingly to greater skills intensity within each economic sector, and also toward sectors that have a greater skills intensity in terms of their employment structure.³¹

The evidence thus highlights the significance of labor market rigidities in terms of an inadequate education system that does not provide suitable skills and/or signalling capabilities for labor market participants. The result is a diminished probability of the labor market clearing, since given the wage rigidities in the labor market, the skills or signalling capacities of labor market participants are simply inadequate. Notable in these results is the implication that labor is mispriced in the South African labor market, with labor productivity proving simply inadequate at prevailing wage rates to render hiring rational. What is more, the presence of the non-linearity in the association between education and employment, which occurs at the high level of post-secondary school education, suggests that this constraint is significant.

5.3 Labor Demand Questions

Under the demand side of the labor market, we focus on two broad sets of studies. The first set has been concerned with how responsive employment has been to changes in the real wage. The second has generated evidence on the employment response to growth. Both shed further light on the source of labor market rigidities.

5.3.1 Wage Elasticity

The most obvious response to the high and persistent levels of unemployment in South Africa would be to suggest that the price of labor has to fall in order to clear the labor market.

That labor mispricing is possibly the single most significant candidate for labor market conditions in South Africa is supported by a range of evidence. In Figure 4 we report employment trends and real remuneration per employee in the Gold and Uranium Mining sector over the course of the last three decades of the twentieth century. What is striking about the evidence is that the significant increase in real labor cost since the beginning of the 1980s, has coincided with a significant process of labor shedding by the sector also. Periods of labor cost moderation, or declines in real labor costs over this period by contrast have seen growth in employment in the sector. Results for other mining sectors are symmetrical.³²

Similar conclusions follow for the manufacturing sector. Figure 5 reports employment and real unit labor cost for South African manufacturing. Once again, the striking feature of the evidence is that the upturn in real unit labor cost in the sector since the early 1990s, is associated with a process of steady and systematic labor shedding by the sector.

The point is further reinforced by the fact that employment growth in South African manufacturing has been significant only in sectors in which growth in real labor remuneration has been highly correlated with labor productivity growth. The lower the correlation between labor productivity growth and the growth in real labor remuneration, the lower has been the growth in employment.³³ Figure 6 illustrates the result.

Yet despite its first order theoretical significance, and despite its *prima facie* empirical plausibility as a source of labor market disequilibrium, wage moderation as a means of job creation, has not received much attention in the South African debate.

The resistance to the use of moderating labor costs as a means of employment creation has taken a number

³⁰See Wittenberg (1999, 2002), Dinkelman and Pirouz (2002) and Lam et al (2011).

³¹See for instance Borat and Hodge (1999), Banerjee et al (2008) and Rodrik (2008).

³²See the full discussion in Fedderke and Pirouz (2002). It should be noted that in a number of contributions to the literature the computation of real labor costs has been arrived at by means of deflating labor remuneration by the consumer price index. This is valid for considerations of labor supply, not for labor demand. For labor demand, computation of real labor cost has to arrived at by means of deflation by the sectoral GDP deflator, in the absence of more micro-level data. Time trends in real labor costs differ markedly depending on which deflator is employed.

³³See the more complete analysis in Fedderke and Mariotti (2002).

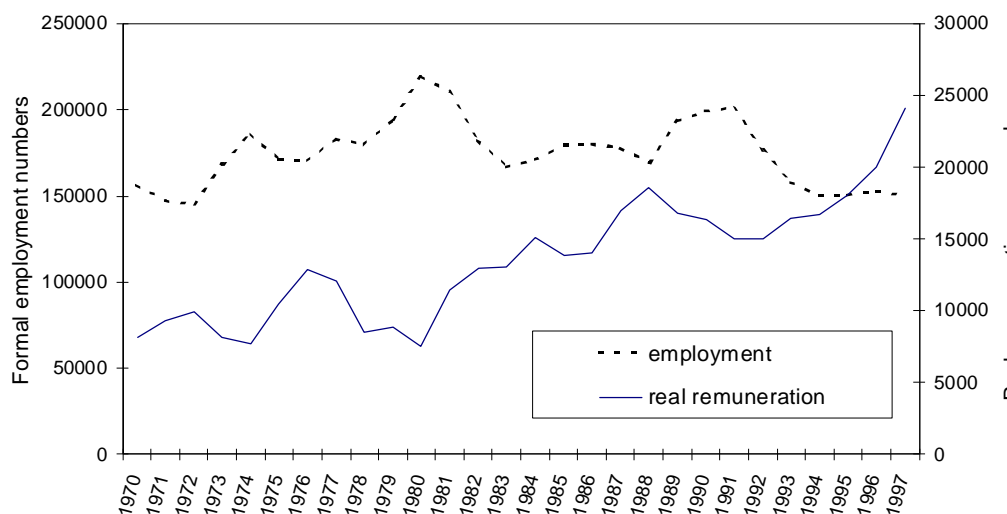


Figure 4: Gold and Uranium Mining: Employment and Real Remuneration per Employee. Source: Fedderke and Pirouz (2002).

of forms.³⁴ The most common has been to argue that estimates of the wage elasticity of employment³⁵ implies that labor demand is inelastic in labor cost: the most generally quoted elasticity being -0.7 .³⁶

Yet this argument ignores the fact that the quoted estimate is an average, with some sectors reported with considerably lower elasticities (mining at -0.15), but also sectors with considerably higher elasticities (services at -0.95 and manufacturing at -1.0). Tellingly, the high elasticities are reported for those sectors that section 2 has identified as being the biggest contributors to employment in the South African economy.

The argument also simply avoids the existence of a wider range of evidence beyond the original study quoted. Some studies have reported elasticities that match -0.7 fairly closely: for Gold and Uranium mining there is an estimated elasticity of -0.69 ;³⁷ an estimate of -0.6 for manufacturing;³⁸ and a range of -0.4 to -0.8 for a cluster of sectors including agriculture, electricity and gas, financial services and manufacturing.³⁹ There are some estimates that are lower: an aggregate elasticity estimate of -0.5 ;⁴⁰ for manufacturing at

³⁴Ignoring the fact that many studies simply do not consider it at all.

³⁵By way of caveat on this section, we note that, the studies that have provided evidence on wage elasticity, have not been explicitly constructed in order to estimate the wage elasticity of labor demand. Generally, the elasticities quoted above arise from estimations concerned with questions not immediately related to labor demand, but which generate an indication of the responsiveness of employment to changes in real labor cost. However, the consequence is that what is being reported in virtually all instances, are estimates of an employment, rather than a labor demand elasticity. In effect, it is the responsiveness of the labor market equilibrium to changes in the real cost of labor that is being reported, without fully identifying labor demand and labor supply shifts in the process.

³⁶The elasticity is the average reported by Fallon and Lucas (1998) for all sectors in South Africa. However, it should be noted that they report a range of elasticity values: -1.0 for manufacturing; -0.95 for services; -0.15 for mining. See also Heintz and Bowles (1996).

³⁷See Fedderke and Pirouz (2002).

³⁸See Rodrik (2008).

³⁹See Fedderke (2006).

⁴⁰See Fields et al (1999).

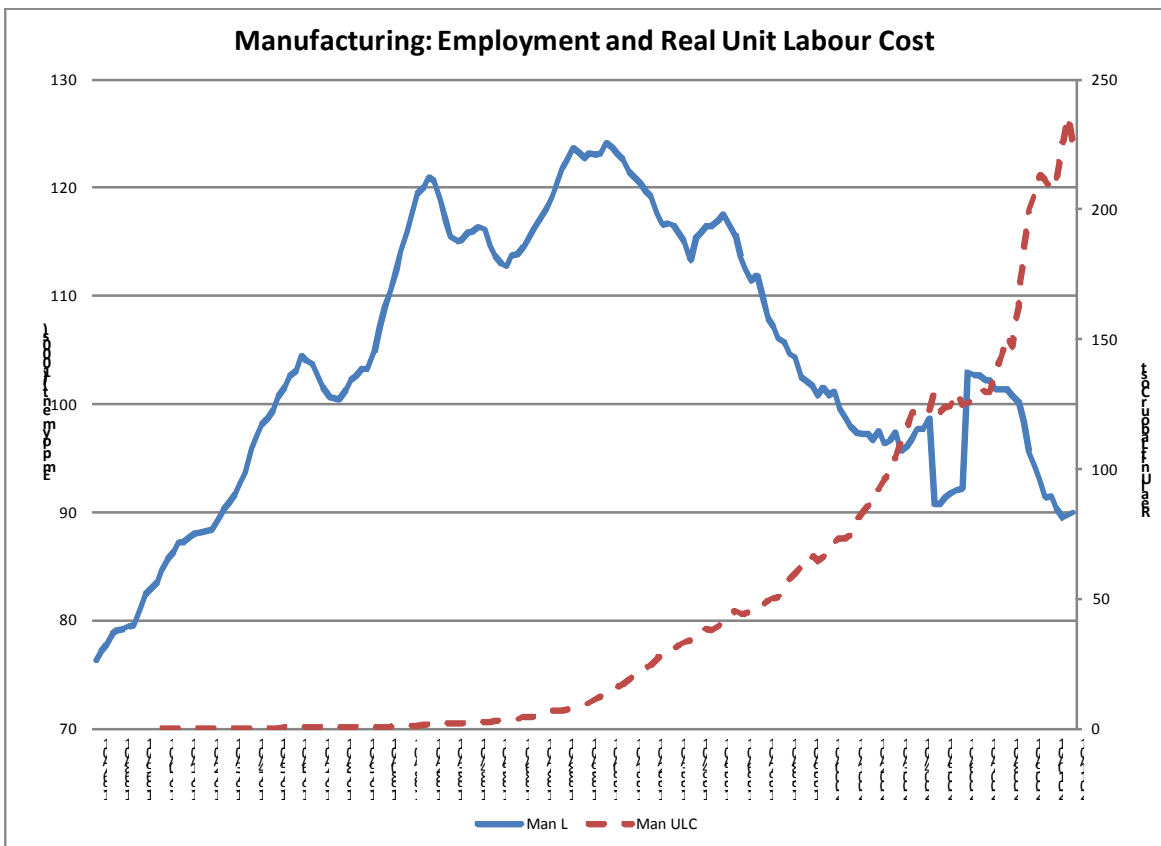


Figure 5:

**Growth in Real Per Labour Remuneration and Employment by
strength of correlation between labour productivity and real labour
Remuneration**

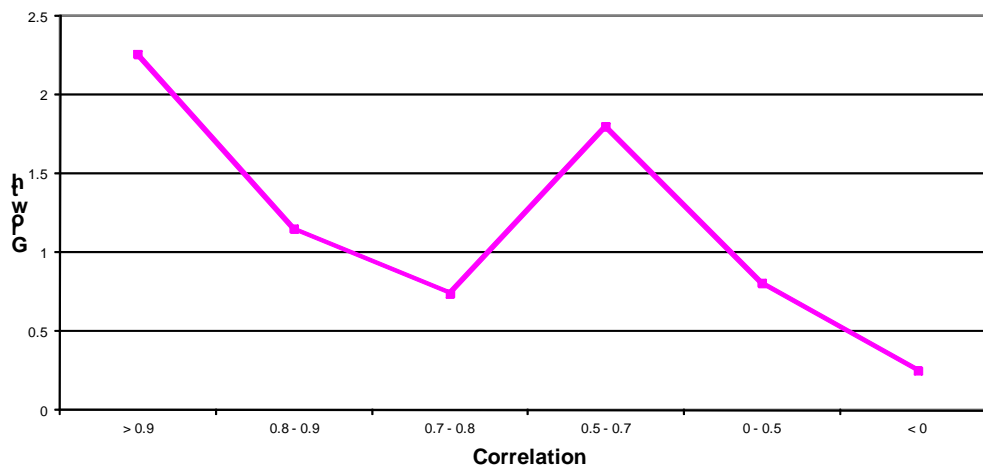


Figure 6: Source: Fedderke and Mariotti (2002).

-0.5 to -0.55;⁴¹ for coal mining at -0.44;⁴² and for transport and general government at -0.15.⁴³ However, there are also estimates that are considerably higher: above all for unskilled labor at -2.23; for mining at -2.20; wholesale and retail trade at -1.28; community services at -1.05; domestic household services at -1.03; construction at -0.97; and electricity gas and water at -0.77;⁴⁴ and for diamond mining at -1.45.⁴⁵

At the very least therefore, the potential responsiveness of employment to wage moderation may be higher than is implied by the conventionally quoted elasticity - particularly in sectors that are conventionally large employers (services, manufacturing), and in labor categories that are particularly critical in poverty terms (unskilled labor). At the very least, however, the frequent failure to properly and fully control for the impact of labor pricing in labor market studies, is impossible to justify, either analytically, or in terms of its policy relevance.

Taking these elasticity values at face value, the two broad sets of findings of low versus high wage elasticities, carry implications for the structure of production in South Africa. We noted in connection with equation (12), that low real wage demand elasticities for labor would imply a low capital and/or technology intensity of production in South Africa. Conversely, high demand elasticities of labor with respect to the real wage would imply a high capital and/or technology intensity of production in South Africa. Empirically, of the two, the evidence favours capital intensity. Table 4 reports an index of capital intensity in aggregate production for a sample of 66 developing middle income and transition countries, for the 1970-2000 period. As is clear from the data, capital intensity in South Africa is amongst the highest in the sample.⁴⁶

Empirical evidence also favours a relatively high technology intensity. This is supported by findings of a strong impact of technology on warranted wage rates for South African manufacturing,⁴⁷ and the

⁴¹ See Fedderke and Mariotti (2002).

⁴² See Fedderke and Pirouz (2002).

⁴³ See Fedderke (2006).

⁴⁴ For the preceding elasticities see Fedderke (2006).

⁴⁵ See Fedderke and Pirouz (2002).

⁴⁶ It is exceeded only by Singapore, Israel, South Korea, Argentina and the Gabon. Data source: Fedderke and Klitgaard (2011).

⁴⁷ See Fedderke et al (2012).

Country:	K/L:	Country:	K/L:	Country:	K/L:
Singapore	5.58	Paraguay	0.38	Sri Lanka	0.15
Israel	2.87	Colombia	0.38	China	0.13
Gabon	2.21	Fiji	0.35	Togo	0.11
Korea South	1.97	Ecuador	0.32	Senegal	0.10
Argentina	1.43	Dominican Rep	0.31	Mauritania	0.09
Hungary	1.03	Swaziland	0.30	Ghana	0.09
South Africa	1.02	Morocco	0.29	Kenya	0.08
Venezuela	0.89	Guyana	0.26	Malawi	0.08
Mexico	0.88	Philippines	0.24	Pakistan	0.07
Malaysia	0.86	El Salvador	0.24	Benin	0.07
Brazil	0.85	Guatemala	0.23	Burkina Faso	0.07
Trinidad	0.80	Egypt	0.22	India	0.07
Mauritius	0.79	Syria	0.20	Mali	0.06
Algeria	0.69	Lesotho	0.19	Gambia	0.05
Uruguay	0.69	Cameroon	0.17	Niger	0.05
Chile	0.59	Ivory Coast	0.17	Bangladesh	0.05
Thailand	0.53	Zambia	0.17	Nigeria	0.05
Tunisia	0.52	Indonesia	0.16	Rwanda	0.04
Botswana	0.51	Honduras	0.16	Haiti	0.04
Panama	0.46	Bolivia	0.16	Madagascar	0.03
Peru	0.45	Zimbabwe	0.15	Nepal	0.03
Jamaica	0.40	Nicaragua	0.15	Burundi	0.02

Table 4: Capital-Labor Ratio: selection of 66 countries: average for 1970-2000. Source: own calculations.

evidence that South African manufacturing was sufficiently close to the international technology frontier to not experience significant negative impacts from trade liberalization.⁴⁸ While internationally in absolute terms, South Africa lags in R&D expenditure, its ratio of R&D expenditure to GDP is at least comparable to countries such as Turkey, Chile, Argentina and Malaysia (though it lags its East Asian comparators) - see Table 5.

Further evidence of the importance of labor prices to South African labor market outcomes has emerged from studies exploring the impact of trade liberalization on the labor market, using panel data from the manufacturing sector.⁴⁹ For these empirical investigations, the relative price of capital to labor is found to have an elasticity of 1.97. Moreover, the full impact of demand-side factors on labor, including the impact of globalization and trade liberalization, is found to have mandated an increase in real wages of on average 0.5% per annum over the last three decades of the twentieth century. Since in fact real wages have increased by 1% per annum, the implication is of a significant degree of mispricing emerging in the labor market, consistent with the poor capacity of the market to generate employment. That technological change over the same period has proved to be significantly labor saving, further exacerbates the negative impact on employment prospects of the mispricing of labor inputs. The implication of these findings is thus that trade liberalization has not proved harmful for employment in South Africa. This finding is further confirmed by Aghion et al (2011), who find that trade liberalization has both a direct and in indirect positive stimulatory impact on productivity growth in South Africa, particularly in the presence of significant levels of pricing power (as applies in South Africa).

Finally, subject to the important caveat that the South African elasticities cannot strictly be isolated as demand elasticities, placing the South African wage elasticities into a wider international perspective, is also instructive. Amongst international estimates of wage elasticities, the South African estimates rank amongst

⁴⁸See the evidence and discussion in Aghion et al (2011).

⁴⁹See the evidence in Fedderke et al (2012).

	GERD	GERD/GDP		GERD	GERD/GDP
Country	PPP \$ millions	%	Country	PPP \$ millions	%
North America			East/SE Asia		
United States (2009)	401,576.5	2.88	Japan (2009)	137,908.6	3.33
Canada (2009)	24,551.3	1.92	China (2009)	154,147.4	1.70
Mexico (2007)	5,719.6	0.37	South Korea (2008)	43,906.4	3.36
South America			Taiwan (2009)	21,571.8	2.93
Brazil (2008)	21,649.4	1.08	Singapore (2009)	5,626.5	2.35
Argentina (2007)	2,678.8	0.51	Malaysia (2006)	2,090.9	0.64
Chile (2004)	1,227.7	0.68		1,120.8	0.21
Middle East			Oceania		
Israel (2009)	8,810.1	4.28	Australia (2008)	18,755.0	2.21
Turkey (2009)	8,681.2	0.85	New Zealand (2007)	1,422.5	1.17
Iran (2008)	6,465.2	0.79	Selected country groups		
Africa			EU (2009)	297,889.6	1.90
South Africa (2008)	4,689.3	0.93	OECD (2008)	965,629.1	2.33
Egypt (2009)	997.3	0.21	G-20 countries (2009)	1,181,263.7	2.01
Morocco (2006)	765.1	0.64			
Tunisia (2009)	1,048.5	1.21			
Central Asia					
Russia (2009)	33,368.1	1.24			
South Asia					
India (2007)	24,439.4	0.76			
Pakistan (2009)	2,055.2	0.46			

Table 5: International comparisons of gross domestic expenditures on R and D and R and D share of gross domestic product, by region and selected country/economy: 2009 or most recent year. SOURCES: OECD - Main Science and Technology Indicators (2011/1); United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics,

the highest reported. Thus estimated elasticities in response to minimum wage elasticities in the USA are considerably lower, ranging from 0 to -0.2.⁵⁰ While for British manufacturing short run estimates range between -0.45 and -0.53, the full range of elasticity estimates covers -0.15 to -0.75 (and as high as -0.93) for manufacturing, and -1.0 to -1.4 for Coal mining in the UK.⁵¹ It is noteworthy that many of the South African elasticity estimates are either considerably higher than the US estimates, or at the upper end of the distribution of elasticity estimates for the UK - suggesting that South African labor markets are at least as responsive to price as important international comparators.

The implication is immediate: the real cost of labor has plausibly been significantly associated with the inability of the sectors of the economy that have been traditionally associated with formal sector employment to grow absolute levels of employment positively, let alone to keep pace with the growth in the South African population. In short: the price of labor is simply too high at prevailing productivity levels for full employment to be feasible in South Africa.

5.3.2 Output Elasticity

A further consideration arising from labor demand, is the responsiveness of employment trends to output growth.

Again, the literature has generated a range of estimates of output elasticities of employment, ranging from negative (or at best 0) to >1 .⁵²

In a study concerned explicitly with the short-run, and the employment response to the output gap over the 1971-2005 period in particular, the finding has been of an elasticity with respect to output for the aggregate economy of 0.16-0.77.⁵³

Long-run employment responses to output have been estimated for total employment at 0.5 for the 1946-2007 period (with the possibility of a negative elasticity in the early 1990s),⁵⁴ with both lower estimates (of 0.29 for the 1980-89 period) and higher estimates (of 0.89 for the 1990-98 period - though the authors acknowledge the possibility of an estimate of 0) reported for the non-agricultural private sector.⁵⁵ For the manufacturing sector, estimated labor usage equations have yielded higher output elasticities (0.86-1.2),⁵⁶ while for Mining, Transport storage and communication and Electricity gas & water estimates of output elasticities of employment lie above 1, for Wholesale and retail trade, Construction, Financial, insurance and real estate, and Community services the elasticity range is from 0.35 - 0.56, and Household domestic services returns an output elasticity of 0.87.⁵⁷

Again this evidence can be contextualized by reference to the theoretical framework presented in section 3. Studies reporting a low employment response to output, by implication are suggesting that the elasticity of labor supply with respect to the wage (ε_{NW}^S) is also low - in effect that reservation wages do play a significant role in South Africa. Moreover, since the elasticity of labor supply with respect to the wage (ε_{NW}^S) is implied to be low, the implication is also that the elasticity of the real wage with respect to output must be high. Thus for an $\eta_{NY} = 0.1$, the implied value of $\varepsilon_{NW}^S = 0.1$ for all plausible values of α , and hence the implied value of $\eta_{NW} \approx 1$, suggesting that each percent increase in output is associated with a

⁵⁰See Deere et al (1995) for estimates ranging between -0.1 and -0.2, and Card and Krueger (1994) and (1995) for the conclusion that minimum wage legislation had no effect on New Jersey fast food employment. Note however the challenge to the Card and Krueger findings by Neumark and Washer (2000) (who do find an impact on employment due to the minimum wage) and the rejoinder by Card and Krueger (2000).

⁵¹See Hamermesh (199: 94-105).

⁵²As in the instance of the wage elasticity, again the studies that have generated employment sensitivities to changes in output, are not principally designed to generate an explicit and properly identified output elasticity of labor demand. Instead, they generate estimates of the employment responsiveness to output as a by-product. As such, again the elasticities are employment elasticities that capture the net demand and supply response in the labor market, rather than a demand elasticity properly specified, and need to be treated with caution as a result.

⁵³See Marinkov and Geldenhuis (2007).

⁵⁴See Hodge (2009).

⁵⁵See Fields et al (1989). In this instance, the authors explicitly attempt to estimate a labor demand equation.

⁵⁶See Fedderke and Mariotti (2002) for estimates in the range from 0.86-1.0, and Fedderke (2006) for the 1.18 estimate (the studies used distinct data sources, hence the divergence in elasticity).

⁵⁷See Fedderke (2006).

percent increase in the real wage. Hence, the most immediate policy response for employment creation has to be real wage moderation as a means of rendering labor more competitive in production.

By contrast, where the employment response to output is strong, the implication is that the elasticity of labor supply with respect to the wage (ε_{NW}^S) is also high, such that reservation wages do not play a significant role in South Africa. Moreover, since the elasticity of labor supply with respect to the wage (ε_{NW}^S) is implied to be high, the implication is also that the elasticity of the real wage with respect to output must be relatively low. Thus for an $\eta_{NY} = 1.0$, the implied value of ε_{NW}^S covers the range 1.4-2.0 for all plausible values of α , and hence the implied value of η_{NW} covers the range 0.5-0.7, suggesting that each percent increase in output is associated with considerably less than a percentage increase in the real wage. Hence, the most immediate policy response is to focus on output growth, in order to raise the growth of output, hence generating employment growth given relatively moderate growth in real wages.

6 Conclusions and Evaluation

The evidence reviewed in this paper suggests that the South African labor market is subject to multiple rigidities.

Real labor costs do not adjust appropriately to adverse unemployment conditions and strong job-losses in the economy. Small shocks to the economy trigger very strong changes in the level of employment.

The source of the underlying rigidities has been traced to conditions in the labor market, as well as to the output markets of South Africa.

Labor supply in South Africa faces market segmentation, insider-outsider problems, the possible existence of high reservation wages, and possible skills mismatch problems. Labor demand, despite possibly responding strongly to lower labor costs, has not faced conditions of declining real unit labor costs. And while possibly responding strongly to output growth, economic growth in South Africa has also not been high and sustained enough for substantial job creation to have significantly improved labor market conditions. Pricing power in output markets has further contributed to labor market rigidities.

Use of the theoretical framework provided by section 3, provides useful structure to the interpretation of the accumulated evidence on the South African labor market. It makes clear that the various elasticities that are often considered singly, and in isolation from one another, in fact are interdependent. Any inference drawn on any one of the elasticities therefore carries implications for the remainder of the parameters crucial for an understanding of the functioning of the South African labor market.

In broad terms, consideration of the accumulated South African evidence suggests that studies fall into two broad clusters:

- Class 1: Those that find high labor supply elasticities to changes in the real wage (ε_{NW}^S), high employment elasticities to economic growth (η_{NY}), and low wage elasticities to economic growth (η_{WY}).
- Class 2: Those that find low labor supply elasticities to changes in the real wage (ε_{NW}^S), low employment elasticities to economic growth (η_{NY}), and high wage elasticities to economic growth (η_{WY}).

Of the two sets of finding, the fact that employment responded positively to the period of growth recovery during the 2000s, as well as strongly to the economic downturn post 2008, suggests that the Class 1 studies conform to the most recent labor market experience most closely.

But independently of which is more likely to be empirically correct, note that the two sets of studies carry quite distinct policy implications. Class 1 studies suggest that since employment responds strongly to economic growth, growth does not generate strong wage pressure, while labor supply responds strongly to whatever wage increases do emerge, the most obvious policy intervention in addressing unemployment in South Africa should be a focus on growth policy.

By contrast, Class 2 studies, by suggesting that employment does not respond significantly to economic growth, while economic growth generates upward pressure on real wage costs without much of a labor supply response, have as a policy recourse only the possibility of moderating or lowering the real wage.

Independently of which set of findings is correct, this makes it easier to understand why unemployment has been so resistant to change in South Africa. Policy has focussed neither on economic growth, nor on real wage cost reduction in South Africa.⁵⁸ Either of the two classes of labor market studies would therefore have to predict that employment creation would be moderate at best, and most likely insignificant.

Finally, despite the fact that a considerable amount of work has accumulated on the South African labor market, in the face of the two empirical observations with which this study began, of dramatic job losses in the face of mild shocks and of continuing increases in real unit labor costs even in the face of labor market disequilibrium, what is surprising is that there is virtually no attention paid to the question of why these outcomes emerge. This study has provided one interpretation by placing existing knowledge into a unifying theoretical framework. But there is clearly much scope for a sustained research effort to address the pressing empirical requirement to isolate the sources of the rigidities that prevent prices from clearing the market.

⁵⁸Instead, concern has centered on labor market regulation, short run stabilization policy, and expansion of the welfare system to address poverty and income inequality. Laudable all, but ineffectual as a means of addressing labor market rigidity.

7 Appendix 1: Derivations

We provide the derivations of (5), (6) and (7).

Directly from equation (4) we have:

$$\begin{aligned}\frac{\partial N}{\partial K} &= \frac{\partial N^S}{\partial F_N} \left[\frac{\partial F_N}{\partial K} + \frac{\partial F_N}{\partial N} \frac{\partial N}{\partial K} \right] \\ &= \left(\frac{\partial N^S}{\partial F_N} \frac{\partial F_N}{\partial K} \right) + \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N} \right) \left(\frac{\partial F_N}{\partial N} \frac{N}{F_N} \right) \frac{\partial N}{\partial K}\end{aligned}$$

where $\frac{\partial N^S}{\partial F_N} \frac{\partial F_N}{\partial K}$ is the productivity effect of the change in capital stock, and $\frac{\partial F_N}{\partial N} \frac{\partial N}{\partial K}$ is the substitution effect of changing wages. Then:

$$\begin{aligned}\frac{\partial N}{\partial K} \left[1 - \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N} \right) \left(\frac{\partial F_N}{\partial N} \frac{N}{F_N} \right) \right] &= \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right) \left(\frac{N}{K} \right) \\ \therefore \frac{\partial N}{\partial K} \frac{K}{N} &= \frac{\left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right)}{\left[1 - \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N} \right) \left(\frac{\partial F_N}{\partial N} \frac{N}{F_N} \right) \right]}\end{aligned}$$

Given $F_N = W$, equation (5) follows.

Again, from equation (4) we have:

$$\begin{aligned}\frac{\partial N}{\partial Y} &= \frac{\partial N^S}{\partial F_N} \frac{\partial F_N}{\partial K} \frac{\partial K}{\partial Y} \frac{Y}{K} \frac{K}{Y} + \frac{\partial N^S}{\partial F_N} \frac{\partial F_N}{\partial N} \frac{\partial N}{\partial Y} \frac{Y}{N} \frac{N}{Y} \\ \therefore \frac{\partial N}{\partial Y} \frac{Y}{N} &= \frac{\partial N^S}{\partial F_N} \frac{\partial F_N}{\partial K} \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right) \frac{K}{N} + \frac{\partial N^S}{\partial F_N} \frac{\partial F_N}{\partial N} \left(\frac{\partial N}{\partial Y} \frac{Y}{N} \right) \\ \therefore \left(\frac{\partial N}{\partial Y} \frac{Y}{N} \right) \left[1 - \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{N^S}{F_N} \frac{\partial F_N}{\partial N} \right) \right] &= \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \frac{N^S}{F_N} \frac{\partial F_N}{\partial K} \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right) \frac{K}{N} \\ \therefore \left(\frac{\partial N}{\partial Y} \frac{Y}{N} \right) &= \frac{\left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right) \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right)}{\left[1 - \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{N^S}{F_N} \frac{\partial F_N}{\partial N} \right) \right]}\end{aligned}$$

Again, given $F_N = W$, equation (6) follows.

Finally, from equation (2):

$$\begin{aligned}\frac{\partial W}{\partial Y} &= \left(\frac{\partial F_N}{\partial K} \frac{\partial K}{\partial Y} \right) \frac{Y}{K} \frac{K}{Y} + \left(\frac{\partial F_N}{\partial N} \frac{\partial N}{\partial Y} \right) \frac{N}{F_N} \frac{F_N}{N} \frac{Y}{Y} \\ \therefore \left(\frac{\partial W}{\partial Y} \frac{Y}{F_N} \right) &= \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right) \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right) + \left(\frac{\partial F_N}{\partial N} \frac{N}{F_N} \right) \left(\frac{\partial N}{\partial Y} \frac{Y}{N} \right) \\ &= \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right) \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right) + \left(\frac{\partial F_N}{\partial N} \frac{N}{F_N} \right) \left[\frac{\left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right) \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right)}{1 - \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{N^S}{F_N} \frac{\partial F_N}{\partial N} \right)} \right] \\ \therefore \left(\frac{\partial W}{\partial Y} \frac{Y}{F_N} \right) \left[1 - \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{N^S}{F_N} \frac{\partial F_N}{\partial N} \right) \right] &= \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right) \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right) \left[1 - \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{N^S}{F_N} \frac{\partial F_N}{\partial N} \right) \right] \\ &\quad + \left(\frac{\partial F_N}{\partial N} \frac{N}{F_N} \right) \left(\frac{\partial N^S}{\partial F_N} \frac{F_N}{N^S} \right) \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right) \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right) \\ &= \left(\frac{\partial F_N}{\partial K} \frac{K}{F_N} \right) \left(\frac{\partial K}{\partial Y} \frac{Y}{K} \right)\end{aligned}$$

Given $F_N = W$, equation (7) follows.

References

- [1] Aghion, P., Braun, M., and Fedderke, J.W., 2008, Competition and Productivity Growth in South Africa, *Economics of Transition*, 16(4), 741-68.
- [2] Aghion, P., Fedderke, J.W., Howitt, P., and Viegli, N., 2011, Testing Creative Destruction in an Opening Economy: the Case of the South African Manufacturing Industries, *Economic Research Southern Africa Working Paper No. 93*.
- [3] Ardington, C., Case, A. and Hosegood, V., 2009, Labor Supply Responses to Large Social Transfers: Longitudinal Evidence from South Africa, *American Economic Journal: Applied Economics*, 1(1), 22-48.
- [4] Banerjee, A., Galiani, S., Levinsohn, J., McLaren, Z., and I. Woolard, 2008, Why has unemployment risen in the New South Africa?, *Economics of Transition*, 16(4), 715-40.
- [5] Bertrand, M., Mullainathan, D., and Miller, D., 2003, Public policy and extended families: evidence from pensions in South Africa, *World Bank Economic Review*, 17(1), 27-50.
- [6] Bhorat, H., and Hodge, J., 1999, Decomposing shifts in labour demand in South Africa, *South African Journal of Economics*, 67(3): 348-80.
- [7] Bhorat, H. and Leibbrandt, M., 2001, Modelling vulnerability and low earnings in the South African labour market, in: H.Bhorat, M.Leibbrandt, M.Maziya, S.Van Der Berg, and I.Woolard (eds.), *Fighting Poverty – labour markets and inequality in South Africa*, Cape Town: UCT Press.
- [8] Card, D., and Krueger, A.B., 1994, Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania, *American Economic Review*, 84(4), 772-93.
- [9] Card, D., and Krueger, A.B., 1995, *Myth and measurement: The new economics of the minimum wage*, Princeton: University Press.
- [10] Card, D., and Krueger, A.B., 2000, Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Reply, *American Economic Review*, 90(5), 1397-1420.
- [11] Casale, D., and Posel, D., 2002, The feminisation of the labour force in South Africa: An analysis of recent data and trends, *South African Journal of Economics*, 70(1), 156-184.
- [12] Choi, C.K., 2007, The Employment Effect of Economic Growth: Identifying Determinants of Employment Elasticity, Mimeo: Washington University.
- [13] Cichello, P.L., Fields, G.S. and Leibbrandt, M., 2005, Earnings and employment dynamics for Africans in post-apartheid South Africa: A panel study of KwaZulu-Natal, *Journal of African Economics*, 14(2), 143-90.
- [14] Conway, P., Janod, V., Nicoletti, G., 2005, Product Market Regulation in OECD Countries: 1998 to 2003, OECD Economics Department Working Papers No. 419.
- [15] Deere, D., Murphy, K.M., and Wech, F., 1995, Employment and the 1990-1991 Minimum-Wage Hike, *American Economic Review*, 85(2), 232-237.
- [16] Dinkelman, T., 2004, How Household Context Affects Search Outcomes Of The Unemployed In Kwazulu-Natal, South Africa, *South African Journal of Economics*, 72(3), 484-521.
- [17] Dinkelman, T., Pirouz, F., 2002, Individual, Household And Regional Determinants Of Labour Force Attachment In South Africa, *South African Journal of Economics*, 70(5), 865-891.

- [18] Fallon, P., and Lucas, R., 1998, South Africa: labour markets adjustments and inequalities. Discussion Paper 15, Informal discussion papers on aspects of the economy of South Africa. Washington, D.C.: World Bank.
- [19] Fedderke, J.W., 2006, From Chimera to Prospect: Toward an Understanding of the South African Growth Absence, in H.Bhorat, and R.Kanbur (eds), *Poverty and Policy in Post-Apartheid South Africa*, HSRC Press.
- [20] Fedderke, J.W., 2010, Sustainable growth in South Africa, in L. de Mello (ed.), *Growth and Sustainability in Brazil, China, India, Indonesia and South Africa*, Paris: Organization of Economic Cooperation and Development (OECD), pp147-88.
- [21] Fedderke, J.W., and Hill, A.J., 2011, Industry Structure and Labour Market Flexibility in the South African Manufacturing Sector: A Time Series and Panel Data Approach. *Economic Modelling*, 28, 1291-302.
- [22] Fedderke, J.W., and Klitgaard, R.E., 2011, Heterogeneity Happens: How Rights Matter in Economic Development, Economic Research Southern Africa Working Paper No. 220.
- [23] Fedderke J.W., Kularatne, C., and Mariotti, M., 2007, Mark-up Pricing in South African Industry, *Journal of African Economies*, 16(1), 28-69.
- [24] Fedderke, J.W., and Naumann, D., 2011, An Analysis of Industry Concentration in South African Manufacturing, 1972-2001, *Applied Economics*, 43(22), 2919-39.
- [25] Fedderke, J.W., and Pirouz, F., 2002 The Role of Mining in the South African Economy, *South African Journal of Economic and Management Sciences*, 5(1),1-34.
- [26] Fedderke, J.W., Shin, Y., and Vaze, P., 2012, Trade and Labor Usage: An Examination of the South African Manufacturing Industry, *Oxford Bulletin of Economics and Statistics*, forthcoming.
- [27] Fedderke J.W. and Szalontai, G., 2009, Industry Concentration in South African Manufacturing: Trends & Consequences, 1970-1996. *Economic Modelling*, 26(1), 241-50.
- [28] Fields, G., Leibbrandt, M., and Wakeford, J., 1999, Key Labour Market Elasticities in South Africa, Unpublished research report for the South African Department of Finance.
- [29] Hamermesh, D.S., 1993, *Labor Demand*, Princeton: University Press.
- [30] Heintz, J., and Bowles, S., 1996, Subsidising employment. Wage subsidies and job creation, in J.Baskin (ed.), *Against the current. Labor and economic policy in South Africa*, Randburg, South Africa: Naledi.
- [31] Heintz, J. and Posel, D., 2008, Revisiting informal unemployment and segmentation in the South African labour market, *South African Journal of Economics*, 76(1), 26-44.
- [32] Hodge, D., 2009, Growth, employment and unemployment in South Africa, *South African Journal of Economics*, 77(4):488-504.
- [33] Hofmeyr, J.F., 2000, The changing pattern of labour market segmentation in South Africa, *Journal for Studies in Economics and Econometrics*, 24(3), 109-28.
- [34] Kingdon, G.G., and Knight, J.B., 2001, What have we learnt about unemployment from microdatasets in South Africa? *Social Dynamics*, 27(1): 79-95.
- [35] Kingdon, G.G., and Knight, J.B., 2004a, Unemployment in South Africa: the nature of the beast, *World Development*, 32(3), 391-408.

- [36] Kingdon, G.G., and Knight, J.B., 2004b, Race and the incidence of unemployment in South Africa. *Review of Development Economics*, 8(2), 198-222.
- [37] Kingdon, G.G., and Knight, J.B., 2006a, The measurement of unemployment when unemployment is high, *Labour Economics*, 13: 291-315.
- [38] Kingdon, G.G., and Knight, J.B., 2006b, How flexible are wages in response to local unemployment in South Africa? *Industrial and Labour Relations Review*, 59(3), 471-95.
- [39] Kingdon, G.G., and Knight, J.B., 2007, Unemployment in South Africa, 1995–2003: causes, problems and policies, *Journal of African Economies*, 16(5): 813-48.
- [40] Klasen, S. and Woolard, I., 2005, Determinants of income mobility and household poverty dynamics in South Africa, *Journal of Development Studies*, 41(5), 865-97.
- [41] Klasen, S. and Woolard, I., 2008, Surviving unemployment without state support: unemployment and household formation in South Africa, *Journal of African Economies*, 18(1): 1-51.
- [42] Lam, D., Ardington, C., and Leibbrandt, M., 2011, Schooling as a Lottery: Racial Differences in School Advancement in Urban South Africa, *Journal of Development Economics*, 95(2), 121-36.
- [43] Leibbrandt, M., Bhorat, H., and Woolard, I., 2001, Household inequality and the labor market in South Africa, *Contemporary Economic Policy*, 19(1), 73-86.
- [44] Marinkov, A. and Geldenhuys, J.P., 2007, Cyclical unemployment and cyclical output: an estimation of Okun’s coefficient for South Africa, *South African Journal of Economics*, 75(3), 373-90.
- [45] Moll, P.G., 1993, Black South African unions: relative wage effects in international perspective, *Industrial and Labor Relations Review*, 46(2), 245-61.
- [46] Natrass, N. and Walker, R., 2005, Unemployment and reservation wages in working-class Cape Town, *South African Journal of Economics*, 73(3): 498-509.
- [47] Neumark, D., and Wascher, W., 2000, Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Comment, *American Economic Review*, 90(5), 1362–96.
- [48] Posel, D. and Casale, D., 2003, What has been happening to internal labour migration in South Africa, 1993-1999? *South African Journal of Economics*, 71(3), 455-79.
- [49] Posel, D., Fairburn, J.A., and Lund, F., 2006, Labour migration and households: a reconsideration of the effects of the social pension on labour supply in South Africa, *Economic Modelling*, 23(5), 836–53.
- [50] Rodrik, D., 2008, Understanding South Africa’s Economic Puzzles, *Economics of Transition*, 16(4), 769-97.
- [51] Wittenberg, M. 1999, Job search and household structure in an era of mass unemployment: a semi-parametric] analysis of the South African labour market, Economic Research Southern Africa (ERSA) Working Paper 3, University of the Witwatersrand, Johannesburg.
- [52] Wittenberg, M., 2002, Job search in South Africa: a nonparametric analysis, *South African Journal of Economics*, 70(8): 1163-97.