Republic of South Africa
Systematic Country Diagnostic

An Incomplete Transition: Overcoming the Legacy of Exclusion in South Africa

Background note

What is the Impact of Investment on Labor Income?

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WORLD BANK GROUP

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Introduction

This study investigates empirically the links between exchange rate volatility, investment and the functional distribution of income. The identification of the driving forces underlying the time-series evolution of the proportion of national output accruing to labour, features prominently in policy discussions. Such concerns have been motivated by the recorded decline of labour shares over the past decades. We use data from a cross-section of countries to investigate the determinants of labour income share focusing on the implications of exchange rate volatility and investment.

The relation between the key factors of production -- capital (K) and labour (L)--, and output (that is, $Y = f(K, L)$), has been customarily considered stable (famously noted as a 'stylized fact' by Kaldor, 1957). The bulk of evidence on income inequality to date comes from studies employing measures of personal income inequality, and studies where the Gini index features prominently as a measure of inequality. The downward trend in the labour share at a global level, however, especially during the past 25 years (see for e.g., Karabarbounis and Neiman, 2014), has challenged the notion of stable relative factor shares, and renewed the interest in understanding the determinants of the functional distribution of income.

The observed downward trend in labour shares is often couched in discussions about rising personal income inequality, as profits are less equally distributed than wages. Piketty (2013) popularised this issue by presenting data linking rising personal income inequality with the higher capital share of income.[3] On a similar note, Atkinson (2009) points to the importance of studying the labour share, as it can allow to draw conclusions regarding both the amount of output ultimately accruing to households, and the level of personal income inequality. Falling labour shares essentially indicate that growth in average wages is lagging labour productivity increases, leading to higher corporate profits. So, the incidence of falling labour shares feeds into discussions about social justice and the proper tax-treatment of different sources of income. The relative increase of the capital share of income can also have far-reaching political implications, bolstering the support for more inward-looking and interventionist policies.[4]

In figure 1, we present a bird's eye view of the labour's income share historical evolution globally and in South Africa. Particularly, we plot the time-series evolution of South Africa's labour's share in GDP from 2003 to 2015. The International Labour Organisation (ILO) does not provide such data for South Africa, so we construct our own dataset using the 'LS6' approach proposed by Guerriero (2012). A casual inspection of the labour share time-series evolution suggests that it exhibits notable variability. Moreover, while it has been moderately declining between 2003 and 2008 (dropping by almost 2%), it experiences an increase of almost 4% therafter until the end of 2015. In the same figure, we also plot the average labour share from the other 34 OECD countries of our sample for the same period. Although the averaging mutes some of the country-level variability, we observe a declining trend until 2007 and an almost 2% increase until 2009, a pattern also shared by the South African labour share data. In the next section, we present some background information of the relationship in question, we describe the empirical design of our analysis, and we report the empirical results.

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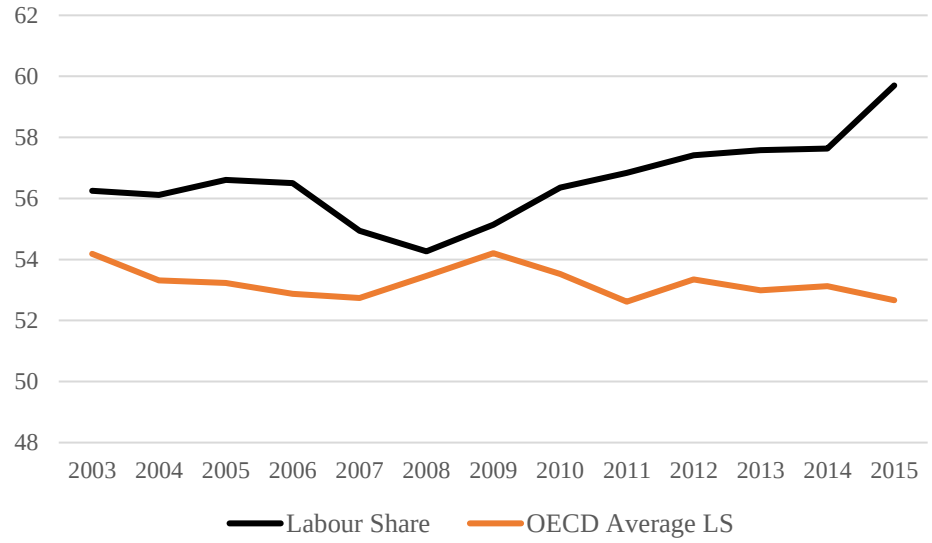
[3] Rognlie (2014) disputes Piketty's (2013) results using net instead real values to measure capital.
[4] See for example, the report prepared for the G20 Employment Working Group in Antalya, Turkey, 26-27 February 2015 by the ILO and the OECD with contributions from the IMF and the World Bank.

Figure 1: South Africa's labour share of income



Notes: This figure shows the labour's share of income in South Africa. It is calculated following the 'LS6' measure recommended by Guerriero, (2012). The data to compute *LS* for South Africa comes from various sources. We use, for instance, UN national accounts for data on SNA 93 items such as compensation of employees and value added net of indirect taxes, as well as data on workforce from ILO's Yearbooks of Labour Statistics. The OECD Average LS shows the average share of income accruing to labour for the rest 34 countries included in our sample.

Tests on the Determinants of Labour Share of Income

Background discussion

Our empirical strategy consists in employing panel regressions of labour shares for a cross-section of countries on a set of variables that theoretically account for labour share variations. The determinants of functional income distribution, identified in extant theoretical work, include the impact of technological change on low-skilled workers' wages, the role of globalisation, financialisation, workers' bargaining power, political capture, the level of mark-ups, and labour market flexibility (see e.g., Lawrence, 2015 and Stockhammer, 2017). Given the low frequency of the data on national accounts we investigate the determinants of labour shares in a panel setting to achieve sufficient degrees of freedom for our estimations. Moreover, pooling the data allows us to explore variation across countries, and to factor into our estimation results the potential cross-correlation of the data.

In the neoclassical paradigm, the elasticity of substitution between capital and labour determines the way in which income is distributed between the two factors of production (see e.g., Lawrence, 2015 for a detailed explanation). Thus, under specific assumptions about the elasticities between capital and labour of different skill levels, technological innovations that are capital-augmenting (i.e., the marginal product of capital is higher than the marginal product of labour) induce firms to substitute labour with capital, and the labour's share of income falls.

Against this background, it has become commonplace to include technological change in reduced-form empirical models seeking to explain the determinants of the functional distribution of income. Karabarbounis and Neiman (2014), for instance, using calibration methods find that the higher capital-labour ratios, as a consequence of technologically-induced lower relative investment prices, account for almost half of the decline in labour income share. It is important, however, to make a distinction between skilled and unskilled labour. Skilled labour is commonly considered to exhibit lower-substitutability/complementarity with capital (Elsby et al., 2013; Lawrence, 2015), motivating, this way, the inclusion of human capital as a factor of production that might explain the functional distribution of income.

Another factor, which might account for the recent decline in labour's share of output globally is the deterioration of labour's bargaining power. The globalisation argument suggests that the bargaining power of employees is thwarted by higher real and financial integration with the world (e.g., Elsby et al. 2013). Unionisation and labour market institutions are also confounding factors that influence the bargaining power of labour, and, thus, its share of income. Previous empirical studies corroborate this view, suggesting that openness, financial globalisation, and welfare state retrenchment account for the declining wage shares (Charpe, 2011; Dünhaupt, 2017; Stockhammer, 2017).

Lawrence (2015) offers an alternative explanation for the decline in labour income share using data from the US manufacturing, mining, and IT sectors. His findings suggest that the decreasing labour share in the US is not due to relative slower growth in wages. Instead, it is due to a combination of insufficient capital formation and labour-augmenting technology. Specifically, based upon estimates showing that labour in the US is to a certain degree complementary with capital in the sectors under consideration, this study asserts that lower capital investment will reduce demand for labour. Less demand for labour, in turn, in conjuction with labour's higher marginal productivity due to labour-augmenting technological progress leads to lower income shares for employees.

Data and Empirical Specification

The total labour income comprises of the total compensation of employees in the corporate, household and government sectors. A major pitfall in studies on the functional distribution of income is the inaccurate measurement of the income shares to different factors of production (see e,g., Gollin, 2002; Karabarbounis and Neiman, 2014; Krueger, 1999). Adjustments for self-employment income, for instance, appear to thwart consistent measurements of household income. To avoid these measurement difficulties the ILO, which publishes a comprehensive dataset about the labour's share for many countries, excludes from total wages the income earned by self-employed and non-wage workers. On a similar note, Karabarbounis and Neiman (2014) focus on the part of income earned only in the corporate sector.

Karabarbounis and Neiman (2014) also exclude the government share of income from their measure of corporate labour share. This adjustment aims to circumvent issues pertaining to the difficulty of pinning down a production function for the government. Stockhammer (2017) adopts a similar adjustment to exclude government spending from his measure of labour income share. Removing the effects of government discretionary policies can facilitate international comparison of labour income share data, which is also the subject of our empirical analysis.

In our study, we use the data about labour income's share in GDP from ILO (*LS* hereafter). Due to unavailability of data for South Africa in the ILO Database, however, we compute the *LS* variable using the 'LS6' measure recommended by Guerriero (2012). The data for computing *LS* for South Africa comes from various sources. We use, for instance, UN national accounts for data on SNA 93 items such as compensation of employees and value added net of indirect taxes, as well as data on workforce from ILO's Yearbooks of Labour Statistics. In our estimations, we also use the private wage share adjustment proposed

by Stockhammer (2017), which removes the government wage share from the total wage share. According to this technique, the private wage share of country *i* for year *t* (that is, $LS^{p}_{i,t}$) and emerges from the relationship $LS^{p}_{i,t} = \left(LS_{i,t} - GC_{i,t}\right)/\left(1 - GC_{i,t}\right)$, where $GC_{i,t}$ is the country's *i* government consumption as a percentage of its GDP at year *t*.

The baseline empirical specification that we use in our estimations is:

$$LS_{i,t} = \alpha_i + b_1 \times LS_{i,t-1} + b_2 \times \sigma.RER_{i,t} + b_3 \times INV_{i,t} + \sum_{c=1}^{6} Z^{c}_{i,t} + \tau_t + \varepsilon_{i,t}. \quad (1)$$

We include a lagged dependent variable to capture the dynamic process of wages. The constant α_i captures the country-specific effects, and τ_t are the time-specific effects. The variable $INV_{i,t}$ stands for country's *i* gross fixed capital formation divided by its GDP at year *t*. The variable $\sigma.RER_{i,t}$ is the standard deviation of the monthly changes in the natural logarithm of the real effective exchange rate of country *i* from February of year *t-1* to January of year *t*, calculated as follows:

$$\sigma.RER_t = \sqrt{\sum_{k=Feb,t-1}^{k=Jan,t} \left(\Delta \ln RER_k - \overline{\Delta \ln RER}\right)^2 \Big/ 11}. \quad (2)$$

$\Delta \ln RER_k$ stands for the first-difference of the natural logarithm of the real effective exchange rate (*RER*) in month *k* of the year (that is, $\ln \mathrm{RER}_{k/12} - \ln \mathrm{RER}_{k-1/12}$). $\overline{\Delta \ln RER}$ is the mean value of all 12 monthly log changes in a country's real effective exchange rate from February of year *t-1* to January of year *t*. Using the standard deviation of exchange rate changes to proxy for exchange rate uncertainty is a common practice in related literature (e.g., Aghion et al., 2009).

The vector of controls $Z_{i,t}$ includes the following variables: GDP growth (*growth*), technological change (*tech*), trade openness (*open*), exposure to the international financial system (*fin*), human capital (*hc*), and union density rate (*ud*). The appendix provides details about the construction and sources of the data. Data for all variables are available for the 34 OECD countries (the data for labour's share of income in Chile are insufficient), and South Africa, a total of 35 countries. The sample we use spans from 1995 to 2015.

Empirical results

We report the results from the estimation of equation (1) for both $LS_{i,t}$ and $LS^{p}_{i,t}$ in table 1. We use two different empirical methodologies for the estimations. In columns *(a)* and *(b)* we present the two-way fixed effects estimators[5] of equation (1), while in columns *(c)* and *(d)* we show the estimators obtained from the system GMM estimator (Arellano and Bover, 1995; and Blundell and Bond, 1998). The system GMM estimation includes both time and fixed effects, allowing the model to capture the dynamic formations of wages, while accounting for possible endogeneity of the explanatory variables.

[5] In all our subsequent estimations, we find that the time effects are jointly significant, and, therefore, should be included in a properly specified model.

Table 1: Determinants of income's labour

	(a)	(b)	(c)	(d)
	Two-way Fixed Effects		System-GMM	
	$LS_{i,t}$	$LS^{p}_{i,t}$	$LS_{i,t}$	$LS^{p}_{i,t}$
$\mathrm{LS}_{i,t-1}$	.975***	.944***	1.08***	1.13***
	(9.99)	*(8.88)*	*(8.19)*	*(7.88)*
$\mathrm{LS}_{i,t-2}$	-.265***	-.266**	-.340***	-.40***
	(-2.80)	*(-2.56)*	*(-2.79)*	*(-3.12)*
$\sigma.RER_{i,t-1}$	-.299	-.472	-.230	-.303
	(-1.42)	*(-1.51)*	*(-1.01)*	*(-0.99)*
$INV_{i,t-1}$	5.35***	8.68***	4.50***	6.29***
	(4.16)	*(4.27)*	*(2.90)*	*(2.80)*
Control variables				
$growth_{i,t-1}$	.142**	.181*	.173**	.254**
	(2.08)	*(2.01)*	*(2.20)*	*(2.36)*
$tech_{i,t-1}$	-.511	.374	-.585	-.107
	(-0.36)	*(0.19)*	*(-0.40)*	(-0.06)
$open_{i,t-1}$	-1.99	-1.65	-1.82	-1.31
	(-1.27)	*(-0.75)*	*(-1.18)*	*(-0.66)*
$fin_{i,t-1}$	-1.88**	-3.19***	-1.85**	-3.08**
	(-2.56)	*(-3.20)*	*(-2.24)*	*(-2.58)*
$hc_{i,t-1}$	-3.93	-7.79	-4.03	-7.72
	(-0.98)	*(-1.50)*	*(-1.02)*	*(-1.60)*
$ud_{i,t-1}$	-1.49*	-2.61**	-1.38*	-2.12*
	(-1.94)	*(-2.26)*	*(-1.82)*	*(-1.84)*
R^2*(%)*	0.74	0.74	-	-
Countries/Obs.	35/503	35/503	35/498	35/498
Sargan [p-value]	-	-	[0.65]	[0.25]
AR(1) [p-value]	-	-	[0.00]	[0.00]
AR(2) [p-value]	-	-	[0.72]	[0.59]

Notes: This table reports the results from the estimation of equation (1) from the main body of the text. The dependent variables are the total labour share ($LS_{i,t}$), and the labour share adjusted for government consumption ($LS^{p}_{i,t}$). The explanatory variables are exchange rate volatility (*σ.RER*), investment to GDP ratio (*INV*), GDP growth (*growth*), the technological progress (*tech*), trade openness (*open*), financial globalisation (*fin*), human capital (*hc*), and union density (*ud*). Details about the definitions and sources of the variables can be found in the aappendix. In columns *(*a*)* and *(b)*, two-way fixed effects estimators are presented with heteroscedasticity and autocorrelation consistent-robust standard errors, while in columns *(c)* and *(d)* one-way system GMM estimators with robust standard errors. The row Countries/Obs. shows the total number of countries and country-year observations included in the estimation of the equations. We report the [*p-value*] of the *Sargan* test of overidentifying restrictions for the null of suitability of the instrument set. AR(1) and AR(2) shows the [*p-value*] of the test for first- and second-order serial correlation in the differenced disturbances of the empirical investment model. */**/*** denote significance at 90%, 95%, and 99% confidence levels respectively.

We find that the lagged capital formation to GDP is positive and statistically significant for both the total labour share and the labour share adjusted for government consumption. This result remains robust for both

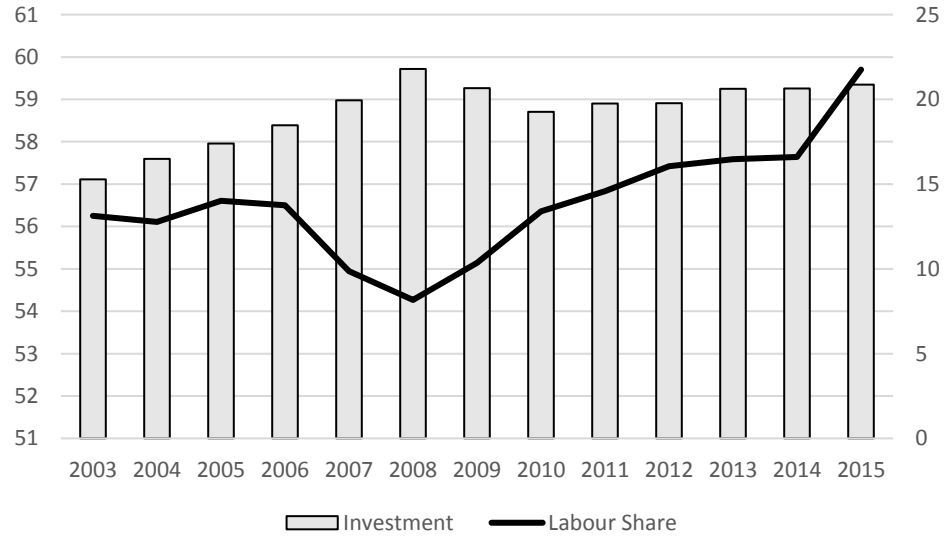
types of estimators used, and suggests that higher investment leads to higher wage shares corroborating Lawrence's (2015) hypothesis on the determinants of labour share.
Two more factors emerging from our results to cause changes in the labour's share of income are the degree of exposure to the international financial system and the union density. Particularly, we find that higher levels of financial globalisation, as measured by the sum of a country's foreign assets and liabilities, are associated with lower labour share. Finally, we find that the degree of union density is negatively associated with labour's share of income. This result is statistically significant only at the 10% level, and, thus, should be treated cautiously.

Conclusion

We pursue an exploratory empirical exercise on the determinants of the functional distribution of income, with a focus on the effects of the exchange rate and investment. We examine the way in which our theoretically motivated variables feed through to labour's share of income in 35 OECD countries during the period 1995-2015. We use a system GMM panel-setting, which can account for the possible endogeneity of the lagged dependent variables. Our study is motivated by investmet and exchange rate volatility concerns of the small open economy of South Africa. Thus, we particularly focus on the potential role of exchange rate volatility and investment in affecting labour shares. While our empirical results do not reveal a statistically significant role for exchange rate volatility, the level of a country's investment emerges as a significant factor driving changes in the labour shares. To the best of our knowledge this is the first study to empirically examine the role of investment in the functional distribution of income, a hypothesis theoretically formulated, by Lawrence (2015).

Casual inspection of figure 2, where we plot South Africa's labour share along with investment confirms the extent to which this average result from the panel estimation also reflects the situation in South Africa. While a definite relationship between these two variables cannot be readily discerned, we can see that after the investment ratio peaks in 2008 the labour share starts to increase. Moreover, the subsequent increases in labour share until 2015 are associated with small increases in investment.

Figure 2: Labour share of income and investment



Notes: This Figure plots the time-series evolution of labour share (solid line) and investment to GDP (columns) for the years from 2003 to 2015 in South Africa.

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APPENDIX

Variable	Description
Total Labour Share (LS)	Labour Income as a percentage of GDP. Data are taken from *ILO SDG* labour market indicators [10.4.1]. For South Africa *LS* data come from authors' calculations, as described in the main body of the text, and the data used come from national sources and the ILO Yearbooks of Labour Statistics.
Adjusted labour share for government consumption. *(LS^p)*	Data is obtained from ILO SDG labour market indicators, and World Bank and OECD national accounts data files. Description of the variable can be seen in the main body of the text.
Investment to GDP (INV)	Gross Fixed Capital Formation from national sources collected from Datastream. GDP data comes from World Bank and OECD national accounts data files.
Exchange Rate Volatility *($\boldsymbol{\sigma}.\boldsymbol{RER}$)*	Real trade-weighted index (not seasonally adjusted) from national sources collected from Datastream. See main body of the text for a description of the variable.
GDP growth *(growth)*	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. World Bank and OECD national accounts data files.
technological change *(tech)*	Value added by Information and Communication industry at current prices divided by GDP. United Nations national accounts data, and national sources where available.
Trade openness *(open)*	Exports of goods and services plus imports of goods and services as a percentage of GDP. World Bank and OECD national accounts data files.
Exposure to the international financial system *(fin)*	Cross-border assets plus liabilities divided by GDP. This measure shows the exposure of a country to the international financial system in terms of their external asset and liability positions. Data to construct this variable are taken from Lane and Milesi-Ferretti (2001) dataset.
Human Capital *(hc)*	Average years of secondary education. United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics.
Government Consumption *(GC)*	General government final consumption expenditure as a percentage of GDP. World Bank and OECD national accounts data files.
Union Density rate *(UD)*	Net union membership as a proportion of wage earners in employment (retired or unemployed union members are excluded). Data on union density rate is obtained from Visser (2013) ICTWSS dataset, and ILO Industrial relations trade union density rate.