



Resource misallocation and total factor productivity in South Africa

Carol Newman (Trinity College Dublin)

John Rand (University of Copenhagen)

Background (1)

- Project: Southern Africa – Towards Inclusive Economic Development (SA-TIED) – see <http://sa-tied.wider.unu.edu/> for details.
- Responsible for WS1: Enterprise development for job creation and growth.
 - WS1: Understanding the opportunities and constraints to private sector development and productivity growth is key for the design of effective policies for job creation and economic growth more broadly.
 - WS1: Deeper understanding of the functioning (economic complexity) of the private sector in SA and the mechanisms through which government private sector policies affect firm-level productivity and job creation.

Background (2)

Overall objectives of SA-TIED - WS1:

- Update and expand the tax administrative and other micro-data available in South Africa for use by researchers.
- Engage in, and support, policy relevant academic research that use these data sources.
- Communicate the findings of the research to all stakeholders including the academic community, policy makers and civil society.
- Build capacity within South Africa in the management and use of large micro-datasets for microeconomic research.

Introduction

- Differences in living standards across countries are closely related to differences in productivity.
- Resource misallocation differences may explain this.
 - Poorer countries may be less effective in allocating resources to their most productive use due to regulation/corruption (institutional failure) or factor markets operate less efficiently (market/information failure)
- Key question: Understanding why some countries have lower aggregate productivity than others is about understanding the underlying causes of factor misallocation.
- Challenge: Require reliable and detailed firm-level data that allow misallocation to be measured and its drivers to be identified.

What we do in this paper....

- We use tax administrative data for South Africa to examine the extent of resource misallocation.
- We examine a selected number of **potential drivers** of misallocation.
 - Access to credit.
 - Policy interventions (R&D allowance, depreciation allowance and “learnership” incentives).
- We zoom in on the **manufacturing sector in South Africa** and quantify the extent to which alleviating distortions would improve productivity.
- We find **significant heterogeneity** in the extent of misallocation along the firm size distribution exist.

Motivation

- Large differences in productivity across countries, and within countries large differences in productivity across firms within sectors.
 - Recent literature highlighting the role of idiosyncratic distortions in explaining differences in aggregate productivity across countries and industries (Bartelsman et al., 2013; Asker et al., 2014).
- TFP changes over time within countries are generally much smaller than the differences in productivity observed across countries suggesting that in specific country contexts misallocation may be **persistent**
 - Understanding the sources of misallocation can provide valuable lessons for policy makers, particularly, in contexts where important policy shifts or regulatory changes are most likely to improve productivity the most.

Literature

- Restuccia and Rogerson (2017) classify potential sources of within-country resource misallocation into three categories
 - Statutory provisions, such as regulation and taxes, that vary with firm characteristics
 - Discretionary provisions that favor or penalize specific firms (e.g. tax breaks or low interest loans, cronyism)
 - Market imperfections (e.g. monopoly power or poorly defined property rights)
- Literature focusing on identifying the sources of misallocation in particular contexts
 - Credit constraints (Caballero et al., 2008; Midrigan and Xu, 2014; Gopinath et al, 2015; Caggese and Cunat, 2013; Brandt et al, 2013)
 - More efficient labor allocation due to less discrimination in the US (Hsieh et al, 2013)
 - Misallocation along the size distribution of firms due to size-dependent distortions (Bento and Restuccia, 2017; Guner et al., 2008; Garicano et al. 2016)
- Dearth of evidence in developing country contexts

Methodological approach

- We follow Hsieh and Klenow (2009) with a standard model of monopolistic competition with heterogeneous firms
 - Distortions that drive wedges between factor marginal products across firms will lower aggregate TFP.
- The optimal allocation of resources would occur where there are **no frictions** in factor markets or distortions that prevent labour and capital from being allocated efficiently across firms.
 - Optimal allocation: Marginal product of labour and capital equal across firms within a sector and revenue productivity should be equated across firms.
- We use differences in revenue productivity across firms within sectors to recover a measure of firm-level distortions.

Methodological approach

- Main equations of interest from HK (2009)

$$\text{TFPQ}_{si} \triangleq A_{si} = \frac{Y_{si}}{K_{si}^{\alpha_s} (wL_{si})^{1-\alpha_s}}$$

$$\text{TFPR}_{si} \triangleq P_{si} A_{si} = \frac{P_{si} Y_{si}}{K_{si}^{\alpha_s} (wL_{si})^{1-\alpha_s}}$$

$$\text{MRPL}_{si} \triangleq (1 - \alpha_S) \frac{\sigma - 1}{\sigma} \frac{P_{si} Y_{si}}{L_{si}} = w \frac{1}{1 - \tau_{Ysi}}$$

$$\text{MRPK}_{si} \triangleq \alpha_S \frac{\sigma - 1}{\sigma} \frac{P_{si} Y_{si}}{K_{si}} = R \frac{1 + \tau_{Ksi}}{1 - \tau_{Ysi}}$$

$$1 + \tau_{Ksi} = \frac{\alpha_s}{1 - \alpha_s} \frac{wL_{si}}{RK_{si}}$$

$$1 - \tau_{Ysi} = \frac{\sigma}{\sigma - 1} \frac{wL_{si}}{(1 - \alpha_s) P_{si} Y_{si}}$$

Methodological approach

1. Compute the dispersion in TFPR, MRPK and MRPL.
2. We quantify the magnitude of the loss associated with resource misallocation (**levels**).
3. Examine how the dispersion has evolved over time and examine heterogeneity across sectors and the firm size distribution (**dynamics**).
4. We perform an ex-post analysis of **potential sources** of the identified misallocation.
 - Determine how much of the misallocation can be explain through observables and determine the potential gains in productivity from addressing them.

Methodological approach (critique)

Problem with this approach is that observed deviations from a hypothetical optimal allocation of resources could be attributed to more than just distortions (Restuccia and Rogerson, 2017):

1. Assumes that all firms in a particular sector in a given year use the same production technology.
2. Adjustment costs or transitory firm-specific shocks could cause deviations in optimal allocations in a particular time period.
3. Deviations from the optimal allocation may be due to measurement error, which is common in firm-level datasets, particularly in developing country contexts (see Bils et al., 2017).

Methodological approach (solution)

We address these concerns in the following ways:

1. Examine heterogeneity across the size distribution. We treat each size group, in each sector, in each time period, as having a separate production technology and examine the extent of misallocation evident within each group.
2. Exploit panel structure of data and consider lags of the policy variables to capture the extent to which differences in TFPR are associated with adjustment costs.
3. Focus on the proportion of the variation in TFPR that we can actually explain using the policy variables to abstract from measurement error and compute how much of the predicted loss in productivity due to misallocation could be alleviated in the absence of these distortions.

South African context: The policy variables

- Legislative provisions in place to encourage investment, job creation and entrepreneurship.
 - income exclusions, exemptions for tax purposes, special tax rates and tax credits.
- **Revenue forgone due to legislative provisions estimated to account for around 3% of GDP.**

South African context: policy variables

Section 11D Research and development incentive:

- Introduced in 2006
- Objective to encourage investment in R&D
- Tax deduction equal to 150 per cent of expenditure incurred directly for R&D
- Accelerated depreciation deduction for capital expenditure used for R&D

- This incentive favours the use of capital over labour and may bias the efficient allocation of resources across firms within sectors where there are different levels of R&D intensity

- The incentive favours large firms so it may create asymmetric distortions along the firm size distribution that could contribute to misallocation

South African context: policy variables

Section 12H Learnership allowances:

- Introduced in 2001
- Provides deductions to employers for qualifying learnership agreements
- Incentive to employers to encourage training, skills development and ultimately job creation
- The number of firms that claimed under the annual allowance reached almost 1,800 in 2013, with a total amount claimed equal to R1.8 billion

- This incentive will likely motivate firms to hire more workers or at the very least encourage training opportunities to existing employees making them more mobile

- This could facilitate a more efficient allocation of labour across firms within sectors

South African context: policy variables

Access to credit:

- Lending and financial services infrastructure of SA compares favourably to other upper middle income countries
- However, larger firms enjoy easy access to credit financing which is not the case for businesses operating at a smaller scale
- Small businesses in South Africa tend to struggle to obtain access to financing (Finmark, 2010; GEM, 2015)
- Firm size heterogeneity in credit access has been attributed to:
 - Lack of information and high search costs for small businesses
 - Limited credit history and collateral constraints (Wellalage and Locke, 2016)
 - Particular constraints among disadvantaged groups due to low levels of education (inability to present viable business plans)

Data

- Tax administrative data collected by SARS (2010-2015)
- South African Corporate Income Tax (CIT) data collected annually and are based on self-reported corporate income tax returns
- The database does not include information on the number of persons employed in the firm so this information is gathered from the PAYE tax data records that can be matched to the firms in the CIT database
 - Output: value added which is deflated by the value added at basic prices deflator
 - Labour: total number of employees of the firm where each employee is weighted by the total number of periods they work at the firm
 - Capital: fixed assets of the firm deflated using the manufacturing industry fixed capital investment deflators. To address lumpiness in fixed assets we use the two-year average of total assets in line with Hsieh and Klenow's (2009) approach.

Calibration

- Rental price of capital set to 0.1 which is the sum of the real interest rate and the depreciation rate
- The elasticity of substitution is set at 3 to simplify the analysis which is a lower bound in terms of the typical values found in empirical studies examining the substitutability of manufacturing goods
- The elasticity of labor is allowed to vary across sectors and is computed as the sector average ratio of real wages in real value added. The average across all sectors is 0.44
- The elasticity of capital is one minus the elasticity of labour
- Using these parameters and the data we estimate MRPK, MPRL and TFPR
- We trim the top and bottom 1 per cent of the distribution of TFPR to eliminate outliers.



Misallocation

Dispersion of TFP, MRPK and MRPL

	2010	2011	2012	2013	2014
lnTFPR					
S.D.	0.745	0.775	0.803	0.944	0.858
75-25	0.876	0.939	0.965	0.995	1.023
90-10	1.794	1.873	1.929	2.048	2.067
Firms	29,734	30,366	29,254	28,635	24,607
lnMRPK					
S.D.	1.324	1.566	1.513	1.651	1.630
75-25	1.538	1.670	1.697	1.729	1.747
90-10	3.114	3.302	3.350	3.497	3.528
Firms	29,734	30,366	29,254	28,635	24,607
lnMRPL					
S.D.	0.575	0.748	0.658	0.649	0.693
75-25	0.550	0.521	0.556	0.633	0.626
90-10	1.151	1.119	1.163	1.350	1.335
Firms	29,734	30,366	29,254	28,635	24,607

Variance decomposition of TFPR

	2010	2011	2012	2013	2014
Variance lnTFPR	0.555	0.601	0.644	0.891	0.736
Contribution of:					
lnMRPK	0.553	0.773	0.717	0.863	0.839
lnMRPL	0.061	0.107	0.081	0.079	0.091
Covariance	-0.059	-0.279	-0.154	-0.051	-0.194

$$\text{var}(TFPR) = \alpha_s^2 \text{var}(MRPK) + (1 - \alpha_s)^2 \text{var}(MRPL) + 2\alpha_s(1 - \alpha_s) \text{cov}(MRPK, MRPL)$$

Comparison with other countries

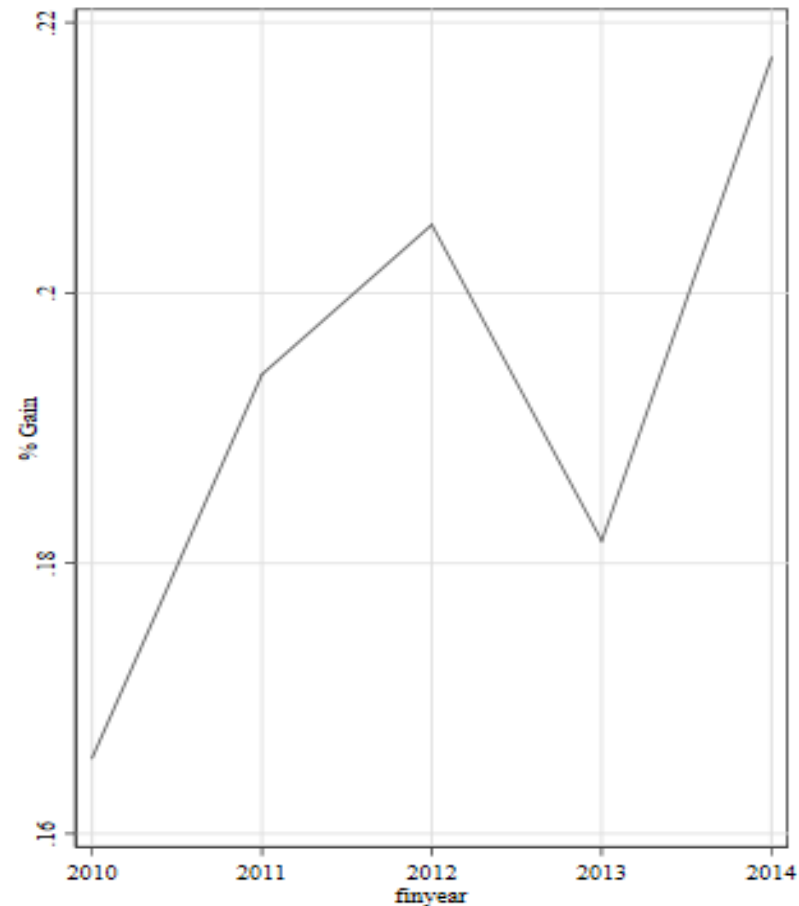
	Std. dev. InMRPK	Std. dev In MRPL
South Africa (2010-2014)	1.537	0.665
Austria (1996-2013)	1.087	1.031
Belgium (1996-2013)	1.153	1.094
France (1996-2013)	1.001	0.950
Germany (1996-2013)	1.076	1.021
Netherlands (1996-2013)	1.142	1.083
Eastern Europe (1996-2013)	1.306	1.282

Note: The 10 Eastern European countries are Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Ukraine. Source: Larrain and Stumpner (2017)

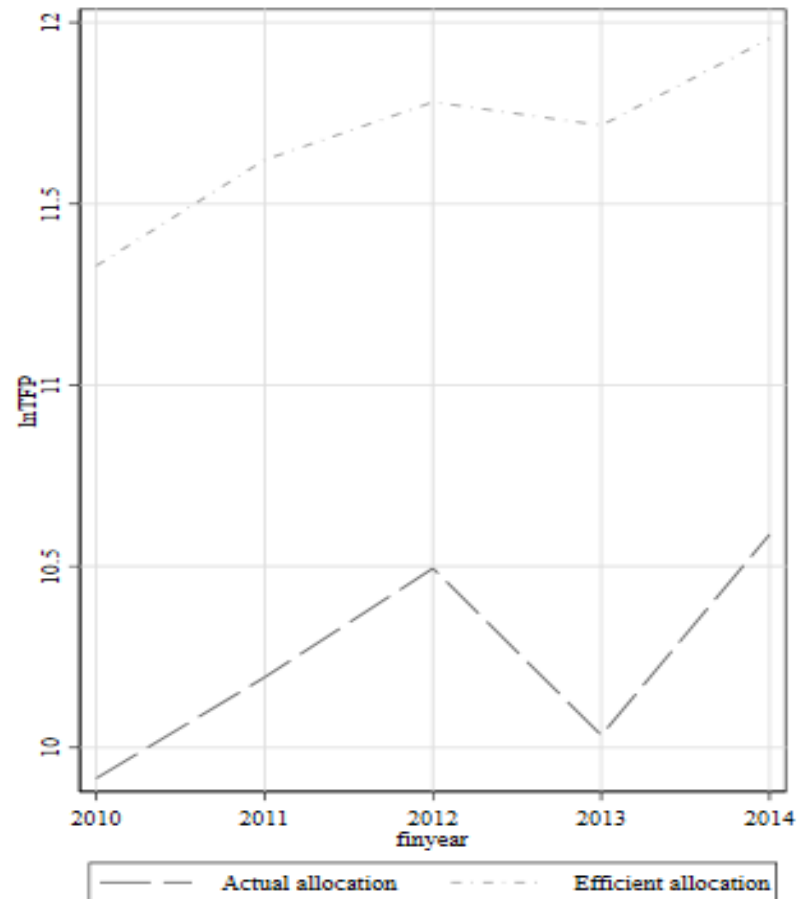


Impact of misallocation on productivity

Gain in TFP: efficient vs actual allocation of resource



lnTFP: efficient vs actual allocation of resources





Sources of misallocation

How much of the misallocation are we actually explaining?

	(1)	(2)	(3)
	lnTFPR	lnMRPK	lnMRPL
Baseline R ²	0.074	0.060	0.044
Baseline + credit R ²	0.186	0.199	0.049
Baseline + credit + policy R ²	0.187	0.200	0.050
Baseline + credit + policy + lags R ²	0.202	0.214	0.053

Potential productivity gains through addressing misallocation due to policy variables

	2010	2011	2012	2013	2014
Aggregate gains	16.6	19.4	20.5	18.2	21.7
Gains through policy	1.9	2.2	2.3	2.0	2.4

Conclusion

- We use tax administrative data to examine the extent of resource misallocation in the South African context.
 - Evidence of significant misallocation of labor and capital in the SA manufacturing sector: Reallocation could lead to a potential gain in aggregate TFP of between 15% and 22%
- We focus on how specific distortions affect the allocation of capital and labor across firms (access to credit, R&D incentive, Learnership allowance, Depreciation allowance).
 - Access to credit is the main driver of misallocation, policy measures explain very little
 - Potential productivity gains of approximately 2 per cent per annum
- We find considerable heterogeneity across the size distribution with most misallocation occurring among micro and small sized firms
 - These readjustments would benefit the smaller end of the size distribution most



UNITED NATIONS
UNIVERSITY
UNU-WIDER



national treasury

Department:
National Treasury
REPUBLIC OF SOUTH AFRICA



IFPRI

INTERNATIONAL
FOOD POLICY
RESEARCH
INSTITUTE



**planning, monitoring
& evaluation**

Department:
Planning, Monitoring and Evaluation
REPUBLIC OF SOUTH AFRICA



the dti

Department:
Trade and Industry
REPUBLIC OF SOUTH AFRICA

