Resource misallocation and total factor productivity: manufacturing firms in South Africa

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Introduction

Resource misallocation occurs where distortions exist in an economy that prevent the flow of capital and labour from less productive to more productive firms leading to a lower level of TFP than could otherwise be achieved

Such misallocation of labour and capital resources can greatly reduce aggregate productivity in an economy

<u>Key questions:</u>

1. To what extent is capital and labour misallocated across firms within manufacturing sub-sectors in South Africa?

2. Is misallocation related to the size distribution of firms?

3. To what extent do legislative provisions in place to encourage investment, job creation and entrepreneurship impact on the efficient allocation of capital and labour?

4. To what extent do credit constraints lead to misallocation?

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

- Hsieh and Klenow (2009) calculate potential TFP gains of 30 to 50 per cent in China and 40 to 60 per cent in India if resources were reallocated to equalize marginal products to US levels

- Bartelsman et al. (2013) show significant variation across countries in the extent of within-industry misallocation explained by adjustment frictions and distortions

- Asker et al. (2014) find that a very large proportion of the cross-industry and cross-country variation in the dispersion of the marginal revenue product of capital can be explained by distortions

- Calligaris et al. (2016) for evidence from Italy, Garcia-Santana et al. (2016) and Gopinath et al. (2014) for evidence from Spain, Dias et al (2014) for evidence from Portugal, Bellone and Mallen-Pisano (2013) for evidence from France, Crespo and Segura-Cayuela (2014) for evidence from Germany

Aside from Hsieh and Klenow (2009) very little evidence on emerging markets where arguably distortions are potentially a lot greater

Motivation

An emerging literature also exists identifying the channels through which misallocation can occur:

- The role of credit constraints in creating distortions that lead to a misallocation of capital across firms (Caballero et al., 2008; Midrigan and Xu, 2014; Gopinath et al, 2015; Caggese and Cunat, 2013)

- Hsieh et al (2013) attribute part of the reduction in misallocation in the US since 1960 to better allocation of talent due to a reduction in gender and race discrimination

- Labor may also be misallocated due to policies that affect the size distribution of firms (Guner et al., 2008; Bento and Restuccia, 2015)

South African Context

A number of legislative provisions in place to encourage investment, job creation and entrepreneurship in SA

These include income exclusions, exemptions for tax purposes, special tax rates and tax credits

In total, tax expenditures are estimated to account for around 3% of GDP in SA

The breakdown for the 2010-2014 period is as follows:

Corporate income tax				
Small business corporation tax savings	1 480	1 551	1 868	2 232
Reduced headline rate	*1 460*	*1 531*	*1 843*	*2 206*
Section 12E depreciation allowance	*20*	*20*	*25*	*26*
Research and development	1 216	1 131	360	745
Learnership allowances	1 368	1 219	758	966
Strategic industrial projects[3]	294	27	51	–
Film incentive	185	574	–	354
Urban development zones	298	975	210	314
Total corporate income tax	**4 840**	**5 477**	**3 247**	**4 611**

South African Context

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

- Large firms tend to benefit more from this type of incentive

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

Section12H 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

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)

Methodological Approach

- Hsieh and Klenow (2009)

- We examine the extent to which capital and labour are allocated efficiently across firms within manufacturing sub-sectors in South Africa by examining the distribution of marginal revenue product of capital (MRPK), the marginal revenue product of labor (MRPL) and the Revenue Total Factor Productivity (TFPR) across firms

- Explore the misallocation of capital along the firm size distribution and identify firm size categories where most misallocation is occurring

- Examine the impact of capital and labour biased incentives offered by the South African government to firms on the allocation (or mis-allocation) of capital and labour and the resulting impact on TFP

- Examine the extent to which access to credit is an indicator of misallocation

Data

Tax administrative data collected by the South African Revenue Services for the 2009–14 period

The primary data source is the South African Corporate Income Tax (CIT) data which are collected annually and are based on self-reported corporate income tax returns

These data include information on sales, capital and other financial indicators, as well as information on access to government incentives

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.

Average take-up rate of the capital and labour incentives

Sector	n	Learnership	R&D	Depreciation
Food	16,269	1.01	2.04	2.28
Beverages	2,002	2.53	3.07	4.28
Textiles	5,242	1.47	1.62	1.84
Apparel	4,225	1.54	0.42	1.31
Leather	2,021	1.70	1.85	2.24
Wood	3,978	0.45	0.40	1.73
Paper	2,924	1.81	1.21	3.63
Printing	9,548	1.07	0.71	2.10
Coke & refined petrol	4,168	0.90	0.81	1.52
Chemical	7,869	1.86	4.22	2.97
Pharmaceuticals	644	5.01	8.85	7.08
Plastics	4,654	1.21	2.55	2.59
Other minerals	6,193	0.75	1.54	2.64
Basic metals	7,558	2.21	1.77	2.30
Other metals	17,816	1.48	1.35	1.62
Computer, electronic	2,746	0.44	2.25	1.60
Electrical machinery	3,830	1.77	2.26	1.74
Machinery nec	18,819	0.95	1.68	1.66
Motor vehicles	23,966	2.74	0.74	1.63
Transport equipment	3,286	2.06	1.13	3.16
Furniture	5,620	0.32	0.41	1.53
Other manufacturing	19,049	1.39	3.13	2.32
Total	172,427	1.50	1.72	2.07

Analysis

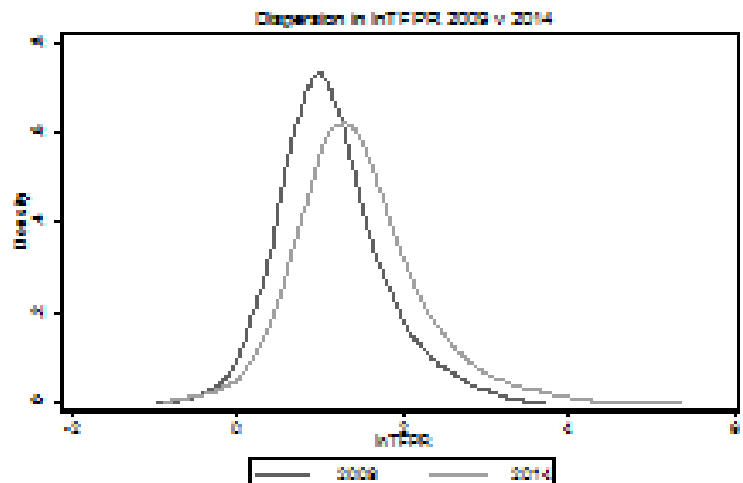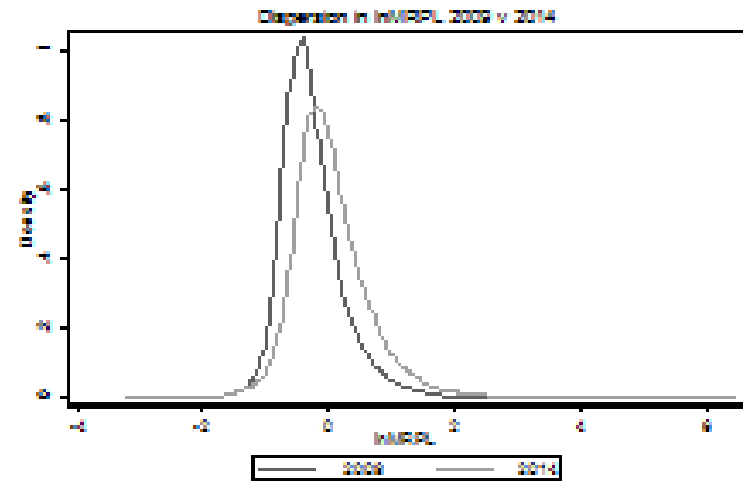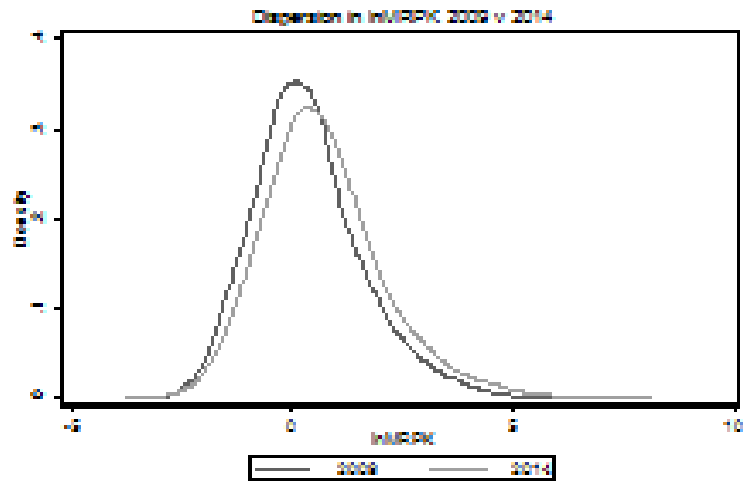# **Figure 1:** Dispersion in TFPR, MRPK and MRPL 2009 vs 2014

Figure 2: Trend in standard deviation of MRPK, MRPL and TFPR within sectors over time
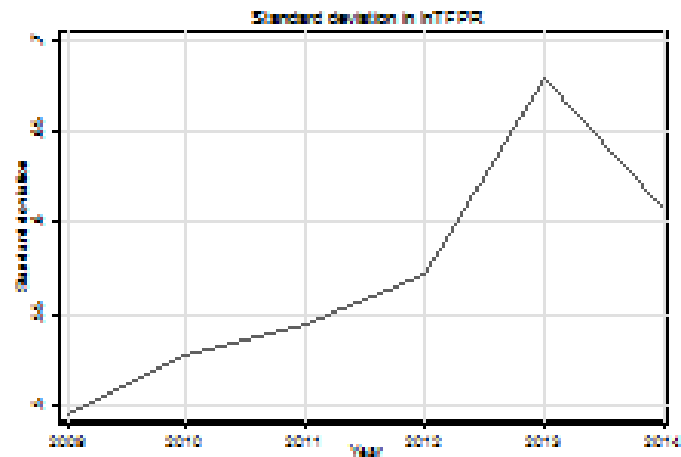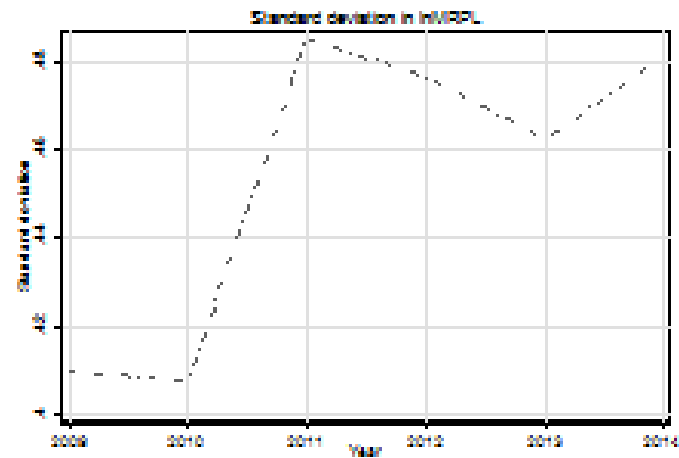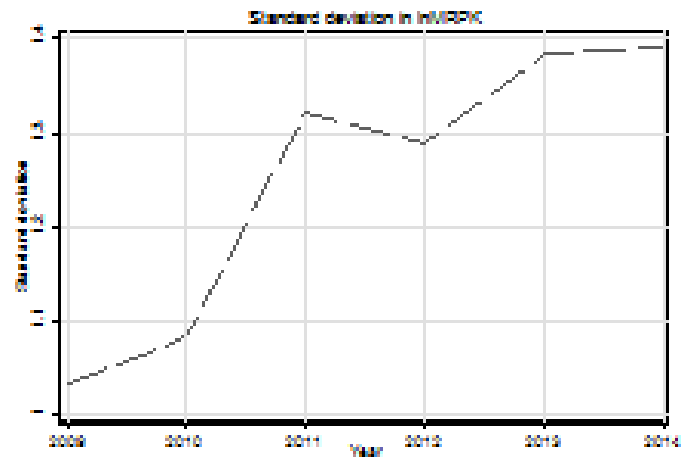
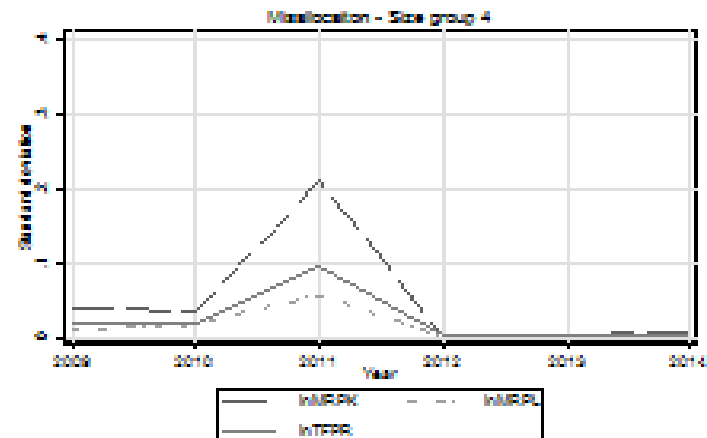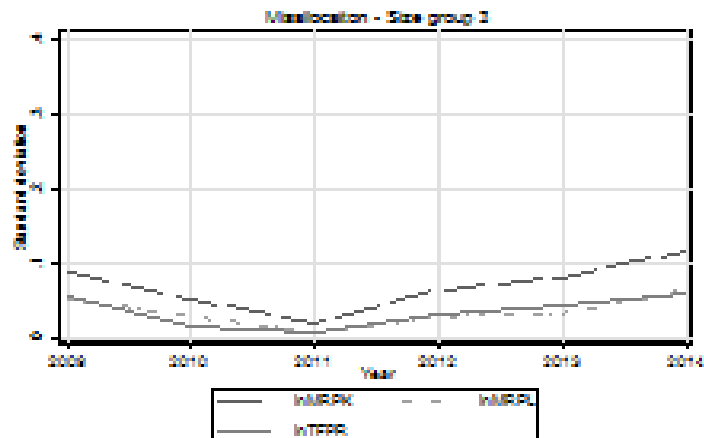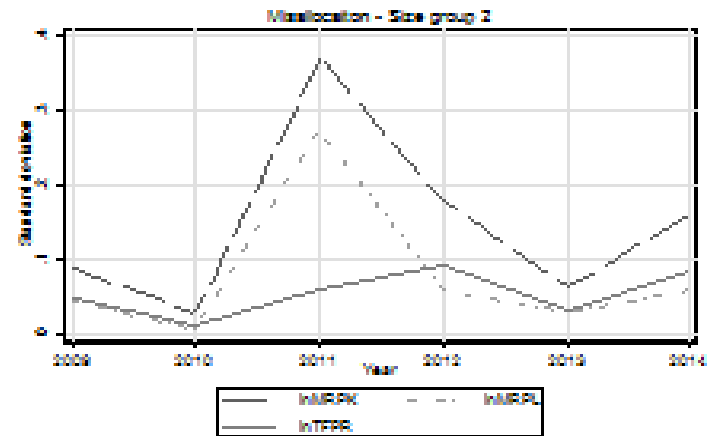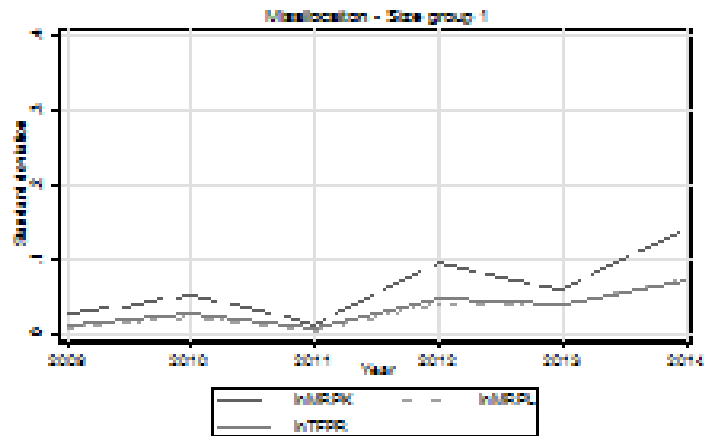# Figure 4: Misallocation of capital and labour across firms within sectors in specific size groups

Markers of misallocation

We use the methodology proposed in Calligaris et al. (2016) to explore the markers of misallocation

In the first stage we estimate the following reduced form equation:

$$\ln \frac{TFPR_{ist}}{TFPR_{st}} = b_0 + b_1 X_{ist} + t_t + q_s + e_{ist}$$

The sum of the square of the residuals can be thought of as an estimator of the variance in relative TFPR once observables are controlled for and so is a good proxy for misallocation at the firm level

In the second stage we estimate:

$$\hat{\varepsilon}^2_{ist} = \beta_0 + \beta_1 X_{ist} + \tau_t + \theta_s + v_{ist}$$

Higher values of the dependent variable imply a greater contribution by the firm to misallocation in the sector

Table 1: Markers of misallocation

	(1) TFPR	(2) MRPK	(3) MRPL
Learnership Allowance	-0.014	-0.072	-0.002
R&D Allowance	0.071***	0.184*	0.065
Depreciation Allowance	-0.012	-0.132***	0.034
Access to Credit	0.012***	0.069***	0.021***
size2	-0.108***	-0.378***	-0.098***
size3	-0.125***	-0.485***	-0.050***
size4	-0.152***	-0.534***	-0.063***
year10	0.012**	-0.033	-0.033***
year11	0.029***	0.038*	-0.056***
year12	0.066***	0.155***	-0.027***
year13	0.118***	0.282***	0.058***
year14	0.140***	0.363***	0.111***
Observations	139,796	139,796	139,796

Table 2: Markers of TFPR dispersion by size category

	(1)	(2)	(3)	(4)
	TFPR 1	TFPR 2	TFPR 3	TFPR 4
Learnership Allowance	-0.192***	0.011	-0.011	-0.023
R&D Allowance	0.066	0.067*	0.019	0.047
Depreciation Allowance	-0.026	-0.014	0.002	-0.048**
Access to credit	0.013***	0.016***	0.008***	-0.021***
Observations	62,152	58,469	17,032	2,143

Table 3: Markers of MRPK dispersion by size category

	(1) MRPK 1	(2) MRPK 2	(3) MRPK 3	(4) MRPK 4
Learnership Allowance	-0.870***	-0.037	-0.096	-0.121
R&D Allowance	-0.020	0.215	-0.054	-0.029
Depreciation Allowance	-0.252**	-0.193**	-0.088	-0.204***
Access to credit	0.085***	0.071***	0.040***	-0.074***
Observations	62,152	58,469	17,032	2,143

Table 4: Markers of MRPL dispersion by size category

	(1)	(2)	(3)	(4)
	MRPL 1	MRPL 2	MRPL 3	MRPL 4
Learnership Allowance	-0.156***	0.090**	-0.015	-0.018
R&D Allowance	0.005	0.005	0.101	0.066
Depreciation Allowance	0.067	0.061	0.057	-0.038
Access to credit	0.020***	0.026***	0.021***	0.006
Observations	62,152	58,469	17,032	2,143

Key markers of misallocation

- Misallocation is most prevalent among the smallest size group

- There is some evidence of higher misallocation of labour among the largest firms compared with medium sized firms

- Credit constraints significantly add to the misallocation of capital and labour among micro, small and medium sized firms but appears to reduce misallocation among the largest firms

- The Learnership Allowance reduces the misallocation of labour and capital among the smallest firms

- The Depreciation Allowance reduces the misallocation of capital across the size distribution

- The R&D Allowance does not appear to affect the allocation of capital and labour

Policy conclusions

- Learnership, Depreciation and R&D Allowances are not having a distortionary effect, if anything they are leading to a more efficient allocaiton of resources across firms (within sub-sectors)

- More research needed into understanding the mechanisms underlying the distortionary effects of access to credit

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Thank you
Questions and comments most welcome