

# Wages, productivity, and labour's declining income share in post-Apartheid South Africa

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**Abstract:** The Marikana incident in 2012, as well as the protracted strikes by platinum miners, metal and postal workers in 2014 suggest that not all is well in the South African labour market. Even though those in employment are better off than the unemployed poor, macroeconomic data indicates that labour's share in Gross Value Added has declined significantly during the first two decades following the first democratic election in 1994. A falling share of labour in income also means, by definition, that average labour productivity growth outstrips real wages growth. Data for South Africa suggests that productivity has indeed increased faster than wages in South Africa. This article argues that financialisation and more aggressive returns-oriented investment strategies applied by for instance large investment institutions translated into higher required rates of return on capital, which in turn caused an increased implementation of capital-augmenting labour-saving technology that reduces labour's share in income.

**Key words:** Labour's share, wages, productivity, post-Apartheid South Africa

**JEL codes:** E24, J31

The Marikana incident in 2012, the five-month-long strike in the platinum industry, the month-long strike by metal workers and the even longer postal worker strike in 2014 suggest that not all is well in the South African labour market. In the period 2009-14 the number of workdays lost due to strikes reached record highs for post-Apartheid South Africa, and labour market unrest reached levels last seen in the turbulent '80s. Articles in the financial press suggest that labour relations are precarious, with mistrust between business and labour leaders widespread. Business leaders complain about expensive labour and business-unfriendly labour legislation, while labour leaders complain about persisting inequality.

Even though those in employment are better off than the unemployed poor (Leibbrandt, Woolard, Finn and Argent 2010, Seekings 2014, World Bank 2014 StatsSA 2014a), macroeconomic data indicates that labour's share in Gross Value Added (GVA) has declined significantly during the first two decades following the first democratic election in 1994 (StatsSA 2014b). (GVA comprises two components: labour remuneration and the Gross Operating Surplus, which is capital's share in GVA.<sup>2</sup>) With the ownership of capital and thus income from capital being more concentrated than salary and wage income, one might therefore expect that the falling share of labour and a rising share of capital in GVA contributes to a deterioration of income inequality. The question is "Why did labour's share decrease?"

International studies (ILO 2013; OECD 2012; Karabarbounis and Neiman 2012; 2013) indicate that the decline in labour's share in GVA is not unique to South Africa. Indeed, it has been a general trend in most OECD and many emerging market economies for the past three decades. In 26 of the 30 OECD countries labour's share fell (OECD 2012:113). The OECD (2012:110; 113) reports that while the median labour share in OECD countries was 66.1% in the early 1990s, it dropped to 61.7% in the late 2000s. The ILO (2013) also presents data to show that the fall in labour's share of income is not limited to OECD countries. If anything, it has been more pronounced in emerging market economies (ILO 2013:44). Even China has seen a significant fall in its labour share (ILO 2013:45).

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<sup>2</sup> Gross Value Added (GVA) plus net taxes on production and product equals Gross Domestic Product (GDP). Thus, GVA is equivalent to GDP excluding net taxes on production and products. While GDP calculates national income from the expenditure side of the economy, GVA calculates national income from the production side of the economy.

Various contributors (ILO 2013; OECD 2012; Karabarbounis and Neiman 2012; 2013, Autor and Dorn 2008) draw on Growth Theory to suggest that the increasing share of capital and the concomitant decreasing share of labour in GVA originate in technological change. The last three decades saw large and significant changes particularly in information technology. In terms of Growth Theory, these technological changes increased the marginal productivity of capital relative to that of labour, hence contributing to a decreasing share of labour in GVA and stagnant or slow-growing wages.<sup>3</sup> The OECD (2012:110) concludes that in OECD countries about 80% of the drop in labour's share can be ascribed to technological change that cause companies to substitute capital for labour. Another 10% originates from increased global competition that sees companies moving parts of their value chains offshore to benefit from low-cost labour in predominantly emerging market countries (OECD, 2012:110). The OECD (2012, 111) argues that offshoring has undermined the bargaining position of particularly lower skilled workers. This, together with a higher level of decentralisation in labour market bargaining structures in many countries contributed to a lower labour share. Indeed, because in OECD countries the income of the average capital owners exceed the income of the average wage earner, there is a strong correlation in OECD countries between the degree to which inequality deteriorated and the degree to which labour's share fell (OECD 2012:114).

However, the ILO (2013:49) argues that technology and globalisation are not the only factors in the reduction of labour's share. More specifically, the ILO highlights the role of financialisation and the increasing role of aggressive returns-oriented investment institutions that emphasise higher returns. Financialisation, globalisation, and automation, together with weaker labour market institutions (such as declining union density and deteriorating collective bargaining mechanisms) have undermined labour's bargaining power and contributed to a fall in labour's share in income internationally. In its empirical analysis the ILO (2013:51-3) considered the impact of financialisation, globalisation, technology and labour market conditions. In developed countries all four contributed to the deterioration in the share of labour, with financialisation contributing 46%, while globalisation (19%), technology (10%) and labour market conditions (25%) contributed to a much smaller extent. In developing countries technology improved labour's share (the ILO ascribes this to technological catch-up), but this was more than offset by the negative effects of financialisation, globalisation and weaker labour market institutions. Again financialisation contributed the largest part.

The discussion below will argue that financialisation and more aggressive returns-oriented investment strategies applied by for instance large investment institutions translated into higher required rates of return on capital, which in turn translated into the decreasing capital/output ratio observed during much of the period since 1994. The higher required rates of return hence caused an increased implementation of capital-augmenting labour-saving technology that reduces labour's share in income. A falling share of labour in income also means, by definition, that real wages increase at a slower rate than average labour productivity. Contrary to views frequently expressed in the popular media, this has indeed been the case in South Africa too and therefore calls for closer inspection of the South African case. Given the above, the discussion below focuses first on the developments in labour and capital's relative shares in GVA in South Africa. In addition to discussing these shares for the economy in the aggregate, the discussion also focuses on the various sectors of the economy to establish which sectors contributed to labour's declining share. Subsequently, given that a falling wage share means that real wages rise slower than productivity,

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<sup>3</sup> Among salary and wage earners technology also increased the marginal productivity of those workers whose types of jobs are complementary to the new technology, while reducing the marginal productivity of those jobs that are substituted by the new technology, hence explaining the increasing income gap among salary and wage earners. However, the fall in labour's wage share in OECD countries is carried fully by lower income earners. The wage income share of the top 1% of wage earners in OECD countries saw a 20% improvement, compared to the bottom income earners who saw a significant deterioration of their positions (OECD 2012:110).

the discussion focuses on the relationship between labour's share, real wages and productivity before considering policy implications.

## 1. The falling share of labour in Gross Value Added

This section first presents a descriptive analysis that shows how labour's share in income has fallen over the two decades since 1994. This is followed by a more formal econometric analysis to establish the relationship between GVA, the Gross Operating Surplus and Labour Compensation.

### 1.1 Labour and capital's shares in Gross Value Added

Figure 1 demonstrates that the share of labour remuneration in GVA was 56% in 1993, while that of capital (Gross Operating Surplus) was 44% (the solid black lines in Figures 1a and 1b). Labour's share subsequently declined to 48% in 2008, before improving to 52%. Figure 2 further demonstrates this pattern, showing the real percentage change in GVA, as well as the real percentage change in the Rand amounts out of GVA allocated to labour and capital. It shows that prior to 2008 and with the exception of the recessionary period in 1998 and the near-recession in 2003, the real percentage increase in the Rand amount out of GVA allocated to capital exceeded that of labour. This has turned around since 2008, i.e. after the onset of the international financial crisis. Nevertheless, over the full period the Rand amount allocated to capital increased at a higher rate than the amount allocated to labour.

Figure 1 – Share of Gross Operating Surplus in GVA

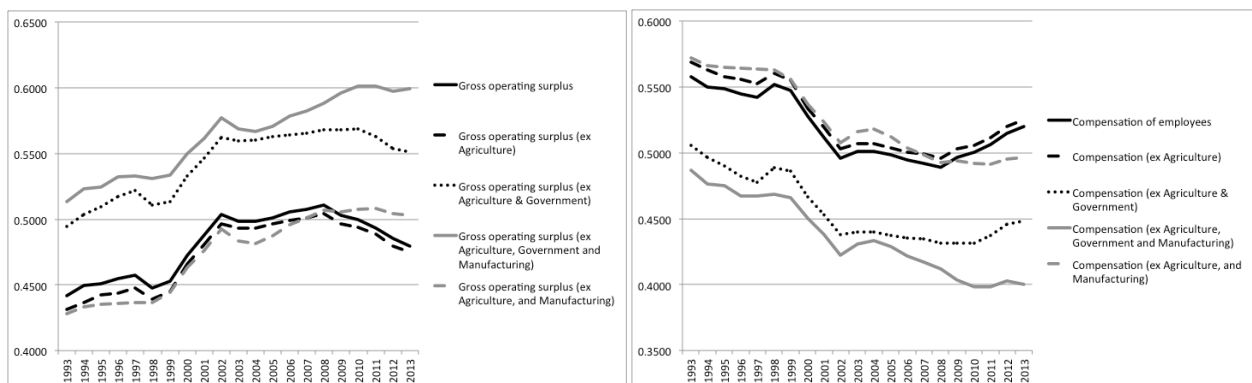
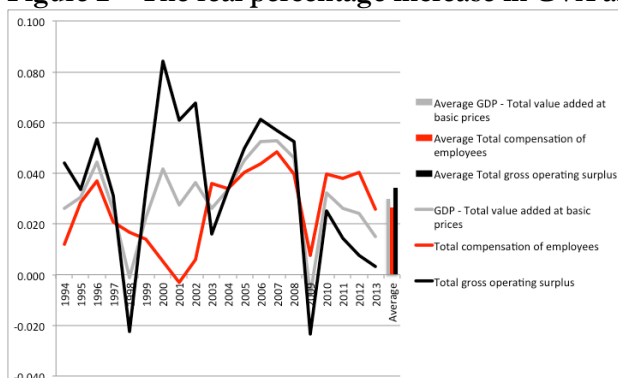


Figure 2 – The real percentage increase in GVA and the amounts allocated to labour and capital

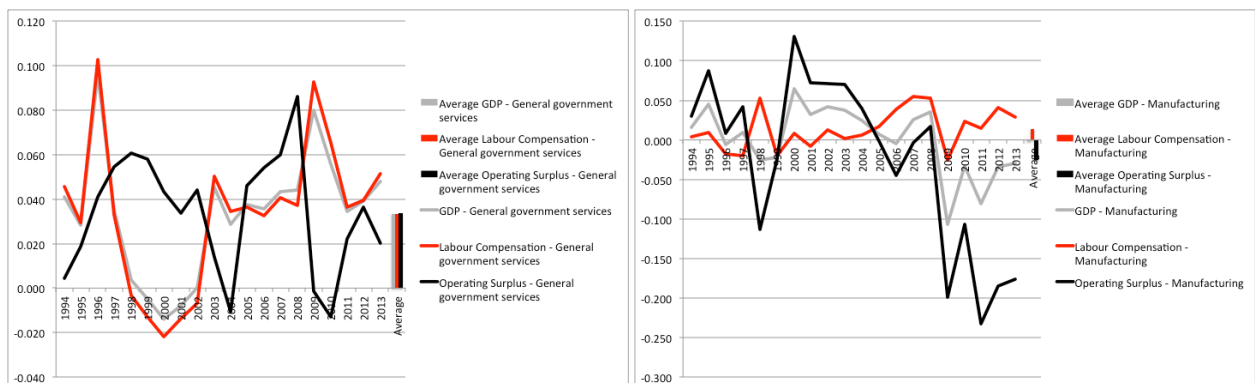


Because of the rather volatile seasonal nature of the agricultural sector and because the wage and productivity data used below exclude it, the agricultural sector was subsequently excluded from the GVA, labour and capital shares data. Excluding the agricultural sector yields the broken black lines in Figures 1. In addition, because the profit motive of firms and government differ, and to ascertain whether or not

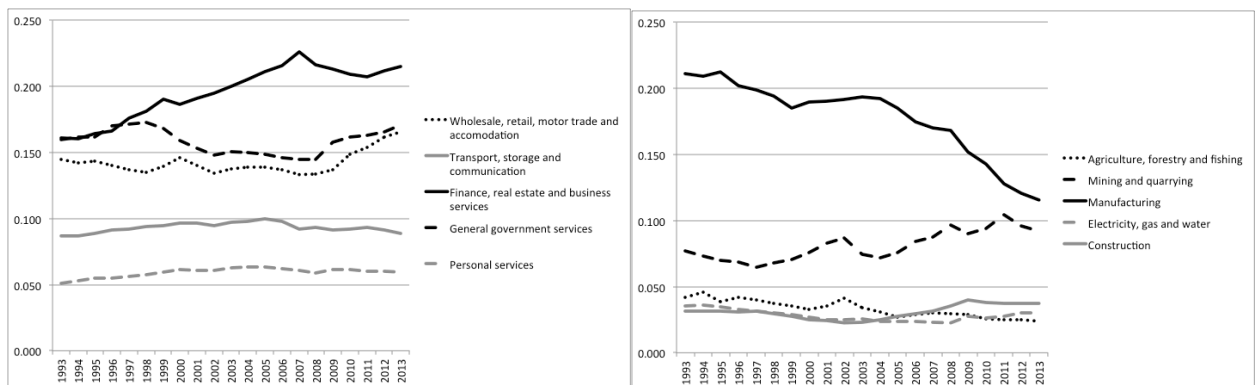
the improved share of labour since 2008 was due to the government spending more on labour, the analysis also excluded general government from the data (also see Figure 3 (left-hand) for the real percentage change in government's GVA, labour remuneration and Gross Operating Surplus). But excluding government does not affect the decreasing trend in labour's share prior to 2008 or the slightly improving trend after 2008.

However, the picture of a decreasing trend before and an increasing trend after 2008 changes when considering the implications of the data in Figure 3 (right-hand). Figure 3 (right-hand) shows the real percentage increase in GVA and the Rand amounts allocated to labour and capital in the manufacturing sector. It would be no understatement to say that the manufacturing sector has been imploding, particularly since the advent of the 2008 recession. As Figures 4 indicates, South Africa has been deindustrialising since the mid-'90s, but the speed at which it does so increased significantly since 2003. The real percentage change in the manufacturing sector's GVA turned negative since 2008, while the share of manufacturing in the total GVA of the economy shrunk from 21% in 1994 to 11% in 2013. None of the other sectors in the economy display such deterioration. The South African manufacturing sector is not unique in this instance, with Dani Rodrik (2013) noting that several emerging market economies (including China) suffer from what he terms premature industrialisation.

**Figure 3 – The real percentage increase in GVA and the amounts allocated to labour and capital in the general government (left-hand) and manufacturing (right-hand)**



**Figure 4 – Shares of sectors in GVA**



The fall in the manufacturing sector's GVA affected its profitability significantly. The Gross Operating Surplus of the manufacturing sector in Figure 3 (right-hand) shows that the profitability of the manufacturing sector has been deteriorating since 2000. Indeed, the Rand amount of GVA allocated to the manufacturing sector's Gross Operating Value has been shrinking in real terms by between 10% and 23% per annum since 2008. Yet, the real percentage change in the Rand amount allocated to labour in the manufacturing sector remained positive on average, meaning that in real terms those still employed in the

manufacturing sector are better off and labour's share in the manufacturing sector's GVA increased. However, labour's share is an improving share in a fast shrinking sector.

**Figure 5 – The real percentage increase in GVA and the amounts allocated to labour and capital**

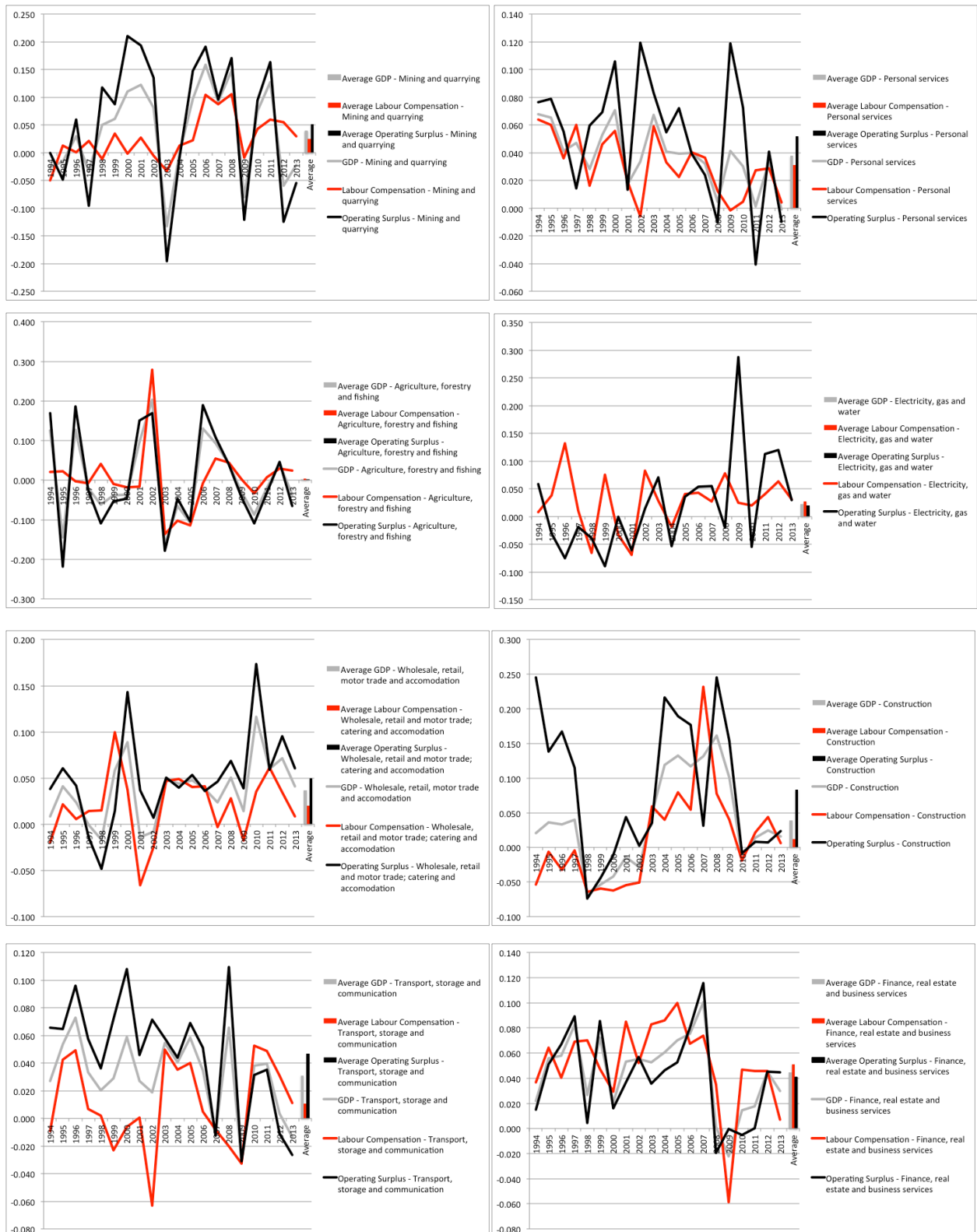


Figure 1 presents the shares of labour and capital once the ailing manufacturing sector is subtracted from the GVA figures (the broken grey line excludes manufacturing and agriculture, while the solid grey line

excludes manufacturing, agriculture and government). When that is done, the improved labour share in GVA since 2008 disappears and *labour's share displays a continuing deterioration over the two decades, while capital's share displays a concomitant continuing increase*. The overall fall in labour's share raises the question, which sectors contributed to the fall in labour's share.

Figure 5 shows the real percentage change in the Rand amounts allocated to capital and labour out of the GVA of the various sectors. If the real percentage change in the Rand amount allocated to labour is lower than that of Gross Operating Surplus, then labour's share in GVA fell relative to that of capital. The significant labour market turmoil in the mining sector since 2012 (the year in which the Marikana incident occurred) can be observed in Figure 5, which shows that since 2012 there has been negative real growth in the Rand amount out of GVA allocated to capital in the mining sector. During that same period there has been a positive growth in the amount out of GVA allocated to labour. A similar pattern emerges for the recessionary periods in 1997 and 2009, as well as 2003 (when the rand appreciated significantly, thereby undermining mining income and profits). In contrast, during the commodity boom years of 2004-8 both the amounts allocated to capital and labour increased significantly in real terms, although the amount allocated to capital increased much more. Thus, during the commodity boom labour did share in the improved earnings resulting from the commodity boom, but certainly not to the same extent as capital. A similar pattern emerges when considering the full two decades, during which on average the amount allocated to capital in the mining sector has grown at almost double the rate compared to that of labour.

Figure 5 shows that in all other sectors, with the exception of the electricity, gas and water sector, as well as in finance, real estate and business services, the amount allocated to capital increased faster than the amount allocated to labour, thereby contributing to a falling share of labour and an increasing share of capital in GVA. Even though it is a corporate sector, electricity, gas and water is dominated by parastatals, and hence not subject to the same investor pressure to maximise profit as the other sectors. The financial sector includes highly remunerated individuals such as portfolio managers who earn bonuses, hence explaining why this sector is an exception.

## 1.2 The relationship between GVA, labour compensation and Gross Operating Surplus

This section uses cointegration analysis to establish the relationship between movements in GVA on the one hand and labour compensation and Gross Operating Surplus on the other (all three have been deflated by the GDP deflator and will be measured in logs of the Rand amount). The model uses quarterly data from Statistics South Africa for the period 1996:3 to 2013:4 for the public and private corporate sectors, thus excluding agriculture and general government. It also excludes the manufacturing sector due to its peculiar nature. First a Vector Error Correction model (VECM) for the log of GOS and the log of GVA is estimated, and secondly one for the log of labour compensation and the log of GVA. In both cases the cointegration test indicates the existence of one cointegrating vector.

Table 2 reports the results for the two VECMs. It shows statistically significant results for both models. In the case of the GOS and GVA model it shows that a 1% increase in GVA leads to a 1.12% increase in GOS (note that the cointegrating vector in Table 2 is reported in vector format, so that a minus represents a positive sign). In contrast, a 1% increase in GVA leads only to a 0.68% increase in labour compensation. These results confirm the respectively rising and falling shares of capital and labour in GVA. The error correction components of -0.086 and -0.072 for the change in the logs of GOS and labour compensation in the two models indicate that the half-life of the error correction mechanism is roughly ten quarters and therefore well within the duration of a normal business cycle. The weak exogeneity test indicates that the models can be normalised on respectively the logs of GOS and labour compensation. The variance decomposition indicates that GVA explains 65% and 72% of the variance of

respectively the logs of GOS and labour compensation, again justifying the normalisation on Gross Operating Surplus and labour compensation.

**Table 1 - Cointegration tests for the logs GOS and GVA and the logs of labour compensation and GVA (excluding manufacturing, government and agriculture)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
<b>GOS and GVA</b>				
None *	0.470	46.827	20.262	0.000
At most 1	0.025	1.804	9.165	0.816
<b>Compensation and GVA</b>				
None *	0.651	77.949	20.262	0.000
At most 1	0.044	3.201	9.165	0.544

Trace test indicates 1 cointegrating eqn(s) for each at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

**Table 2 – VECM results for the models containing the logs GOS and GVA and the logs of labour compensation and GVA**

<b>Coint Eq:</b>				<b>Coint Eq:</b>					
<b>GOS(-1)</b>				<b>COMP(-1)</b>					
1				1					
<b>GVA(-1)</b>				<b>GVA(-1)</b>					
-1.197 [-39.263]				-0.676 [-7.831]					
<b>C</b>				<b>C</b>					
3.129 [ 8.329]				-3.492 [-3.285]					
<b>Error Correction:</b>	<b>dGOS</b>	<b>dGVA</b>		<b>Error Correction:</b>	<b>dCOMP</b>	<b>dGVA</b>			
<b>CointEq1</b>	-0.086	0.0723		<b>CointEq1</b>	-0.072	-0.0624			
	[-2.051]	[ 2.779]			[-7.844]	[-10.254]			
<b>Adj. R-squared</b>	0.571	0.826		<b>Adj. R-squared</b>	0.897	0.845			
<b><math>\chi^2</math>-test: <math>\alpha_{11} = 0</math> (prob)</b>	0.0377			<b><math>\chi^2</math>-test: <math>\alpha_{11} = 0</math> (prob)</b>	0.0000				
<b><math>\chi^2</math>-test: <math>\alpha_{21} = 0</math> (prob)</b>	0.0055			<b><math>\chi^2</math>-test: <math>\alpha_{21} = 0</math> (prob)</b>	0.0000				
<b>Serial correlation</b>	1	0.882	3	0.116	<b>Serial correlation</b>	1	0.414	3	0.848
<b>LM test (prob)</b>	2	0.699	4	0.077	<b>LM test (prob)</b>	2	0.958	4	0.392
<b>Variance decomposition (30 periods)</b>									
<b>Variance explained by</b>					<b>Variance explained by</b>				
<b>GOS</b>					<b>COMP</b>				
<b>GVA</b>					<b>GVA</b>				
<b>GOS</b>	34.99	65.01		<b>COMP</b>	28.13	71.87			
<b>GVA</b>	23.39	76.61		<b>GVA</b>	21.95	78.05			
Cholesky ordering: GVA GOS					Cholesky ordering: GVA COMP				

The number of lags to include in the short-run component for each model was determined using information criteria. For the GOS and GVA model includes one lag in the short-run component, and DUM1, DUM2 and DUM3 as seasonal dummies. For the COMP and GVA model includes three lags in the short-run component and only DUM1, as DUM2 and DUM3 came out statistically insignificant.

## 2. Wages, productivity and capital

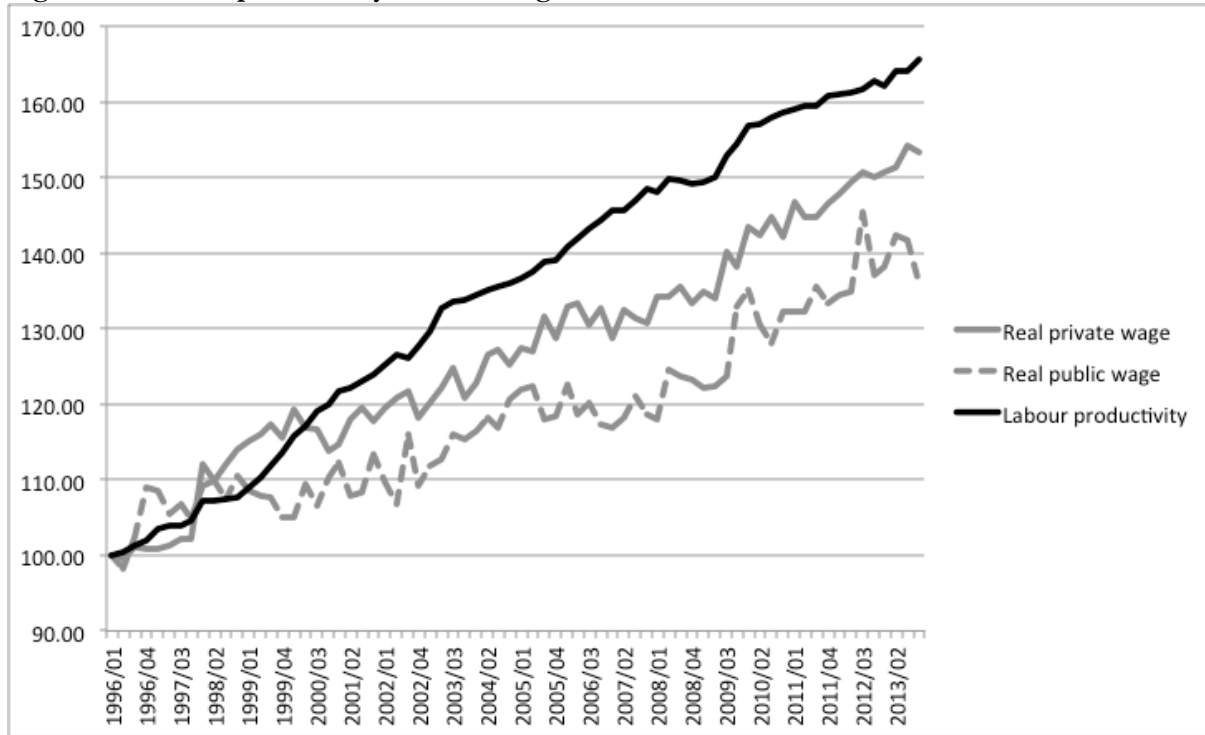
Using a simple production function, it is fairly trivial to show that a decline in the share of labour in GVA, discussed above, is only possible if average labour productivity (calculated as GVA divided by the number of workers) increases faster than real wages. Figure 6 shows data from the South African Reserve Bank, indicating that labour productivity indeed increased faster than both public and private sector wages (all three these series exclude agriculture).<sup>4</sup> Surprisingly, given what is often reported in the press, public sector wages increasing slower than private sector wages. In the eighteen years depicted in Figure 6

<sup>4</sup> The SARB provides both quarterly level and quarterly four-quarter percentage change series for productivity, total, private and public sector wages. The level series provided by the SARB contain several breaks due to the use of different StatsSA labour market surveys. However, the SARB has statistically linked the quarterly four-quarter percentage change series, thereby taking out the breaks. Using the last four quarters of the level series one can then use the quarterly four-quarter percentage change series to reconstruct level series that are break-free. These are the series presented in Figure 6. Figure 6 also rebases the three indices so that they start at 100 in 1996. This allows for a comparison of their rates of increase over time.

labour productivity increased by 66%, real private sector wages by 53% and real public sector wages by 47%.

In economic literature the relationship between productivity and wages is studied using a wage equation that usually regresses wages on productivity and unemployment (cf. Maning (1993) for an earlier study, and Folmer (N.A., but *circa.* 2007) for a meta study on the estimation of the wage equation). The analysis below also presents a wage equation, but it first draws on Growth Theory to understand labour's falling share and the differing rates of increase in wages and productivity. Drawing on Growth Theory leads to a better-specified wage function for use in the empirical analysis below and a better understanding as to what causes labour's falling income share.

**Figure 6 – Labour productivity and real wages**



i) *Changing marginal products of capital and labour, wages that increase slower than labour productivity, and changing capital/output ratios*

The Constant Elasticity of Substitution (CES) production function provides a model to understand how a falling labour share results from changing technology (ECB 2011:21-2):

$$Y_t = \left[ (E_t^K K)^{\frac{\sigma-1}{\sigma}} + (E_t^L L)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad (1)$$

where  $E_t^K$  and  $E_t^L$  are the levels of efficiency of capital,  $K$ , and labour,  $L$ , and  $\sigma$  represents the constant elasticity of substitution between capital and labour. Note that unlike the standard CES production function, the production function in equation (1) allows for the efficiency of capital and labour to change at different rates. The rate at which efficiency changes affects the level of efficiency of a factor  $i$ :

$$E_t^i = E_0^i e^{\kappa_i(t-t_0)} \quad (2)$$

where  $i = K, N$  and  $\kappa_i$  is the growth rate of factor augmenting technical progress of factor  $i$  and  $t$  represents a time trend. If  $\kappa_K > \kappa_L \geq 0$  then the growth in the technical progress of capital exceeds that

of labour (if  $\kappa_K > \kappa_L = 0$  Solow-neutrality exists). What will happen to labour's share in the face of technological change depends on whether  $\kappa_K > \kappa_L$  or  $\kappa_K < \kappa_L$ , as well as on whether capital and labour are gross substitutes ( $\sigma > 1$ ) or gross complements ( $\sigma < 1$ ). If technological change is capital-augmenting (i.e.  $\kappa_K > \kappa_L$ ) and capital and labour are gross substitutes ( $\sigma > 1$ ), then technology increases the demand for capital more than for labour, causing a fall in labour's share (see ECB 2011:21, Acemoglu 2003, Martin and Havlicek 1977:138).

Using equation (2) and selecting a baseline time  $t = t_0$  yields the following baseline efficiencies in year 0:

$$E_0^L = \frac{Y_0}{L_0} \left( \frac{1}{\alpha_0} \right)^{\frac{\sigma}{\sigma-1}} \text{ and } E_0^K = \frac{Y_0}{K_0} \left( \frac{1}{1-\alpha_0} \right)^{\frac{\sigma}{\sigma-1}} \quad (3)$$

Substituting equations (3) into equation (1) yields:

$$Y_t = \left[ (1 - \alpha_0) \left( K_t e^{\kappa_K(t-t_0)} \frac{Y_0}{K_0} \right)^{\frac{\sigma-1}{\sigma}} + \alpha_0 \left( L_t e^{\kappa_L(t-t_0)} \frac{Y_0}{L_0} \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad (4)$$

$$Y_t = \left[ (1 - \alpha_0) K_0^{\frac{1-\sigma}{\sigma}} \left( K_t e^{\kappa_K(t-t_0)} \right)^{\frac{\sigma-1}{\sigma}} + \alpha_0 L_0^{\frac{1-\sigma}{\sigma}} \left( L_t e^{\kappa_L(t-t_0)} \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad (5)$$

Expressing equation (5) in log form gives (ECB 2011:34):

$$\log(Y_t/Y_0) = \frac{\sigma}{\sigma-1} \log \left[ (1 - \alpha_0) \left( \frac{K_t}{K_0} e^{\kappa_K(t-t_0)} \right)^{\frac{\sigma-1}{\sigma}} + \alpha_0 \left( \frac{L_t}{L_0} e^{\kappa_L(t-t_0)} \right)^{\frac{\sigma-1}{\sigma}} \right] \quad (6)$$

Equation (6) can now be used to derive the marginal profit-maximisation condition with respect to wages,  $w$ :

$$\log(w) = \log \left( \alpha_0 \frac{Y_0}{L_0} \right) + \frac{1}{\sigma} \log \left( \frac{L_0}{Y_0} \right) + \frac{1}{\sigma} \log \left( \frac{Y_t}{L_t} \right) + \frac{\sigma-1}{\sigma} (\kappa_L(t - t_0)) \quad (7)$$

Note that  $\log \left( \alpha_0 \frac{Y_0}{L_0} \right) + \frac{1}{\sigma} \log \left( \frac{L_0}{Y_0} \right)$  in equation (7) is a constant. Equation (7) can be estimated by regressing the log of wages on the logs of productivity and a proxy for technological change. In the case where  $\sigma = 1$  the CES production function approximates the standard textbook Cobb-Douglas production function and equation (7) reduces to a standard wage equation:

$$\log(w) = \log \left( \alpha_0 \frac{Y_0}{L_0} \right) + \log \left( \frac{L_0}{Y_0} \right) + \log \left( \frac{Y_t}{L_t} \right) \quad (8)$$

Given the specification of equation (8), when estimating it by regressing the log of real wages,  $\log(w)$ , on average labour productivity,  $\log \left( \frac{Y_t}{L_t} \right)$ , the expectation is thus to find that the parameter for average labour productivity equals 1. This also means that the percentage change in average productivity can be taken as an indicator for what the average change in the real wage should be. However, if  $\sigma \neq 1$  then the change in the real wage cannot be expected to be equal to changes in average productivity. Indeed, a falling wage share implies that wages,  $w$ , increase slower than average labour productivity,  $Y/L$ , in equation (9):

$$s_L = \frac{wL}{Y} = \frac{w}{Y/L}$$

ii) *Augmented capital and the capital/output ratio*

Bentolila and Saint-Paul (2003) show that there is a stable relationship between the wage share and the capital/output ratio. Thus, if the wage share is changing, then the expectation is that the capital/output ratio is also changing. Recall equation (4) and for simplicity define  $A_t = e^{\kappa_K(t-t_0)} \frac{Y_0}{K_0}$ ,  $B_t = e^{\kappa_L(t-t_0)} \frac{Y_0}{L_0}$  and  $\varepsilon = \frac{\sigma-1}{\sigma}$ :

$$Y_t = [(1 - \alpha_0)(K_t A_t)^\varepsilon + \alpha_0(L_t B_t)^\varepsilon]^{1/\varepsilon} \quad (10)$$

labour share,  $s_L$ , can be calculated as:

$$s_L = \frac{\alpha_0(L_t B_t)^\varepsilon}{(1-\alpha_0)(K_t A_t)^\varepsilon + \alpha_0(L_t B_t)^\varepsilon} \quad (11)$$

The capital/output ratio is:

$$\frac{K_t}{Y_t} = \left( \frac{K_t^\varepsilon}{(1-\alpha_0)(K_t A_t)^\varepsilon + \alpha_0(L_t B_t)^\varepsilon} \right)^{1/\varepsilon} \quad (12)$$

Equations (11) and (12) together gives:

$$s_L = 1 - (1 - \alpha_0)((K_t/Y_t)A_t)^\varepsilon \quad (13)$$

The relationship is monotonic in  $K_t/Y_t$ , and it increases or decreases depending on the sign of  $\varepsilon$ . Therefore, if labour and capital are gross substitutes ( $\varepsilon > 0$ ), a lower capital intensity will increase the labour share, with the opposite holding for if labour and capital are gross complements. Note that in equation (13) the effect of capital,  $K_t/Y_t$ , and capital augmentation,  $A_t$ , on the share of labour has the same sign. Recall that above it was also argued that when labour and capital are gross substitutes, capital augmentation implies that the demand for capital will increase faster than the demand for labour. The demand for physical capital of course also translates into a demand for financial capital. Therefore, capital augmentation also increases the return on financial capital. As long as the required rate of return on capital remains the same (i.e. the capital supply curve is flat), financial investors (who finance the expanded demand for capital) will meet the higher demand for capital, which means that the capital/output ratio will expand until the actual rate of return on capital again equals the required rate of return on capital. Note that this means that the change in the capital/output ratio will be correlated with the change in the capital augmentation, i.e. with technological improvement. Thus, the capital/output ratio can then be used as a proxy for the change in technology. Note further that because both  $A_t$  and  $K_t/Y_t$  appear in equation (13) their positively correlated movements mean that  $A_t$  and  $K_t/Y_t$  in equation (13) move in the same direction.

If the higher demand for capital, financed through the financial market, is met in the financial market by an upward-sloping capital supply curve (i.e. the required rate of return on capital increases), the capital/output ratio will still increase, but at a slower rate, with interest rates rising. However, if the higher demand for capital meets with a backward-sloping capital supply curve (meaning the income effect in the saving decision dominates the substitution effect) then a higher demand for capital implies a decreasing capital/output ratio. And the interest rate will still increase. In addition, the change in the capital/output ratio will still be correlated (though with a negative sign) with the change in the capital augmentation, i.e. with technological improvement. Thus, the capital/output ratio can then still be used as a proxy for the change in technology, even though the sign indicating the relationship between the two will be negative.

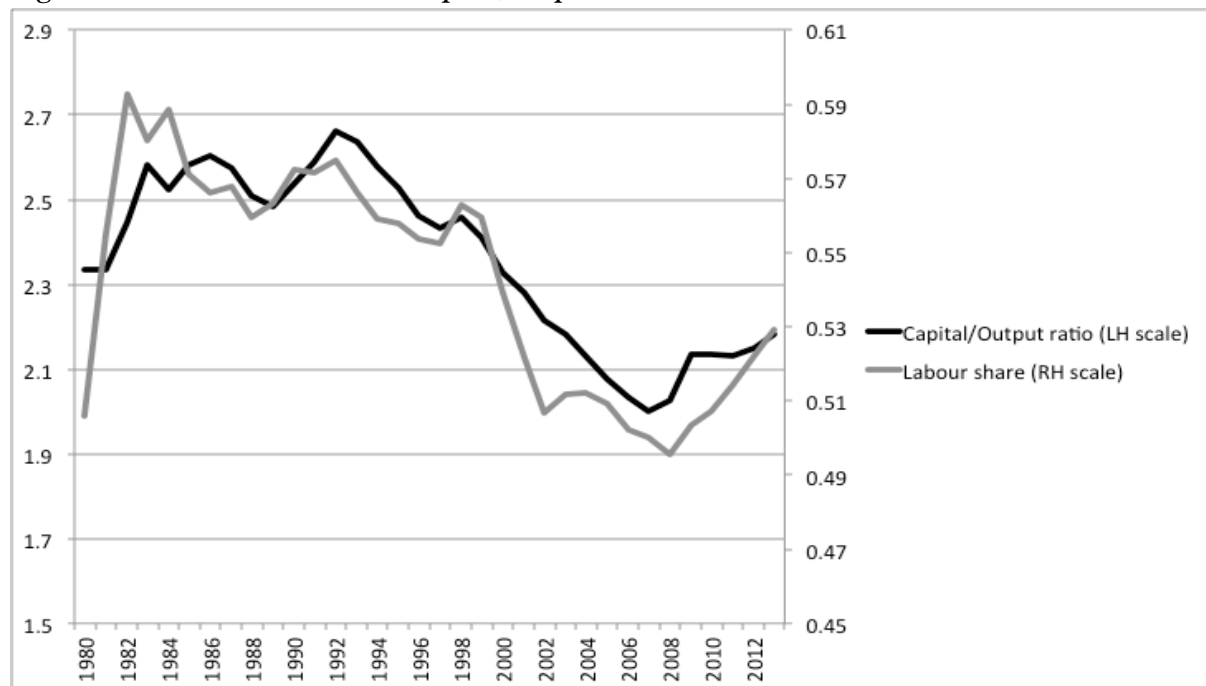
Note however, that the negative correlation between the change in technology and the change in the capital/output ratio, with the former causing the latter, means that  $A_t$  and  $K_t/Y_t$  in equation (13) move in opposite directions. Thus, the net effect of technological change on labour's share will comprise its direct effect through  $A_t$  and an indirect effect through  $K_t/Y_t$ . The relationship between  $A_t$  and  $K_t/Y_t$  can be portrayed by equation (14):

$$d\log(K_t/Y_t) = g d\log A_t \quad (14)$$

If  $g$  in equation (14) is positive the substitution effect dominates the income effect in financial investor's saving decision, and the higher demand for capital caused by the technological improvement will lead to a higher  $K_t/Y_t$ . However, if the income effect dominates the substitution effect, then the technological improvement will lead to a lower  $K_t/Y_t$ , thus  $g$  in equation (12) will be negative. Note that whether the net effect on labour's share will be positive or negative depends on whether  $g < -1$ . If it  $-1 < g < 0$ , the net effect of the technological change and the change in  $K_t/Y_t$  that it caused will result in a falling labour share.

So what is the correlation in South Africa, i.e. did the capital/output ratio decrease or increase in the face of a decreasing labour share? Figure 7 shows that it decreased since the 1990s, and that since 1980 the movements in the capital/output ratio are very similar to that of labour's share.<sup>5</sup> The decrease in the capital/output ratio suggests that the income effect might have dominated the substitution effect. However, to assert this, presupposes that technological improvements, via the rate of return on capital, caused the changes in labour's share and the capital/output ratio. It is, however, also possible to argue that causality ran the other way. The next section discusses this.

**Figure 7 – Labour share and the capital/output ratio**



<sup>5</sup> A capital/output series is available from the SARB, but it only allows for one decimal place. Hence, to get the more accurate number total real fixed capital is divided by real Gross Value Added (no nominal series is available for total fixed capital) – both are also obtained from the SARB.

iii) *The political economy of wages and capital returns – the bargaining power of labour and capital*

The above model suggests that in the main, the reduction in labour's share in income can be understood as being due to the introduction of capital-augmenting labour-saving technology that increases the marginal product of capital. One frequently cited criticism of using the marginal product of labour as an explanation of wages is that the outcome of wages being equal to the marginal product of labour only holds under conditions of perfect competition. Since most industries in South Africa are characterised by central bargaining, high levels of unionisation and highly concentrated goods markets, wages might not necessarily equal the marginal product of labour. Nevertheless, the wage level in efficiency wage and labour union models still *reflects* the marginal product of labour; a higher marginal product of labour still means a higher efficiency wage, *ceteris paribus*. The same goes for wages set in union wage models.

Rodrik (1999) has argued that because labour has a better bargaining position in democracies compared to authoritarian regimes, wages in democracies are usually up to 50% higher than in non-democracies. As a result labour has a higher share in income. He suggests this as evidence that the marginal product of labour is not the sole determinant of the wage level (Rodrik 2007; 1999:717). Rodrik (1999:722, 725) also cites evidence from countries showing that during a time of political transition wages grew faster than productivity. This has not been the case in South Africa (see Figure 6 above). Furthermore, Rodrik (1999:725-6) shows that democracies shift income from profits to wages (and *vice versa* for authoritarian regimes).

Rodrik (1999:727) argues that apart from labour productivity three factors determine wages. These are labour's relative bargaining strength (through among other unions), labour's outside income options (i.e. outside the private market economy in for instance public sector employment and the informal sector, both affecting the reservation wage) and capital's outside income options (i.e. investing in another country). Political participation and political competition strengthen labour's bargaining position and therefore explain why income is shifted from capital to labour.

However, as Rodrik argues, the outside option for the owners of capital also plays a role in the wage level. Should the return on outside options increase, it puts downward pressure on the share allocated to labour. Globalisation and the financialisation highlighted by the ILO (2013), with the latter associated with an increase in aggressive returns-oriented investor institutions, points to stronger outside options for capital. If financial investors have better outside income options (i.e. they can take their money offshore to earn higher rates of return), the required rate of return on capital increases. The higher rate of return that shareholders require, or what is the same thing, a lower saving rate at any given rate of return, will result in a reduced capital/output ratio, and put pressure on firms to deliver those higher returns. Causation then runs from a higher required rate of return to a changing capital/output ratio, and on to technological changes and a fall in labour's share. As such, movements in the capital/output ratio and labour's share will be positively correlated, with a decrease in both reflecting increased investor pressure for higher returns. As Figure 7 shows, the capital/output ratio and labour's share in South Africa are positively correlated.

Note that whether the required rate of return increases because of capital's stronger outside option or because the income effect dominates the substitution effect, the required rate of return on capital nevertheless increases, meaning financial investors demand more.

### **3 The relationship between productivity, wages and the power of capital**

The discussion above suggests that the implementation of capital-augmenting labour-saving technology as well as changes in the power relations between labour and capital affect the relationship between wages

and productivity. The discussion also suggests a close relationship between movements in the capital/output ratio,  $K/Y$ , and labour's share in income,  $S_L$ . This section first estimates a VECM to test the relationship between labour's share,  $S_L$  and the capital/output ratio,  $K/Y$ . This is followed by the estimation of the wage equation.

### 3.1 The relationship between labour's share and the capital/output ratio

Following Bentolila and Saint-Paul (2003) this section presents an estimation of the relationship between labour's share and the capital/output ratio, based on equation (13). The estimation is done in log format and includes labour productivity and the GDP deflator as a control variable for cost. Capital markets in South Africa were liberalised in the early 1980s. Before 1980 interest rate ceilings prevented investors to fully express their required rate of return. Hence the pattern between the capital/output ratio and labour's share is only apparent since the early 1980s. Hence, the analysis runs from 1980 to 2013. All the series are  $I(1)$ (Table 3) – the KPSS shows that labour's share, the capital/output ratio and the deflator are  $I(1)$ . It does not give a clear indication with regard to productivity, but the Dickey-Fuller GLS test shows that productivity is  $I(0)$ . The trace test shows that there is one cointegrating vector between them (Table 4). The number of lags was selected on the basis of information criteria.

**Table 3 – KPSS test**

Variable	Level	Change in level
$\ln(S_L)$ - KPSS test	0.569	0.124
$\ln(K/Y)$ - KPSS test	0.488	0.213
$\ln(\text{Deflator})$ - KPSS test	0.205	0.088
$\ln(\text{Productivity})$ - KPSS test	0.584	0.503
$\ln(\text{Productivity})$ - DF-GLS	-2.168	

Critical values (KPSS did not include a trend): 1%: 0.739, 5%: 0.463, 10%: 0.347

Critical values for the deflator (KPSS included a trend): 1%: 0.216, 5%: 0.146, 10%: 0.119

Critical value for labour productivity (DF-GLS): 1%: -2.644, 5%: -1.953, 10%: -1.610

**Table 4 – Trace test for co-integration**

Hypoth. No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
<b>Model with <math>\ln(\text{Alpha})</math></b>				
<b>None *</b>	0.617	70.527	63.876	0.012
<b>At most 1</b>	0.418	39.834	42.915	0.098
<b>At most 2</b>	0.332	22.489	25.872	0.125
<b>At most 3</b>	0.259	9.599	12.518	0.147

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 5 shows that there is a positive relationship between labour's share,  $S_L$ , and the capital/output ratio (the cointegrating relationship reported in Table 5 is written in vector format, meaning that the minus indicates a positive parameter and *vice versa*). A 1% increase in the capital/output ratio leads to a 0.215% increase in labour's share. The error correction value of -0.899 indicates that labour's share adjusts almost fully to a disturbance in the long-run relationship within one period. However, the capital/output ratio does not adjust, since its error correction term is statistically insignificant. This is borne out by the weak exogeneity test that shows with a probability of 0.0033 for the  $\chi^2$ -test:  $\alpha_{11} = 0$ , while the probability for the  $\chi^2$ -test:  $\alpha_{21} = 0$  is 0.3712. Therefore, the capital/output ratio is weakly exogenous, indicating that causality runs from the capital/output ratio to labour's share. This suggests that it is a higher required rate of return that, via a lower capital/output ratio, put pressure on firms to implement the capital-augmenting labour-saving technology that subsequently changes labour's share.

**Table 5 – The relationship between K/Y and S<sub>L</sub>**

Coint Eq:				
ln(S <sub>L</sub> )(-1)			1	
ln(K/Y)(-1)			-0.215 [-2.359]	
ln(Productivity)(-1)			0.592 [4.014]	
ln(Deflator)(-1)			0.282 [4.520]	
Trend			-0.034 [-4.111]	
C			0.336	
Error Correction:	dln(S <sub>L</sub> )	dln(K/Y)	dln(Productivity)	dln(Deflator)
CointEq1	-0.899 (-3.811)	0.135 (0.429)	0.015 (0.078)	-0.066 (-0.225)
Adj. R-squared	0.408	0.327	0.641	0.741
χ <sup>2</sup> -test: α <sub>11</sub> = 0 (prob)			0.0033	
χ <sup>2</sup> -test: α <sub>21</sub> = 0 (prob)			0.3712	
Serial correlation	1	0.953	3	0.932
LM test (prob)	2	0.944	4	0.111
Variance decomposition (5 periods)				
	Variance explained by			
	ln(S <sub>L</sub> )	ln(K/Y)	ln(Productivity)	ln(Deflator)
ln(S <sub>L</sub> )	6.74	48.72	15.10	29.45
ln(K/Y)	1.77	92.59	3.89	1.75
ln(Productivity)	0.80	7.81	61.58	29.80
ln(Deflator)	0.14	1.32	3.54	94.99
Cholesky ordering: ln(Deflator), ln(K/Y), ln(Productivity), ln(S <sub>L</sub> )				

### 3.2 The relationship between productivity and wages – one-for-one or one-for-less?

The production function model above uses capital-augmenting technological change that increases the marginal product of capital to account for a falling share of labour compensation in GVA. The discussion also suggests why the capital/output ratio might have decreased, and it explains why the rate of increase in labour productivity can exceed the rate at which real wages increase. The falling share of labour in GVA, a declining total capital/output ratio, as well as a rate of labour productivity increase that exceeds the rate of increase in real wages are all characteristics of the South African economy. The section estimates two wage equation models (equations 15a & 15b), based on equation (7), where the capital/output ratio serves as a proxy for capital-augmenting technological change.<sup>6</sup> Given that labour legislation for a democratic South Africa was accepted by parliament in 1995, the sample starts in the third quarter of 1996, so as to ensure that the models (with their lags) cover only the period to which this legislation applies. The sample runs until the fourth quarter of 2013.

$$\ln Wage_t = \beta_1 + \beta_2 \ln Productivity_t + \beta_3 \ln(K_t/Y_t) \quad (15a)$$

$$\ln Wage_t = \beta_1 + \beta_2 \ln Productivity_t + \beta_3 K_t/Y_t \quad (15b)$$

Because of the non-stationarity of the variables, the estimation below is done with a standard Vector Error Correction Model (VECM). For all the models two cointegrating relationships are postulated, one for real private wages, the other for real public wages. Hence, the models estimated below will include both private and public real wage indices, as well as the labour productivity series. The capital/output

<sup>6</sup> In the literature wage equations often also includes unemployment to accommodate cyclical fluctuations in real wages. Unfortunately unemployment is a time-series that comes with a health warning. Because of the frequency of labour surveys, only one value per year is available up to 1999, while for the period 1999-2008 only two values per year are available. Since 2008 four values per year are available. Hence, the unemployment series available from the SARB shows less variation in earlier years. Therefore, due to the problematic nature of the unemployment series, it is not included in the estimation.

series is also the same as the one used in Figure 7. Because the total fixed capital series are only available on an annual basis, interpolation is used to create quarterly series. Therefore, the section below presents four VECMs; (1) one estimated with the log of the capital/output ratio and (2) the last estimated with the capital/output ratio.

The VECMs takes the form of Equations (16):

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^k \Gamma_i \Delta X_{t-i} + \varepsilon_{kt} \quad (16)$$

where  $X_t = (\ln(\text{Private Wages}), \ln(\text{Public Wages}), \ln(\text{Productivity}), \text{and either } \ln(K/Y), \text{ or } K/Y)$  is a 4x1 vector that includes the endogenous I(1) variables),  $\Gamma_i$  is 4x4 short-run coefficient matrix and  $\varepsilon_{kt}$  are normally and independently distributed error terms. The trace test is used to determine the number of cointegrated vectors and as will be shown below, two cointegrating vectors were found.  $\Pi_i$  in Equation (16) can be decomposed as the following  $\alpha$  and  $\beta'$  matrices:

$$\pi x_{t-1} = \alpha \beta' x_{t-1} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \\ \alpha_{31} & \alpha_{32} \\ \alpha_{41} & \alpha_{42} \end{bmatrix} \begin{bmatrix} 1 & 0 & \beta_{13} & \beta_{14} \\ 0 & 1 & \beta_{23} & \beta_{24} \end{bmatrix} \begin{bmatrix} \ln \text{Private Wages}_{t-1} \\ \ln \text{Public Wages}_{t-1} \\ \ln \text{Productivity}_{t-1} \\ \ln(K/Y_{t-1}) \text{ or } K/Y_{t-1} \end{bmatrix} \quad (17)$$

where  $\alpha$  is a 4x2 matrix (five variables and two cointegrating relationship) that contains the error-correction (adjustment) parameters, and  $\beta'$  is a 2x4 matrix that contains the long-run parameters in the long-run relationship.

**Table 6 – Stationarity test**

Variable	Level	Change in level
ln(Private Wages) – KPSS	1.090	0.257
ln(Public Wages) – KPSS	1.053	0.095
ln(Productivity) – KPSS	1.084	0.611
ln(Productivity) – DF-GLS	0.753	-2.824

Critical values: KPSS: 1%: 0.739, 5%: 0.463, 10%: 0.347. The KPSS test for ln(productivity) only indicates stationarity at the 1% level. So a Dickey-Fuller GLS test was also conducted. It indicates that ln(productivity) is I(1).

Critical value for labour productivity (DF-GLS): 1%: -2.644, 5%: -1.953, 10%: -1.610

**Table 7 – Trace test for co-integration**

Model with K/Y				
None *	0.315	58.365	47.856	0.004
At most 1 *	0.228	31.916	29.797	0.028
At most 2	0.167	13.790	15.495	0.089
At most 3	0.014	1.013	3.841	0.314
Model with K/Y				
None *	0.315	59.330	47.856	0.003
At most 1 *	0.245	32.836	29.797	0.022
At most 2	0.162	13.165	15.495	0.109
At most 3	0.012	0.830	3.841	0.362

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

The KPSS test indicates that all the variables are I(1) at a 5% level (see Tables 3 and 6). The trace test, shown in Table 7, indicates that in the case of both VECMs there are two cointegrating relationships and hence, the estimation will assume two cointegrating relationships. Both models include four lags, selected on the basis of information criteria.

Table 8 contain the results for the models. The long-run component of the models (again reported in vector format, which means that the minuses indicate positive parameters) contains the two cointegrating

equations, one normalised on private wages, the other on public wages. In all four models the variables have the expected sign. In both models the parameters for  $\ln(K/Y)$  and  $K/Y$  are positive. Given that the capital/output ratio on average decreased over time, indicates that its contribution to wages decreased, thereby explaining why wages grew slower than productivity. The parameters for productivity range from 0.935 to 0.97, which suggests that the capital-labour substitution rate ranges between 1.03 and 1.07, suggesting the use of capital-augmenting labour-saving technology. However, this finding is not unambiguous as these parameters are fairly close to one, and, indeed, a  $\chi^2$  -test with the null hypothesis that these two parameters are equal to one, has a probability of 0.878 in both cases, meaning it cannot be rejected. Nevertheless, if the true value of capital-labour substitution is very close to 1 but nevertheless exceeds it, say at 1.03, it might be statistically impossible to clearly reject the null hypothesis that productivity's parameter equals 1. Given that labour's share indeed did change and given that a parameter of 1 would imply a Cobb-Douglas production function in which the share of labour cannot change, suggests that the true parameter exceeds 1, but is nevertheless close to 1.

**Table 8 – Wage equation models estimated with  $\ln(K/Y)$  and  $K/Y$**

<b>Model estimated with <math>\ln(K/Y)</math></b>				
<b>Coint Eq:</b>	<b>CointEq1</b>		<b>CointEq2</b>	
Private Wages(-1)	1		0	
Public Wages(-1)	0		1	
Productivity(-1)	-0.968 [-15.824]		-0.935 [-8.473]	
$\ln(K/Y)$ (-1)	-0.539 [-4.493]		-0.700 [-3.235]	
C	-0.147		-0.127	
<b>Error Correction:</b>	<b>dPrivate Wages</b>	<b>dPublic Wages</b>	<b>dProductivity</b>	<b>d(<math>\ln(K/Y)</math>)</b>
<b>CointEq1</b>	-0.426 [-3.287]	-0.620 [-3.153]	0.018 [0.410]	0.000 [-0.156]
<b>CointEq2</b>	0.262 [2.950]	-0.246 [-1.823]	0.068 [2.248]	0.000 [-0.046]
<b>Adj. R-squared</b>	0.352	0.302	0.212	0.995
<b>Autocorrelation LM test (prob)</b> 0.689 (1) 0.928 (2) 0.839 (3) 0.003 (4) 0.293 (5) 0.349 (6)				
<b>Weak exogeneity <math>\chi^2</math> -test: <math>\alpha_{11}</math>&amp;<math>\alpha_{22} = 0</math> (prob)</b> 0.006				
<b>Productivity-Wage nexus <math>\chi^2</math> -test: <math>\beta_{13}</math>&amp;<math>\beta_{23} = 1</math> (prob)</b> 0.878				
<b>Model estimated with the <math>K/Y</math></b>				
<b>Coint Eq:</b>	<b>CointEq1</b>		<b>CointEq2</b>	
Private Wages(-1)	1		0	
Public Wages(-1)	0		1	
Productivity(-1)	-0.970 [-15.297]		-0.945 [-9.035]	
$K/Y$ (-1)	-0.245 [-4.500]		-0.324 [-3.607]	
C	-0.023		0.079	
<b>Error Correction:</b>	<b>dPrivate Wages</b>	<b>dPublic Wages</b>	<b>dProductivity</b>	<b>d(<math>K/Y</math>)</b>
<b>CointEq1</b>	-0.428 [-3.328]	-0.620 [-3.167]	0.013 [ 0.302]	-0.002 [-0.273]
<b>CointEq2</b>	0.272 [ 2.975]	-0.293 [-2.100]	0.0720 [ 2.280]	-8.37E-05 [-0.017]
<b>Adj. R-squared</b>	0.365	0.312	0.206	0.995
<b>Autocorrelation LM test (prob)</b> 0.760 (1) 0.945 (2) 0.880 (3) 0.004 (4) 0.321 (5) 0.353 (6)				
<b>Weak exogeneity <math>\chi^2</math> -test: <math>\alpha_{11}</math>&amp;<math>\alpha_{22} = 0</math> (prob)</b> 0.003				
<b>Productivity-Wage nexus <math>\chi^2</math> -test: <math>\beta_{13}</math>&amp;<math>\beta_{23} = 1</math> (prob)</b> 0.878				

The statistical significance and signs of the parameters for productivity,  $\ln(K/Y)$  and  $K/Y$  in the two VECMs support the theory discussed in the previous section. The models highlight the role of a lower capital/output ratio and the increasing use of labour-saving technology in the reduction of labour's bargaining power.

The error-correction terms showing whether or not private wages react to disturbances in the long-run relationship normalised on private wages, all have the correct sign and size (i.e. they are between -1 and 0), and are statistically significant. The same is true for the error-correction terms of public wages, except that the statistical significance of the error-correction term of public wages in the second long-run

relationship in the model estimate with  $\ln(K/Y)$  is borderline. Nevertheless, the weak exogeneity tests testing the null hypothesis that  $\alpha_{11} = \alpha_{22} = 0$  is rejected in all models, indicating that both private and public wages react to disturbances in the long-run relationships in which they respectively appear. The weak exogeneity tests therefore indicate that the models can be normalised on private and public wages. The size of these error-correction terms indicates that between a third and two-thirds of disturbances are corrected within the first period (i.e. quarter), indicating a relatively fast return to equilibrium.

There is no autocorrelation in any of the 12 lags tested (6 are reported), except in the fourth lag. However, the probabilities for the serial correlation test of all the lags except the fourth are so high that serial correlation is not a serious problem – its presence in the fourth lag is probably an artefact of the interpolation performed on the capital/output ratio. The variance decomposition, reported in Table 9, shows that in all the models the capital/output ratio and productivity explain more than 50% of the variation in private and public wages.

**Table 9 – Variance decomposition (30 periods)**

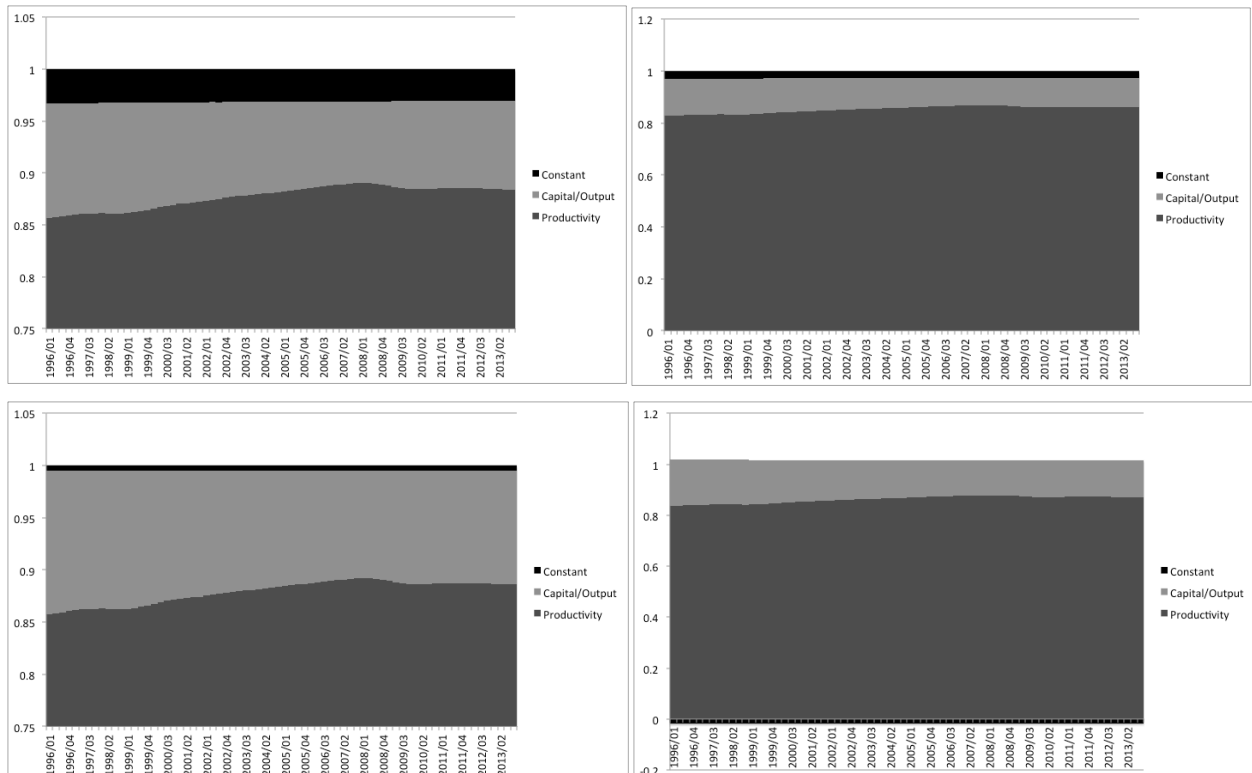
	Variance explained by:			
	Private Wages	Public Wages	Productivity	$\ln(K/Y)$
Private Wages	34.162	15.399	24.403	26.036
Public Wages	14.251	32.391	13.765	39.593
Productivity	5.589	12.073	38.838	43.499
$\ln(K/Y)$	0.503	1.737	3.349	94.410

	Variance explained by:			
	Private Wages	Public Wages	Productivity	K/Y
Private Wages	34.690	14.789	27.216	23.304
Public Wages	14.291	32.289	15.889	37.530
Productivity	4.504	10.909	39.435	45.152
K/Y	0.533	1.887	3.594	93.987

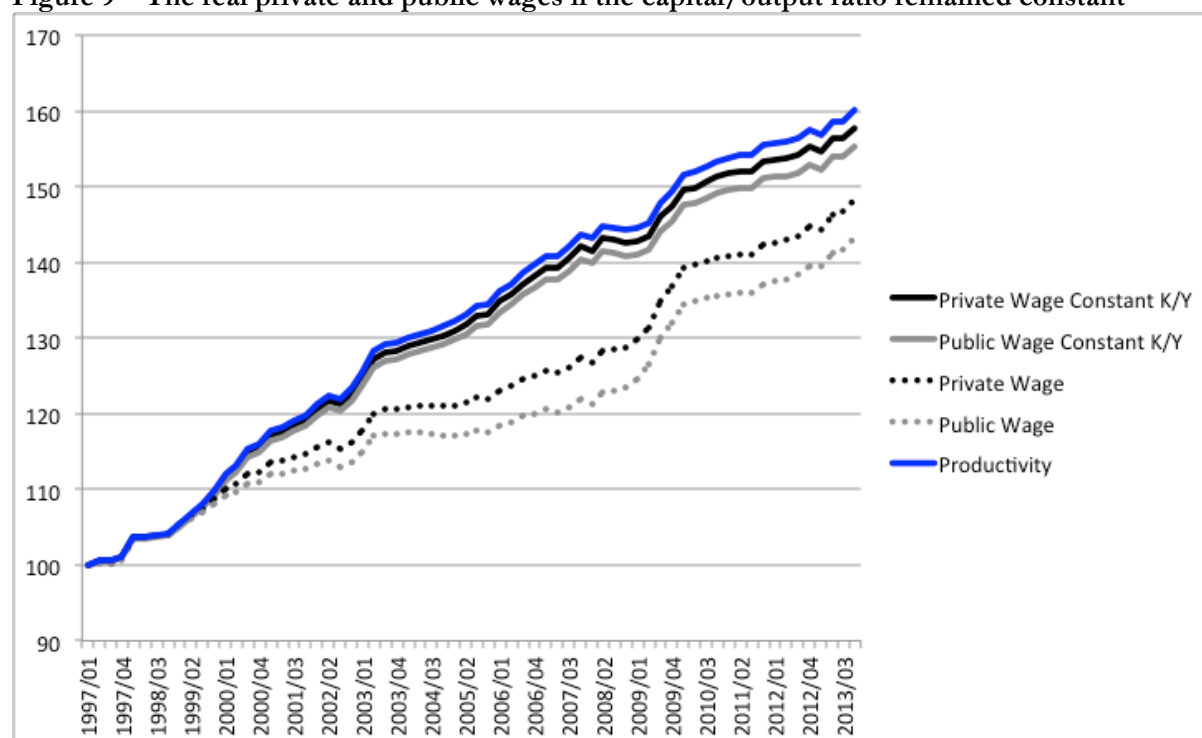
Cholesky Ordering: (1)  $\ln(\text{Alpha})$ ,  $\text{Alpha}$ ,  $\ln(K/Y)$  or  $K/Y$  (2) Productivity (3) Private Wages (4) Public Wages

**Figure 8 – Decomposition of the contribution of productivity and the capital/output ratio to the private real wage (left-hand) and public real wage (right-hand) - % of total (top two estimated with  $\ln(K/Y)$ , bottom two estimated with  $K/Y$ )**



With the capital/output ratio acting as a proxy for the pressure to improve returns and the role of capital-augmenting labour-saving technology, it is possible to explore specifically the impact of capital-augmenting labour-saving technology on wages. Figure 8 shows the percentage contribution each variable makes to the total value of wages in any given period. More specifically Figures 8 shows how the contribution of the capital/output ratio shrunk until 2008, where after it stabilised. Figure 9 subsequently shows what the real private and public wage would have been had the capital/output ratio remained constant at its value at the start of 1997 (i.e. assuming that its contribution did not shrink). The purpose of showing this is not to demonstrate an alternative history, but, with the capital/output ratio serving as proxy for the pressure to improve returns and the role of capital-augmenting labour-saving technology, keeping the capital/output ratio constant allows for the assessment of the impact of the pressure to improve returns and the role of capital-augmenting labour-saving technology. The comparison shows that with a constant capital/output ratio both private and public wages would have increased at a rate close to that of productivity. The results are borne out by Table 10. Table 10 uses the data from Figure 9 to calculate the average rates of change if labour's share and the capital/output ratio remained constant and then compares these with the increase in wages as estimated with the models in Table 8. Again, the average rate of change in private and public wages would have been much closer to the rate of change in productivity.

**Figure 9 – The real private and public wages if the capital/output ratio remained constant**



**Table 10 – The average real change in private and public wages if labour's share and the capital/output ratio remained constant**

	Private Wage		Public Wage		Productivity
	Constant	Actual	Constant	Actual	
$\ln(K/Y)$	0.028	0.023	0.027	0.021	0.029
$K/Y$	0.028	0.023	0.027	0.020	0.029

Therefore, the models highlight the role of a lower capital/output ratio and the increasing use of capital-augmenting labour-saving technology in the reduction of labour's bargaining power and the rate at which real wages increased.

### 3. Conclusion

At 52% the percentage share that labour receives out of income in 2013 is significantly lower than in 1994, when it stood at 56%. Although labour's share improved since its low of 48% in 2008, the improvement results from the profitability crisis in the manufacturing sector and not an improvement in labour's overall position. Indeed, when the manufacturing sector is excluded from the analysis, labour's share displays a continuous decreasing trend in the two decades since 1994, decreasing from 57% to 49%. The analysis shows that for every 1% increase in the real amount of GVA, real Gross Operating Surplus improves by 1.12%, while the real amount of labour remuneration out of GVA only improves by 0.68%.

A simple CES production function suggests that the increasing use of capital-augmenting labour-saving technology caused labour's share to decrease. The theoretical analysis also postulated a relationship between the capital/output ratio and labour's share, while the production function furthermore indicates that labour's share only decreases if real wages increase at a slower rate than average productivity. In the two decades since 1994 the percentage increase in productivity outstripped the percentage increase in both private and public sector wages. More specifically, over the period 1996-2013 productivity increased 66%, while real private and public sector wages increased 53% and 47%. The analysis plugs this data into a wage equation, together with the capital/output ratio. The results are consistent with the theory, suggesting that the bargaining power of labour decreased significantly over the two decades since 1994. The increased use of labour-saving technology and higher levels of globalisation and financialisation (the financial sector is the largest sector in the South African economy) all contribute to a weakening of labour's bargaining power since 1994. The declining labour power thus contributed to a lower share of labour in GVA.

Because capital income is more concentrated than labour income, a falling labour share contributes to a deteriorating income distribution. Hence, from a policy point the question would be whether the decrease in labour's share can be arrested *without undermining economic growth*, and if so, how can it be arrested. Merely passing legislation that redistributes income from capital to labour might arrest the falling trend, but if designed and implemented without care, can also undermine economic growth. Nevertheless, recent studies published by the IMF (Ostry, Berg and Tsangarides 2014) and others (e.g. Trubek, Coutinho, and Schapiro (2013) for a study on Brazil, and Bernard and Boucher (2007) comparing a number of OECD countries with various welfare and distribution systems), indicate that measures such as minimum wages, welfare benefits that encourage human capital creation, and more progressive income taxes do not necessarily undermine economic growth. Thus, these measures deserve attention as possible candidates to arrest the falling labour share.

Economists such as Laura Tyson (2014) also argue that stagnating wages (which is linked to a falling labour share) contribute to stagnant aggregate demand and hence secular stagnation. To counter the stagnation Tyson (2014) recommends that workers share in corporate profits. Tyson (2014) cites studies by Blinder, as well as Kruse, Freeman and Blasi who found a positive correlation between profit sharing and productivity.

Furthermore, the discussion above argues that when under pressure to improve profitability, firms may prefer to implement capital-augmenting labour-saving technology with capital and labour being gross substitutes to ensure that capital captures a larger share of income. For labour's share not to decrease means that when implementing capital-augmenting labour saving technology, capital and labour need to

be gross complements, not substitutes. Alternatively, firms need to implement labour-augmenting technology. Therefore, to arrest the decline in labour's share might require improvements and changes in labour's skill levels resulting in labour possessing the types of skills that complement capital, and thereby causing labour and capital to become gross complements instead of gross substitutes. For instance, what are needed are the types of labour skills that complement the increasing use of IT and related technology.<sup>7</sup> Even if firms then implement capital-augmenting technology, it will not be labour-saving technology. With the capital-labour rate of substitution below 1 (meaning capital and labour are gross complements), capital-augmenting technology results in the demand for labour increasing faster than that for capital, which, in turn, results in an increase in labour's share.

Lastly, as the ILO (2013) shows, with the advent of large aggressive and global returns-oriented investment institutions that focus on short-term (quarterly) profits, firms face more pressure to produce higher profits. Probably the most difficult question to resolve from an ideological point of view is the question about what constitutes a *socially fair* rate of return on capital that nevertheless compensates owners of capital for the risk that they bear. Likewise the question remains as to what constitutes *fair* remuneration for work. What complicates these questions is that finding and implementing their answers is not just an intellectual exercise, but, as Rodrik (1999) showed, is tied up with existing national and global institutional setups that define the bargaining power of both labour and capital. A resolution would depend on a broader public debate and indeed, a (sufficient) public consensus on the contents of society's social contract – at present that contract seems incomplete. Whether the national and global institutional setup will allow for the completion of the social contract, remains to be seen.

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<sup>7</sup> An example of capital and labour being gross substitutes, are automatic teller machines (ATMs) that replaced human bank tellers. Similar examples can be found in IT-driven inventory and distribution systems that cut physical shop fronts and replaced human stock pickers and packers with fully automated and digitised warehousing.

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