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Firm Dynamics, Job Outcomes, and Productivity

African Formal Businesses, 2010–14

Reyes Aterido
Ayanda Hlatshwayo
Duncan Pieterse
Andre Steenkamp

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Abstract

The formal private sector has a key role to play in fostering growth and reducing unemployment in South Africa—strengthening its performance is therefore critical. This paper looks at firm behaviour, firm entry and exit, job outcomes, and productivity dynamics using firm-level administrative data for South Africa. It is the first paper to benchmark employment and productivity dynamics against various comparator countries for which similar analysis has been undertaken. The paper finds that South Africa has an aged private sector with low firm dynamism and characterized by large firms that hold a large share of employment and revenue, although they are not as productive as micro firms and pay lower wages on average. The paper also finds that job creation is concentrated predominantly in incumbent firms, which are old and large, and job creation from entry and exit is negligible. The static and dynamic productivity decompositions raise a concern that although productive efficiency is gained, it is at least in part at the expense of labor. Large firms are not exploiting economies of scale, and particularly unproductive large firms may drive the weak performance of the private sector. Relatively high wages in South Africa could be partly explained by the inefficient use of labor and negative correlation between productivity and size. Likewise, these larger firms could be responsible for the negative direct impact on jobs of firms raising productivity.

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Firm Dynamics, Job Outcomes, and Productivity: South African Formal Businesses, 2010–14[1]

Reyes Aterido, World Bank
Ayanda Hlatshwayo, National Treasury of South Africa
Duncan Pieterse, National Treasury of South Africa
Andre Steenkamp, National Treasury of South Africa

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JEL codes: D22, D24, D61, E24

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1. Introduction and background

South Africa's economy continues to struggle with slow growth, high levels of inequality and unemployment. The South African economy grew by an annual average of 1.9 percent between 2010 and 2016, well below the levels required to address structurally high levels of unemployment (National Treasury, 2017). Exploring dynamics at the firm level is critical to strengthening our understanding of the performance of the private sector and its contribution to growth. In this study, administrative tax data, which are increasingly being used for empirical research, are used to explore firm, employment and productivity dynamics trends for South African formal businesses.

The level of detail available in administrative tax data allows for examination of sectors in unprecedented detail as analysis can proceed at the level of each individual firm. An analysis of total factor productivity (TFP) in South Africa using these data yielded the first firm-level productivity estimates for South Africa's manufacturing sector (see Kreuser and Newman, 2018).[2] Other studies, such as Edwards et al. (2018), found that firms that engage in international trade employ more people, pay higher wages, have more capital, and exhibit higher levels of productivity.[3]

This paper explores firm-level dynamics in South Africa by providing a detailed set of descriptive data along with regression analysis of employment, wage, productivity, and other firm dynamics. A key contribution is the international firm-level data comparisons used to benchmark South African data. These comparisons provide valuable insight into the structure, performance and peculiarity of the South African economy in comparison to selected advanced and developing countries.

Evolving policy context

The South African economy developed around the mining industry, exploiting the country's rich resource endowment. This led to the underdevelopment of downstream industries – as cheap energy provided by the state electricity utility allowed for the exploitation of South Africa's mineral wealth and the development of capital-intensive upstream industries (Roberts and Rustomjee, 2009). The apartheid government's interventions in telecommunications, mining, agriculture, and energy led to the creation of large firms and high levels of market

[2] Two key findings were that: (i) productivity varies strongly by firm size, with larger firms being more productive; and (ii) firms with linkages to international markets, through importing or exporting goods, are more productive than other firms.

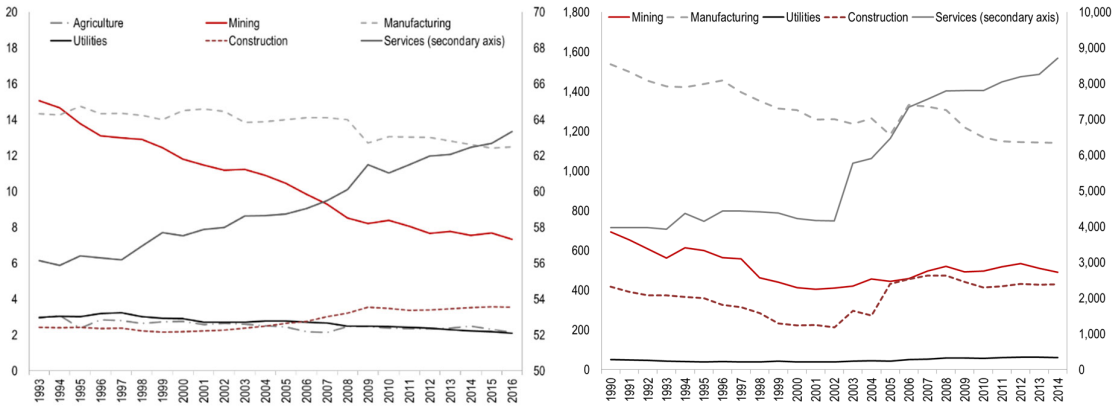
[3] A special issue focusing on a collaborative effort between the National Treasury and the South African Revenue Service (SARS) to employ administrative record data from SARS for economic policy analysis was published by the South African Journal of Economics (https://onlinelibrary.wiley.com/doi/abs/10.1111/saje.12183).

concentration (Faulkner and Loewald, 2008). These barriers to entry distort market structure and reduce the incentives for productivity and innovation, which directly inhibit economic growth.

Following South Africa's reintegration into the world economy, there have been clear sectoral shifts in GDP and formal employment. South Africa has become an increasingly services driven economy: its share of GDP increased from 56.2 percent in 1993 to 62.7 percent in 2015 (Statistics South Africa, 2017).[4] This has been driven by mainly an increase in the financial services sub-sector. Domestic consumption of services has doubled over the last two decades and currently accounts for the largest share of consumption (43.9 percent in 2016).[5]

Services exports, have grown substantially in recent years: despite a slow start, the volume of services exports more than quadrupled over 1993-2013 and their share in real export volumes more than doubled, reaching 18 percent of total exports in 2013 (van Seventer, 2015). The growth in services exports is also positive for other parts of the economy. The rapid spread of South African supermarket chains throughout Africa has greatly facilitated exports of South African foods and consumer products (das Nair and Chisoro, 2015). The competitiveness of South African exports of mining equipment is boosted by service contracts that assure the equipment will remain operational (Fessehaie, Rustomjee, and Kaziboni, 2016).[6]

Figure 1: Share of GDP by economic activity (%) and Formal employment trends by economic activity ('000)



Source: Statistics South Africa (1st panel). Statistics South Africa historical QLFS series (2nd panel). Note that employment in agriculture is not provided in this long term data series.

Mining's direct contribution to GDP has gradually declined from 15 percent in 1993 to 7.3 percent in 2016 and manufacturing's contribution to GDP declined modestly from 14.3 percent

[4] Value added at constant 2010 prices.
[5] Final consumption expenditure by households: constant 2010 prices (Statistics South Africa, 2017).
[6] The rising importance of services over time as a country develops is not unique to South Africa. Fedderke (2014) shows that as a country becomes wealthier, demand shifts from primary and secondary sectors where the income elasticity of demand is below one to tertiary sectors where the income elasticity of demand is above one.

in 1993 to 12.5 percent in 2016 (Statistics South Africa, 2017). Mining remains a vital sector in terms of job creation, indirect linkages to other industries through upstream procurement and downstream value addition, significant foreign exchange generation and the country's balance of payments. In 2016, total capital investment declined for the first time since 2010, with large decreases in mining and manufacturing (National Treasury, 2017). Although the agriculture sector accounts directly for only around 2.5 percent of GDP, its linkages to the informal economy, rural areas and other upstream (agricultural inputs) and downstream (food processing) activities, increases its overall value to the economy considerably.

The changing sectoral composition of employment mirrors the structural transformation that has occurred on the production side. Although mining employment recovered somewhat during the commodities boom, employment in the rest of the economy grew substantially faster. Mining's employment share declined from 6.2 percent in 1995 to 3.2 percent in 2015 and manufacturing's share of total employment declined gradually from 18.3 percent in 2008 to 14.3 percent in 2016. The services sector's increased contribution to GDP has been matched by a significant increase in employment, particularly from 2001 onwards. Services are almost completely supplied by the domestic market and used mostly in domestic production and expenditure. Thus, services sectors tend to have higher growth and employment multipliers than goods markets (Gabriel, 2016). Services' disproportionate absorption of low skilled workers makes the growth of services sub-sectors a potential driver of employment growth (Altman et al., 2005).

Rapid technology change in production is creating an increasing bias towards skills-intensive employment demand (Rodrik, 2008). Historical underinvestment in education for the majority of South Africans have contributed to a lack of adequate skills in the labor force (Faulkner and Loewald, 2008). In a skills constrained economy, skills biased technological change has the unintended consequence of raising wage premiums (see Wittenberg, 2014) and reinforcing wage inequality.

Gabriel (2016) uses a new social accounting matrix (SAM) to look at structural change and productivity growth rates by sector in South Africa. He finds that on aggregate, productivity grew by approximately 1.4 percent per annum from 1993-2013, however, nearly all of that growth occurred prior to 2008 – with significant variation by sector. There are no sectors that exhibit both high productivity growth and high employment growth - mining and electricity both exhibit negative productivity growth. Manufacturing sectors tend to exhibit positive productivity growth but negative employment growth while services sectors tend to show positive employment growth but low rates of productivity growth.

Economywide trends in TFP over the period 1990-2015 reveal that South Africa has mostly lagged behind its developing country peers, and recently even experienced a contraction in TFP growth. By exploring firm-level dynamics using tax administrative data, we are able to gain further insights into the structural changes observed on an aggregate level. This allows for a better understanding of firm, employment and productivity dynamics.

The paper is structured into five sections. Section 2 provides a brief overview of the SARS administrative tax data. Section 3 discusses where formal wage workers work in terms of firm characteristics such as size, age and economic activity. In Section 4 we look at which type of firms are creating the most jobs. Section 5 focuses on dynamics between productivity growth and jobs and the efficiency of factor allocation. Section 6 sets out the regression analysis and section 7 provides the results. Conclusions and policy implications are discussed in section 8.

2. Data

We use the SARS-National Treasury panel (herein referred to as SARS-NT panel), which is an unbalanced panel data set of administrative tax data from 2010-2014.[7] The panel consists of four merged sources of administrative tax data: (i) company income tax (CIT) records from registered firms who submit tax forms; (ii) employee records from employee income tax certificates submitted by employers; (iii) value-added tax records from registered firms; and (iv) customs records from traders (Pieterse et al., 2018). The SARS-NT Panel constitutes a unique source for the study of firm-level behavior in South Africa, as it is at the level of individual firms and individuals, and provides a comprehensive, disaggregated picture of the economy in recent years.[8] The CIT records contain firm characteristics, such as the sector in which a firm operates, financial information from their income statements and balance sheets, and tax information. The employee records contain all employee related incomes, deductions, taxes, and payments made by the firm (such as skills development levy and unemployment insurance fund payments).

Table 1: Key summary statistics

	2010	2011	2012	2013	2014
Total number of workers	4 060 897	5 104 117	5 378 704	5 516 065	5 133 552
Total number of firms	122 516	130 387	129 860	126 484	108 150
Mean number of workers per firm	33.15	39.15	41.42	43.61	47.47
Mean firm age	12.02	12.70	13.38	14.06	14.92
Mean sales per worker (R'000)	10.42	9.87	9.86	9.87	10.21
Mean value added per worker (R'000)	3.46	3.49	3.53	3.52	3.58

Source: SARS-NT Panel (own calculations).

Table 1 above highlights the key summary statistics – variable definitions are provided in the data appendix. The SARS-NT panel covers formal workers employed by registered firms in the private sector.[9] From 2010 to 2014, the total number of workers ranges from 4 million to 5.5 million. The number of firms varies over the period, peaking at 130,387 firms in 2011. The average number of workers per firm increased from 33.15 in 2010 to 47.47 in 2014. Half the firms in our panel employ 8 or fewer employees, emphasizing the large number of small formal firms in terms of employment size present in the panel. The average firm age increased from

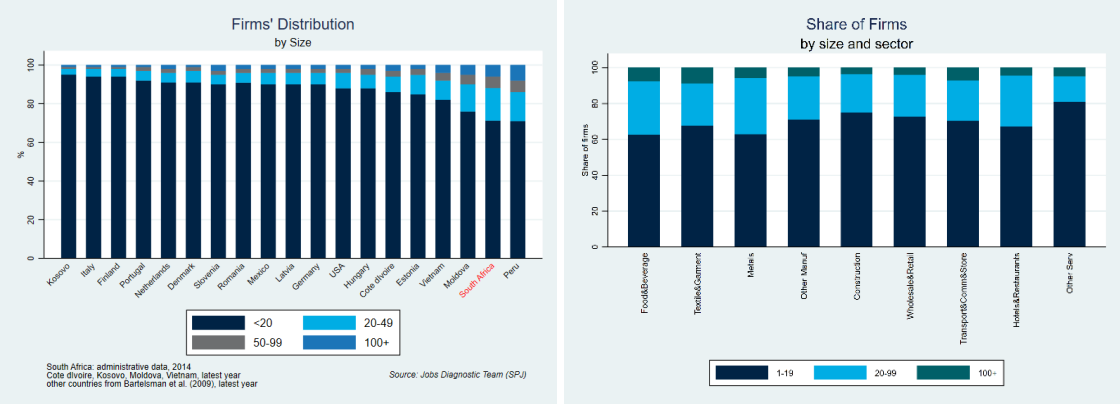
[7] We use the same panel as Pieterse et al. (2018), Kreuser and Newman (2018) and Edwards et al. (2018). Differences across key variables are due to differences in how these variables are defined. Refer to the data appendix for further detail.
[8] See Pieterse et al. (2018) for a detailed explanation of the key sources of tax data used to create the panel, questions that arise as a result of panel construction, potential biases in the resulting data and a comparison to other data sources.
[9] Firms that do not report wage employees are excluded.

12.02 years in 2010 to 14.92 years by 2014 and half the firms are 10 years or older, indicative of a relatively aged formal sector. Average sales per worker declined in 2011, but then increased again in 2014. Average value added per worker marginally improved between 2010 and 2014, showing a marginal improvement in aggregate productivity. A list of key variables including their means and standard deviations over the 2010 to 2014 period is provided in Table A1 in the data appendix.

3. Where do wage workers work?

Around 70 percent of all firms in South Africa are micro firms that employ fewer than 20 employees. As shown in the first chart in Figure 2, with the exception of Peru, other comparator countries have considerably higher proportions of micro firms. The services sector has the highest proportion of micro firms – close to 80 percent – followed by the construction sector at around 75 percent (second chart in Figure 2). In each sector, more than 60 percent of firms are micro firms that employ fewer than 20 employees.

Figure 2: Distribution of firms by size and country and distribution of firms by size and sector



Source: SARS-NT Panel (own calculations)

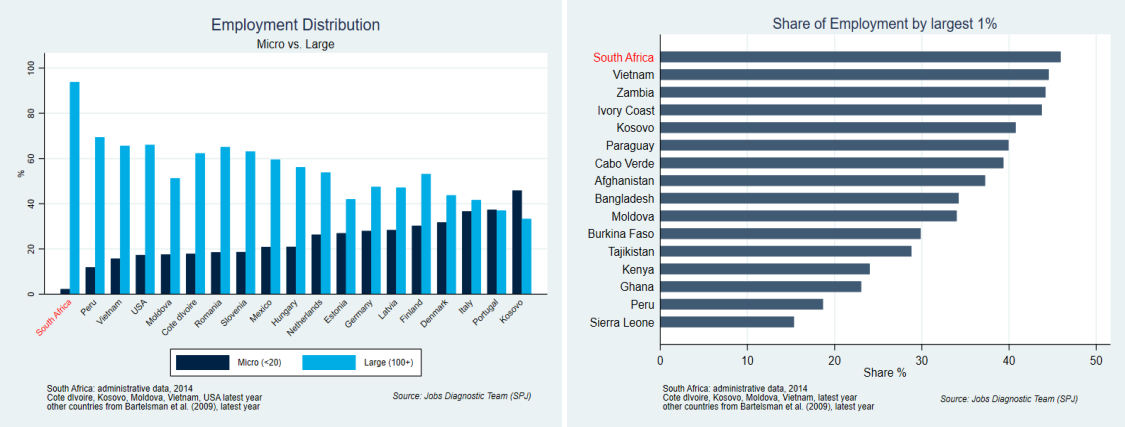
Around 90 percent of all wage workers work in firms with more than 100 employees (as shown in the first chart in Figure 3). South Africa has the highest concentration of employment in the largest 1 percent of firms among a group of comparator countries, emphasizing an important structural feature of the South African economy. Various other studies have pointed out the concentrated nature of the South African economy (see, for example: CCRED, 2016a; CCRED, 2016b; Simatele, 2015; Fedderke and Naumann, 2009; and Cutts and Kirsten, 2006).

The second chart in Figure 3 shows a cross-country benchmarking of the share of employment by the largest firms. The top 1 percent of firms employed 48 percent of workers and are responsible for 60 percent of revenue.[10] In relation to other countries, this is very high. While employment and revenue are concentrated in large firms in South Africa, average productivity and wages are lower in large firms compared to micro firms. This finding is in contrast to Kreuser and Newman (2018), who use a measure of TFP to show that firms in the manufacturing sector are more productive as they become larger.[11] We test whether our

[10] Values refer to the 2010-2014 average. In 2014, 49 percent of workers and 62 percent of revenues were concentrated in the top 1 percent of firms respectively. Concentration has increased throughout the period.
[11] Kreuser and Newman (2018) construct TFP following Petrin and Levinsohn with materials as instrumental variable. Our definition of TFP is outlined in the data appendix and follows Bartelsman et al. (2009).

results are driven by services sectors (which were excluded in the Kreuser and Newman (2018) paper), but the findings are robust to all productivity measures.[12]

Figure 3: Employment distribution and share of employment by largest firms



Source: SARS-NT Panel (own calculations)

When comparing wages and productivity by looking at the ratio of micro firms to large firms, South Africa is an outlier. In most comparator countries, large firms are on average more productive and likely to pay higher wages. The average productivity of micro firms is 1.7 times higher than large firms; and real wages paid by micro firms are almost double on average relative to large firms (see Figure A1 in Annexure A).[13]

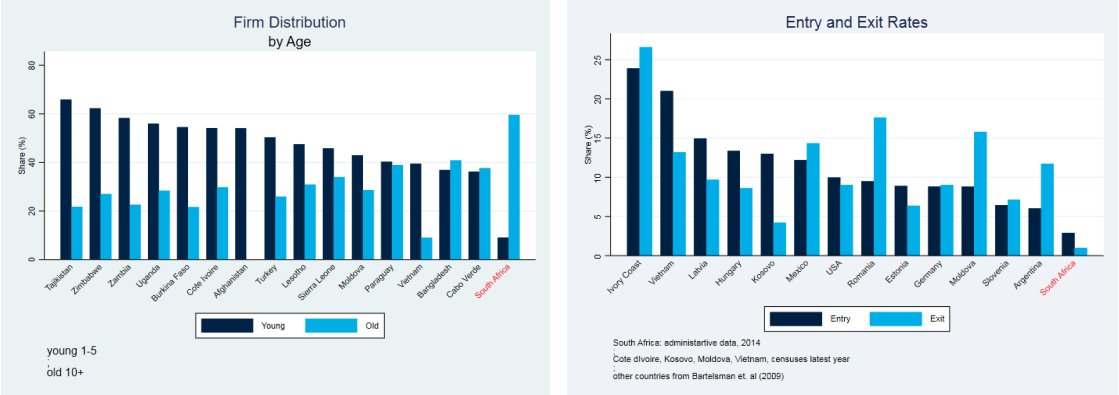
In South Africa, nearly 60 percent of firms are at least 10 years old. There are few young firms and their share has been declining over the period. Among 14 comparator countries, South Africa has extremely low entry and exit rates as illustrated in the second chart in Figure 4. This suggests that new firms are not entering, while incumbents are getting older.[14]

A possible explanation comes from looking at merger and acquisition activity by JSE listed firms, which suggests that many young firms are bought up relatively quickly and may innovate from within older firms.[15] Mergers and acquisitions could also be used as a strategy by firms

[12] We run regressions for manufacturing firms only using several measures of productivity (both labor productivity and TFP) and our results are consistent.
[13] The wage and productivity findings may be subject to selection bias as most micro firms are informal and those that are registered for tax are likely to be the more productive micro firms, which may be paying higher wages on average.
[14] This finding is consistent with other studies of South African firms using data from the Quarterly Employment Survey (QES) (see Kerr et al., 2014). The QES is an enterprise-based sample survey conducted by Statistics South Africa. The samples are drawn from private non-agricultural businesses such as factories, firms, offices, and stores, as well as from national, provincial and local government entities. The survey is designed to obtain information regarding the number of employees and gross salaries paid.
[15] An unpublished paper by Ewa Karwowski and Pedro Mendes Loureiro points to significant merger and acquisition activity by JSE-listed firms (i.e. more likely to be large and established) in anticipation of capital increases.

to enter new markets relatively more frequently in South Africa, compared to entry through greenfield investment. The lack of firm growth and entry is consistent with a relative lack of market contestability, providing some evidence that barriers to entry may be relatively more significant in South Africa than in comparator countries. This highlights the need for further detailed research on this topic, which may need to take a sectoral approach.

Figure 4: Firm distribution by age and firm entry and exit



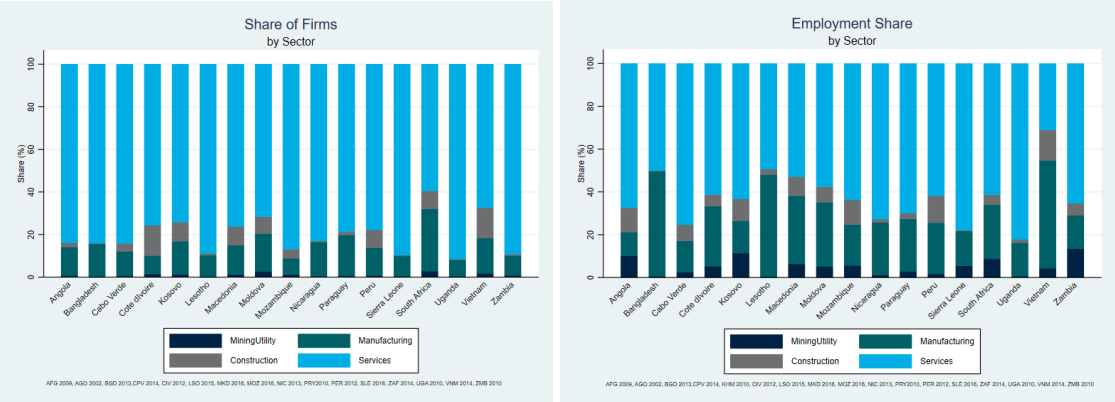
Source: SAS-NT Panel (own calculations)

Even though firm characteristics have not really changed in the private sector, the structure of the private sector has seen some minor shifts. Between 2010 and 2014, most of the firm entry in the economy came from the services sector, highlighting the growing importance of the services sector in the South African economy (see Figure A2 in Annexure A). Services account for approximately 60 percent of all firms (which includes construction, hotels, restaurants, transport, storage, communication, commerce and other services), around 27 percent of firms fall under manufacturing, and around 13 percent under construction (see Figure 5). South Africa is one of two countries in a group of 14 that has a larger share of employment in large firms in services compared to manufacturing (see Figure A3 in Annexure A). The services sector also accounts for a significant share of employment in South Africa at approximately 62 percent, followed by manufacturing at around 23 percent and mining and utilities at close to 10 percent (Figure 5).

South Africa also has a larger share of firms in the manufacturing sector compared to comparator countries (Figure 5). However, the manufacturing sector in most of these respective countries accounts for a higher share of employment compared to South Africa's manufacturing sector. This suggests that South Africa's manufacturing production is either not as labor intensive or has more firms which hire smaller numbers of employees compared to these comparator countries. South Africa's manufacturing sector is biased towards heavy, capital intensive industries, which explains in part the relatively low employment share in

manufacturing compared to other countries which may be more orientated towards light-manufacturing subsectors that are more labor intensive.

Figure 5: Share of firms and employment by sector



Source: SARS-NT Panel (own calculations)

The share of firms in the services sector is low in South Africa compared to the comparator countries. The contribution of the services sector to GDP in South Africa is 68.6 percent, compared to Brazil and Mexico where services contribute 73.3 and 63.5 percent, respectively.[16]

Overall, the descriptive analysis reveals that South Africa's formal private sector is characterized by large firms that hold a large share of employment and revenue, even though they are not as productive as micro firms and pay lower wages on average. These are the types of firms where most wage workers in South Africa work and this has not changed significantly over time. The structure of the South African formal private sector has become more services oriented as services increase their share of firms relative to manufacturing, agriculture and mining over time.

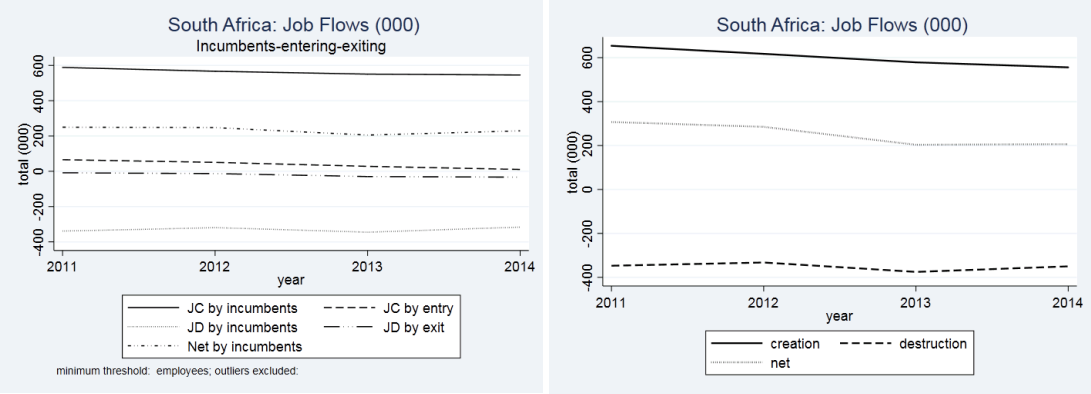
[16] http://data.worldbank.org/indicator/NV.SRV.TETC.ZS

4. Which firms are creating jobs?

Job creation can occur through new firms entering the market or through the expansion of existing firms or incumbents – by opening new branches or expanding existing operations.[17] In South Africa, job creation through firm entry is extremely low – firm expansion by incumbents accounts for almost all the jobs created in the economy.[18]

Incumbent firms in South Africa's formal private sector created approximately 200,000 net jobs per year between 2011 and 2014 (Figure 6). This is consistent with the Quarterly Labour Force Survey (QLFS),[19] which shows that over the period 2011 to 2015, approximately 198,000 jobs were created on average in each year (Statistics South Africa, 2018). Entrants do not contribute significantly to job creation – it is driven by incumbent firms. There are a small number of firms entering the formal private sector, which do not contribute significantly to net job creation.

Figure 6: Job creation and destruction



Source: SARS-NT Panel (own calculations)

Exiting firms do not contribute significantly to job destruction. In fact, job destruction is the highest among incumbent firms, offsetting job creation in incumbent firms by nearly half. Therefore, the role of firm entry and exit in net job creation is negligible in South Africa, in

[17] Job creation in the informal sector is not captured here. Over the period 2010 to 2014, the number of people employed in the informal sector increased by an annual average growth rate of 1.5 percent, compared to growth of 3 percent in the formal sector, according to data from the Quarterly Labour Force Survey (Statistics South Africa, 2018).

[18] It is possible that some of the low levels of firm entry reflect the fact that the period under examination was also characterized by consistently low GDP growth and stubbornly high unemployment.

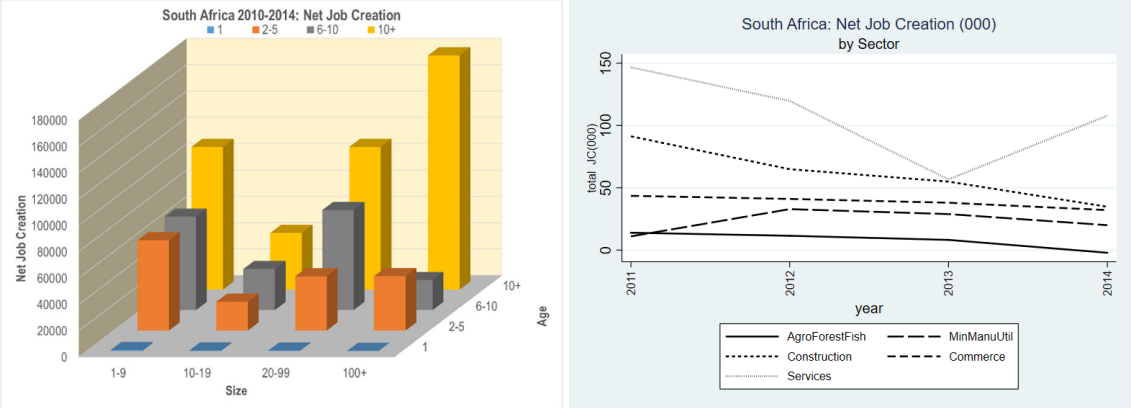
[19] The QLFS is a household-based sample survey conducted by Statistics South Africa. It collects data on the labor market activities of individuals aged 15 years and above who live in South Africa and was first conducted in January 2008. It measures a variety of issues related to the labor market, including the official unemployment rate.

contrast to countries such as Vietnam where entry constitutes the predominant form of job creation.[20]

Job creation takes place predominantly by large and old firms. Over the period 2010 to 2014, net job creation was highest among firms that were 10 years or older that employ 100 or more employees (Figure 7).[21] This was followed by firms 10 years or older employing 20 to 99 and 1 to 9 workers. Net job creation was also relatively high among post-entry young firms across most employee size categories.

Net job creation is mainly driven by the services sector, followed by the construction and commerce sectors (Figure 7). This is not surprising given that the services sector accounts for a significant and growing share of GDP and employment in South Africa, while manufacturing has stagnated and many manufacturing sub-sectors becoming increasingly capital intensive over recent years.

Figure 7: Net job creation, by size, age and sector



Source: SARS-NT Panel (own calculations)

The transition matrix in Table 2 below looks at the probability of a firm of a particular initial size being in a different size category three years later (see Table 2). Most firms remain in the same employee size category as they were in the initial period: 75 percent of firms employing 1 to 9 individuals, 57 percent of firms employing 10 to 19 individuals, 78 percent of firms employing 20 to 99 individuals, and 85 percent of firms employing 100 workers or more remained in that size category three years later. Encouragingly, 21 percent of firms that employed 10 to 19 individuals increased their number of employees to 20 to 99 employees three years later. However, some firms also downscaled in terms of employee size – 18

[20] "Vietnam Job Diagnostics", World Bank (2018). Forthcoming.
[21] Mamburu (2017) finds that contrary to many other countries, high-growth firms in South Africa tend to be large.

percent of firms that employed 10 to 19 employees in 2010, employed 1 to 9 individuals three years later.

Exit rates are very low in South Africa, which may reflect a lack of competition or market distortions in the form of government support that enable the survival of unproductive firms in some sectors. Exit rates are highest among firms that employ only 1 to 9 individuals (around 8 percent), and it decreases with firm size.

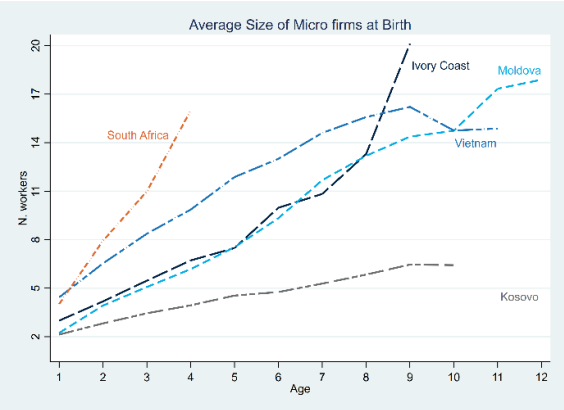
Table 2: South Africa 2010-2014: Transition Matrix

size	1-9	10-19	20-99	100+	exit	total
			size at period *t* to *t+3*			
1-9	**75%**	13%	4%	0%	8%	100%
10-19	18%	**57%**	21%	1%	3%	100%
20-99	3%	10%	**78%**	7%	2%	100%
100+	1%	1%	12%	**85%**	1%	100%

Source: SARS-NT Panel (own calculations)

The life cycle of surviving micro firms for which we observe entry shows that the average size of these firms increased from 4 employees to almost 17 over the 5-year period from 2010 to 2014 (Figure 8). This growth trajectory compares favorably to other countries such as Vietnam, Kosovo and the Côte d'Ivoire where the average size of surviving micro firms increased at a slower rate over a longer period of 9 to 12 years. This suggests that micro firms that are able to survive over the short to medium term experience relatively faster growth, or are able to expand more rapidly, than the growth experienced by surviving micro firms in countries such as Vietnam. This is consistent with the net job creation by micro firms observed in Figure 7.

Figure 8: Life cycle of surviving micro firms



Source: SARS-NT Panel (own calculations)

5. Productivity growth and efficiency of allocation

Efficient economies minimize market frictions, enabling high mobility of resources between firms so that productivity and output increase over time. In such an environment, new firms enter to compete, incumbent firms learn and improve their efficiency as they age, and unproductive firms exit. Productivity dispersions in relation to other countries may signal misallocation in terms of labor not being allocated to more productive firms, or more productive firms creating fewer jobs, or productivity enhancing firms shedding jobs. If, in a given sector, the marginal products of labor and capital are very far apart, then this provides evidence of distortions. It signals that unproductive firms may have advantages which allow them to operate at a higher marginal cost level than a more productive firm, whose entry is prohibited because of the artificial protection supporting less productive firms.

Following a simple model decomposing weighted aggregate productivity by Olley and Pakes (1996), we consider a static framework to assess whether employment is allocated to more productive firms over time. This approach assumes that in the absence of distortions, more productive firms would expand and would gain market or employment share while less productive firms become smaller or even exit the market (see equation 1 where efficient allocation is "measured" by the positive sign of the covariance term). By implication, productivity and firm size move in the same direction. A zero covariance term suggests that productivity growth is distributed randomly across firms of all sizes. A positive and large covariance term suggests that the economy has efficient mechanisms for allocating resources.

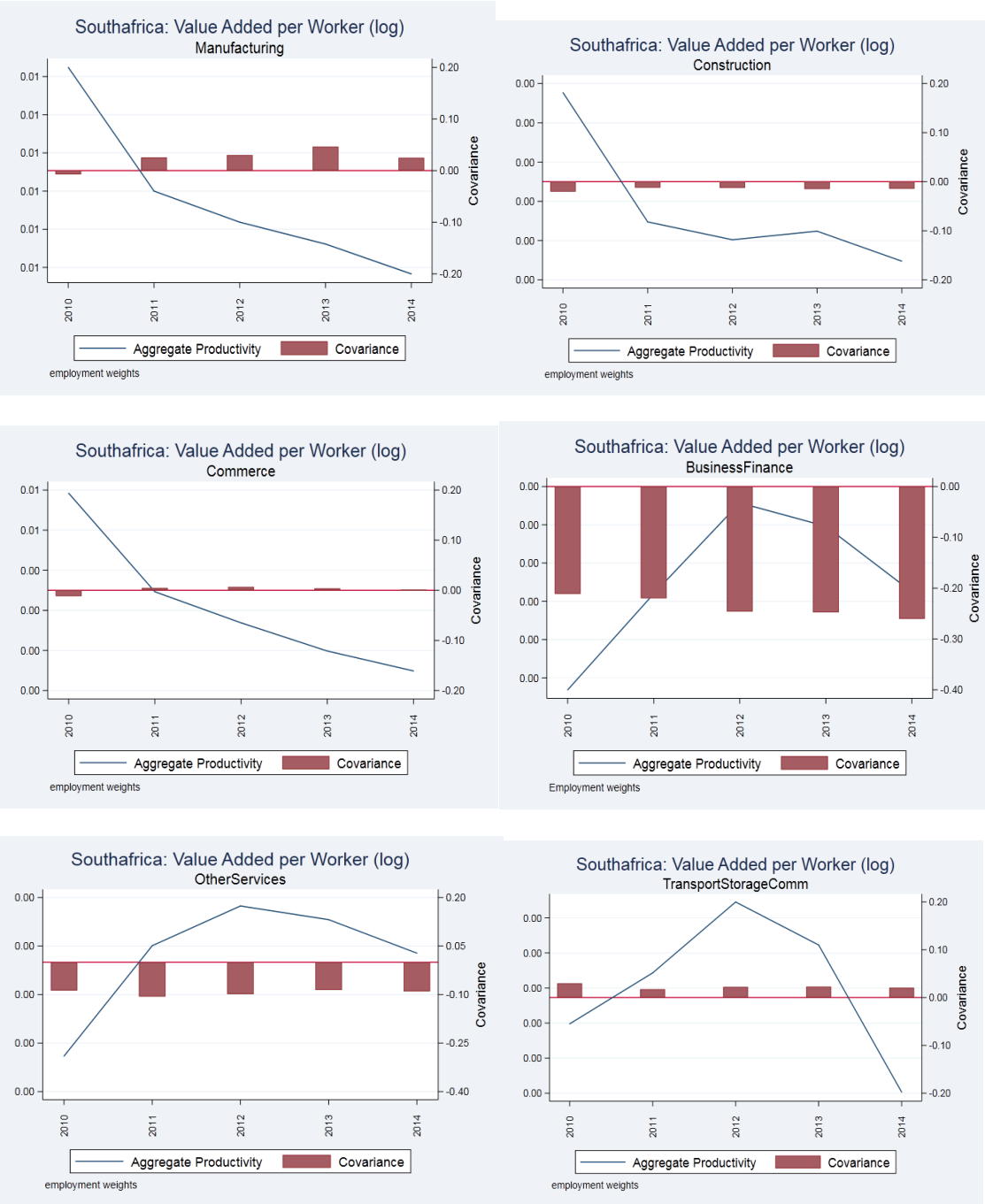
$$\boldsymbol{\Omega_t} = \sum_i \boldsymbol{s_{it}\omega_{it}} = \bar{\boldsymbol{\omega}}_{\boldsymbol{t}} + \sum_i (\boldsymbol{s_{it}} - \bar{\boldsymbol{s}}_{\boldsymbol{t}})(\boldsymbol{\omega_{it}} - \bar{\boldsymbol{\omega}}_{\boldsymbol{t}}) \qquad \textbf{[1]}$$

where $\boldsymbol{\Omega_t}$ is aggregate productivity, $\bar{\boldsymbol{\omega}}_{\boldsymbol{t}}$ is unweighted average productivity, $\boldsymbol{s_{it}}$ is the employment share, and $\boldsymbol{(\sum_i (s_{it} - \bar{s}_t)(\omega_{it} - \bar{\omega}_t))}$*100/$\boldsymbol{\Omega_t}$ is the labour reallocation effect (i.e. the percentage contribution of the covariance term). The estimates from equation 1, using labor shares (i.e. value added per worker) are illustrated for each sector in Figure 9.

The allocation of labor in manufacturing firms has improved as more productive firms account for a larger share of workers in 2011 through to 2014, although this did decrease in 2014 somewhat (i.e. the covariance term becomes positive in 2011 and remains positive in each year thereafter). Commerce and transport, storage and communications also have a positive covariance but it is small in magnitude.[22]

[22] Olley-Pakes assumes workers move between sectors.

Figure 9: Value added per worker, by sector



Source: SARS-NT Panel (own calculations)

The construction, business and finance and other services sectors did not allocate labor efficiently over the period – the covariance term is negative each year. This could be due to

financial market failures, imbalances in the tax regime or enforcement, or labor policy failures. There was a sharp decline in aggregate productivity in manufacturing, construction and commerce over the period 2010 to 2014. Other services and transport, storage and communications experienced increasing aggregate productivity between 2010 and 2012, but productivity declined thereafter.

In a dynamic setting (equation 2), Foster et al. (2001) decompose aggregate productivity growth. Their approach allows an analysis of the contribution of the reallocation of activity across individual producers in accounting for aggregate productivity growth. There are five components in the decomposition that help explain growth (each of these terms correspond to the terms in equation 2): (i) within-firm productivity growth holding employment share constant; (ii) a between-firm effect measuring the contribution to aggregate productivity growth of high-productive firms expanding shares and low-productivity firms shrinking shares; (iii) a cross-term capturing the contribution of firms that increase productivity and expand, and firms that decrease productivity and shrink; (iv) an entry effect that contributes positively to productivity growth if entering firms have higher productivity than the average in the base period; and (v) an exit effect that contributes positively to sector productivity growth if exiting firms have lower productivity than sector average in the base period.[23]

$$\Delta lnLP_{st} = \sum_{i \in \mathbb{C}_s} \theta^{s}_{i,t-k}\, \Delta lnLP_{it}$$

$$+\left[\sum_{i \in \mathbb{C}_s} \Delta\theta^{s}_{it} \left(lnLP_{i,t-k} - lnLP_{s,t-k}\right) + \sum_{i \in \mathbb{C}_s} \Delta\theta^{s}_{it}\, \Delta lnLP_{it}\right] \qquad \textbf{[2]}$$

$$+\left[\sum_{i \in \mathbb{N}_s} \theta^{s}_{it} \left(lnLP_{it} - lnLP_{s,t-k}\right) + \sum_{i \in \chi_s} \theta^{s}_{i,t-k} \left(lnLP_{s,t-k} - lnLP_{i,t-k}\right)\right]$$

Foster et al. (2001) demonstrate that a key determinant of productivity growth dynamics illustrated in equation 2 is the horizon over which the productivity growth is measured. For example, due to learning and selection effects, younger firms are likely to have on average a lower productivity than older firms. Therefore, the results presented here are sensitive to: (i) the length of period under examination because the contribution of any differences in productivity will likely be greater for changes measured over a longer horizon; and (ii) the specific period under examination because the where the economy is in the business cycle at the time will also be reflected in productivity dynamics.[24]

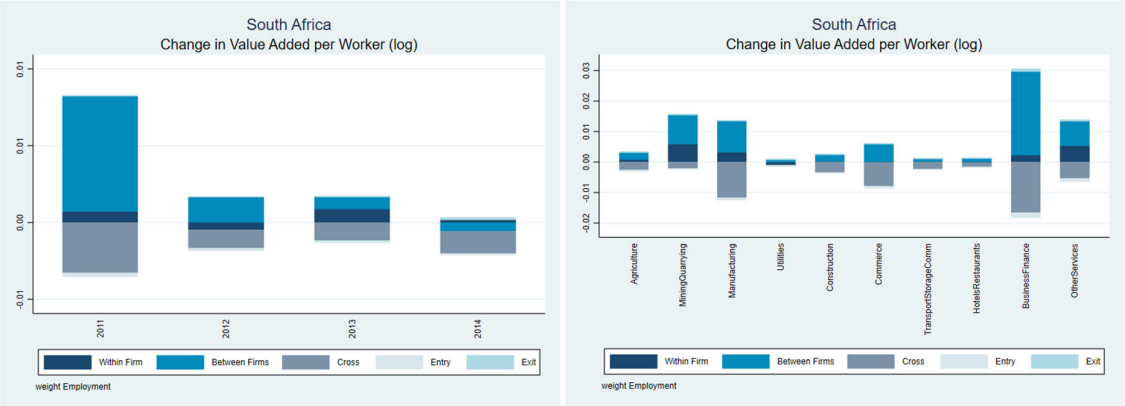
[23] In this decomposition, the between term and the entry and exit terms involve deviations of plant-level productivity from the initial industry index (Foster et al., 2001).
[24] For example, in Foster et al. (2001) productivity decompositions yield quite different stories for the periods that are roughly coincident with cyclical downturns. These findings suggest that these estimations should be updated as additional tax administrative data become available.

As shown in the first chart in Figure 10, there is a decline in value added per worker growth over time, becoming negative in 2014. This is in line with actual GDP growth outcomes over the period, which weakened significantly until 2016 (National Treasury, 2018). Productivity-enhancing reallocation effects (the between-term) account for the majority of changes in value added per worker growth, especially in 2011 and 2012. By 2013, the negative cross-term offsets the between-firm component and by 2014 the large negative cross-term drives negative value per worker productivity growth. The contribution of within-firm value added per worker growth is generally small, negative in 2012, but positive for the remainder of the period. This reflects a weakness in firms improving performance, as value added per worker growth is low when the employment share is held constant.

The cross term is consistently negative; this shows that firms that are expanding productivity are declining their employment shares (i.e. they are becoming more productive at the expense of shedding labor). Other countries also tend to show a negative cross term overall (see Figure A4 in Annexure A). Entry and exit contribute negligibly to changes in productivity, which is consistent with the low rates of entry and exit observed in the previous sections. The offsetting nature of the between- and cross-terms, which is evident from 2012, is consistent with the view that downsizing has been productivity enhancing for continuing firms (Foster et al., 2002).

In summary, the average firm exhibited limited value added per worker growth over the period (within-effect), reallocation played a dominant role initially, but this effect declined over time (between-effect) and firms increased value added per worker growth at the expense of employment (the negative cross term).

Figure 10: Change in value added per worker



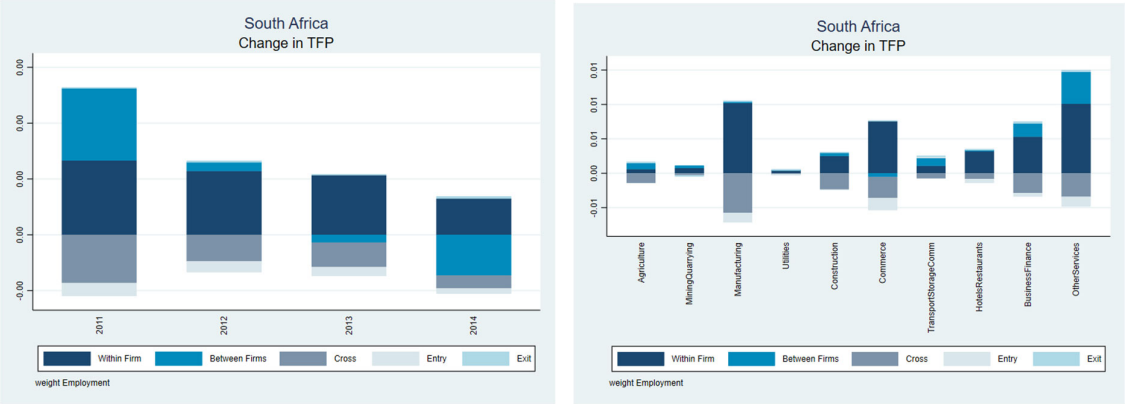
Source: SARS-NT Panel (own calculations)

The second chart in Figure 10 shows value added per worker growth by sector over the period. The role of labor allocation between firms is large and positive for several sectors. It is highest in the business and finance sector followed by manufacturing, mining, other services and

commerce. In the business and finance sector, value added per worker growth is mainly explained by reallocation effects (the between-term) – this means that productive firms are expanding their share of employment and/or unproductive firms are shrinking over the period. The contribution of within-firm value added per worker growth is generally positive and largest in mining and other services.

The cross term is consistently negative for most sectors over the period – firms growing their value added per worker are not increasing their share of employment. At the sector level, entry and exit contribute negligibly to changes in value added per worker growth, which is consistent with the low rates of exit observed in the Figure 4 and Table 2.

Figure 11



Source: SARS-NT Panel (own calculations)

While the trend of declining productivity growth is the same, overall productivity dynamics are slightly different when TFP is used. As shown in the first chart in Figure 11, there are two important differences between Figures 10 and 11: (i) when using TFP to measure productivity, the within-firm effect remains positive and large, but by 2014 it is offset by a large negative contribution of reallocation between firms and a negative cross-term. Larger within contribution when productivity is measured by TFP reflects that firms become more productive due to efficiency in the use of capital overriding the low within contribution to labor productivity growth where capital is not factored-in. (ii) Entry makes a non-negligible and negative contribution to TFP growth. The latter implies that entrants are less productive than the average firm in the base year.

The second chart in Figure 11 illustrates that between- and within-firm effects remained consistently positive across all sectors over the period, with the exception of commerce where the between effect was negative. This indicates that the reallocation of workers between firms is efficient, contributing positively to aggregate productivity in most sectors (between firm

effects) and firms holding employment shares constant are improving efficiency (within firm effects).[25]

These decompositions reveal two key results. First, the consistently negative cross effect indicates that although firms have increased their productivity across the sectors, it has not translated into growing employment. While this finding is not unique to South Africa (see Figure A4 in Annexure A), it is concerning in light of high levels of structural unemployment. Fedderke (2014) found that on the supply-side of the economy, there was differential TFP growth across sectors, combined with a price elasticity of demand that is below unity, leading to the prediction of labor shedding in sectors that have high TFP growth. This implies that South African firms are becoming more capital intensive as they grow.

Second, the negligible contribution of entry and exit to productivity dynamics requires further research – South Africa seems different from other developing countries like Vietnam where firm entry contributes positively to productivity growth. This may reflect the period under examination, which was characterized by very low levels of economic growth and high levels of policy uncertainty, which may have undermined entry dynamics.

[25] As pointed out by Foster et al. (2001), measurement error in estimating equation 2 will yield a spuriously low (high) within-firm share for TFP (labor) productivity growth – Figures 10 and 11 seem to suggest that measurement error is not a driver of these results.

6. Regression Analysis

The multivariate analysis in the regression analysis enables us to deepen our understanding of productivity dynamics. The default model is a random effects model, which assumes that the specific individual effects are uncorrelated with the independent variables and capitalizes on the panel structure of the data. All specifications control for 2-digit sector, location and year. Standard errors are clustered by size and sector and therefore supposes correlation within clusters, but not between.[26] The basic specification is expressed in equation 3, where Y is logged employment, productivity, or wages.

$$y_{ilst} = \beta_0 + \beta_1 S_{ilst} + \beta_2 A_{ilst} + \beta_3 F_{ilst} + \theta I_s + \varphi Y_t + \varepsilon_{ilst} \qquad \textbf{[3]}$$

where *i* identifies the firm, *l* the location, *s* the sector and *t* the year. *S* is a vector of size category dummies, *A* is a vector of age category dummies, *F* is ownership, (a firm is identified as a foreign firm if 10 percent of shares or more are foreign owned). *I* identifies 2-digit sector, and *Y* the financial year.[27] Additional independent variables include 10 categories of sectors (omitting the vector of 2-digit sectors), export status, productivity, capital intensity and measures of labor and output market concentration.

Equation 3 allows us to determine whether firms scale-up as they age. If so, this is an indication of entrepreneurial ability and an environment that enables job creation. If firms do not to grow overtime, it could signal the existence of market frictions. On the other hand, firms increasing productivity as they age is evidence that firms are "learning by doing", using their resources more efficiently. An additional set of regressions look at the determinants of growth (where growth is defined using equation 1 in the data appendix). The results will indicate the type of firms that grow faster in terms of employment, productivity and wages. We also estimate the probability of exit with a probit regression and report probit marginal effects coefficients. These results will indicate the type of firms that are more likely to exit.

Finally, we use a fixed-effects model to explore within-firm dynamics. In these regressions we are able to determine the average effect of "how" firms increase productivity. Thus, whether firms that increase their productivity also hire more workers and share their gains with workers.

[26] Three size categories, five sectors, and eight regions.
[27] Excluded when the dependent variable is "Employment".

7. Results

The complete set of regression results are in Annexure B. Table B1 presents the results of the determinants of firm size where the dependent variable is the number of employees (log). In South Africa, consistent with what is found in other countries, size and age are positively and monotonically correlated (see Table B1).[28] The older the firm, the larger it is, on average. This means that firms either grow as they age or that smaller firms are more likely to exit. Later regressions will further explore these dynamics.

Column 2 in Table B1 shows that there is unusually little size variation between major sector categories. For example, manufacturing firms are not any larger than hotels and restaurants.[29] While the wholesale and retail sector has a negative coefficient indicating that firms are smaller, the standard errors are large. Foreign firms and firms that export are likely to be 20 and 17 percent larger than domestic or non-exporter firms respectively (see column 3). Capital intensive firms[30] are likely to be 19 percent smaller suggesting substitution between capital and labor (see column 4). The coefficients on the Herfindahl index for both labor and output markets are insignificant, indicating that firms in sectors with more labor and sales concentration are not more likely to be larger on average.

Firms that on average were more productive in the previous period, other things equal, tend to be smaller in size (columns 7-12). This result is robust to all productivity measurements (output per worker, value added per worker and total factor productivity). The magnitude is not very large; an increase of 10 percent in productivity is associated with a decrease of around 0.5 percent in size. On average, more productive firms are smaller. In the case of output per worker and value added per worker, the relationship is nonlinear and the slope becomes even more negative for more productive firms (shown by the negative squared term). This result suggests that productivity gains could be achieved at the expense of labor. Evidence is mixed in other countries.[31]

To gain insights from within-firm dynamics, Table B2 looks at regressions with firm fixed effects where the dependent variable is the number of employees (logged). These types of regressions are unable to capture the effect of time invariant variables,[32] but have the advantage of estimating the effect of dynamic changes within firms. Our results show that

[28] The omitted variables are micro firms (1-9 employees), young (less than 6 years old), domestic, and manufacturing in column 2.
[29] While the wholesale and retail sector has a negative coefficient indicating that firms are smaller, the standard errors are large.
[30] Firms are defined as capital intensive if their capital/labor ratio is above the sector's median.
[31] The South African experience is shared by Cabo Verde, Zambia, Sierra Leone, Afghanistan, and Peru while in Vietnam, Moldova, Kosovo, Burkina Faso, Côte d'Ivoire, and Paraguay the correlation is positive.
[32] Firm invariant characteristics, such as sector, location, and ownership are excluded from the specification.

surviving firms expand, becoming larger on average as they age. However, the effect decreases as firms get older, turning into a negative correlation (quadratic term is negative).

These findings support results from the dynamic decompositions in the previous section that firms increase productivity at the expense of labor (see the negative cross-term). This result is robust to all measures of productivity. The effect is greater for more productive firms as indicated by the negative quadratic term – the more productive a firm is, the more jobs it sheds except for TFP where the quadratic term is positive. This implies that once capital is factored-in, the negative dynamics between productivity and size of the firm is diminished. In other words, as firms become more productive, they are more likely to shed less jobs when productivity is measured using TFP.

Although this negative correlation between labor and productivity is built-in by construction (labor affects productivity through the denominator), it shows that productivity gains are not achieved through scaling-up production and a more efficient use of inputs. Depending on the productivity measure, an increase of 10 percent in productivity is linked to 1.2 to 4 percent decrease in firm size (i.e. a firm with 100 employees that increased productivity by 10 percent will on average reduce its headcount by 4 employees).

Table B3 focuses on employment growth of incumbent firms – this refers to post-entry growth, excluding exit. Firm size, as the explanatory variable, is constructed in categories corresponding to the average size of the corresponding growth period.[33] Figure A5 in Annexure A shows that patterns differ greatly by country.[34] In South Africa, the relationship with size is not monotonic. Small firms (between 10 to 19 employees), medium (between 50 and 249 employees), and very large firms (500 or more employees) grow around 3 percent faster than micro firms.[35]

Firms that are younger, in sectors with lower concentration in terms of sales, and that are more productive, grow faster (columns 1 to 6). There is no significant difference between sectors. Foreign firms grow faster, which may reflect better integration into global value chains. However, once labor productivity is controlled for, foreign firms grow at a slower pace than domestic firms. More productive firms grow faster (columns 7 to 9). This is consistent with the positive between-term in the dynamic decompositions. The quadratic term is positive for output per worker and value added per worker (the more productive a firm is, the faster it grows), but

[33] Given the inverse correlation between firm size and growth, or "regression to the mean effect", the current or base size would yield spurious results. The average size avoids the downward bias that results from using the end year of the growth period or the upward bias of coefficients estimated using the base year.
[34] International comparisons use the same specification.
[35] When controlling for productivity, large firms (between 250-499) are also likely to grow faster. Growth rates are likely to be higher the smaller the firm is, although for the same rate a larger firm will add more jobs.

not for TFP where it is negative (accounting for capital decelerates growth of higher productivity firms, indicating substitution effects between capital and labor).

Table B4 examines the determinants of productivity, where the dependent variables are value added per worker (logged) and total factor productivity. Smaller firms, across all sectors, are likely to be more productive on average. The negative correlation between firm size and productivity also appeared in Table B1 (where there was a negative relationship between productivity in the previous period and firm size). Older surviving firms, foreign firms, exporters and firms in the transport, communications, business and finance sectors are more productive

Mining and utilities show higher labor productivity than manufacturing (omitted category), but the effect disappears for TFP (columns 2 and 8). This is indicative of less efficiency in capital. There is evidence that sectors with higher labor and output market concentration, a proxy for less competition, have on average higher labor productivity.[36] Therefore, firms operating in sectors with higher levels of concentration are able to use labor more efficiently but once capital is accounted for, they do not seem to operate more efficiently.[37]

Table B5 looks at determinants of average wages – larger firms are likely to pay less on average to their workers, which is robust to controlling for productivity. This could be due to large firms hiring a larger share of unskilled workers.[38] Firms that are foreign, more productive, export and operate in more concentrated sectors, are likely to pay higher wages. There are also some differences regarding sectors. With respect to manufacturing, firms in mining, transport, storage and communications, business and finance, and other services pay higher wages on average. Whereas firms in construction, commercial agriculture, hotels and restaurants pay lower wages to their workers on average. Although, wholesale and retail firms have a negative coefficient, it is not significant.

Firm fixed-effects regressions in Table B6 indicate that firms hiring workers do so at the expense of reducing average wages even when controlling for within-firm productivity changes. However, firms that experience increasing productivity, increase their average wages. Likewise, firms increasing the share of exports, increase their average wage (see column 4), but this result is not robust to all specifications (see columns 7 and 8 where value added per worker and TFP are controlled for). This suggests that productivity gains are shared with workers.

[36] However, they are not significantly different in the case of TFP – see columns 5, 6, 11, and 12.
[37] Notice in Table B5 that they are more likely to have higher average wages; therefore, labor is not cheaper.
[38] Large firms are likely to have a larger share of (unskilled) temporary workers. Our employment variable reports total workers - with temporary workers weighted by the duration of the contract (see Data Appendix). Thus, this may be why we observe lower wages in larger firms.

Finally, Table B7 shows the marginal probability of exit (conversely, probability of survival). As expected, young and small firms are more likely to exit, while foreign, exporters and large firms are more likely to survive (although magnitudes are small – e.g. around 0.4 percent in the case of foreign firms). There are some sectoral differences – firms in the mining, construction and services sectors are more likely to exit. Inefficient firms are more likely to exit. There is an average marginal effect of log labor productivity of -0.0038 – this implies that a one standard deviation improvement in log labor productivity reduces the chances of exit by 0.4 percentage points.[39] While positive, this is a very small effect considering the average exit rate of about 1 percent in the sample period. Figure 6 in Annexure A puts this value in the international context (productivity measured in US dollars). It shows that compared to other countries, the likeliness of small firms and inefficient firms exiting is small in magnitude, suggesting that market frictions are at stake.

[39] This is calculated by evaluating the difference in exit probability when log labor productivity is one standard deviation away from its mean and all other controls are at their means.

8. Conclusion and policy implications

Understanding trends in firm dynamics, productivity growth and job creation is essential to design policy that facilitates the growth of the private sector. This paper explores firm-level dynamics in South Africa by providing a detailed set of descriptive data along with regression analysis of employment, wage, productivity, and other firm dynamics. A key contribution is the international firm-level data comparisons used to benchmark South African data. These comparisons provide valuable insight into the structure, performance and peculiarity of the South African economy in comparison to selected advanced and developing countries.

In the descriptive analysis, we find that the role of firm entry and exit in net job creation is negligible in South Africa. This is in contrast to other fast-growing developing countries such as Vietnam where firm entry constitutes the predominant form of job creation in other countries. Job creation is taking place predominantly by large and old firms and net job creation is mainly driven by the services sector, followed by the construction and commerce sectors.

The life cycle of surviving micro firms for which we observe entry shows that the average size of these firms increased from 4 employees to almost 17 over the 5-year period from 2010 to 2014. This growth trajectory compares favorably to other countries such as Vietnam, Kosovo and Côte d'Ivoire where the average size of surviving micro firms increased at a slower rate over a longer period of 9 to 12 years. This suggests that micro firms that are able to survive over the short to medium term experience relatively faster growth, or are able to expand more rapidly, than the growth experienced by surviving micro firms in countries such as Vietnam.

In our static decompositions, we find that the construction, business and finance and other services sectors did not allocate labor efficiently over the period. There is also a sharp decline in aggregate productivity in manufacturing, construction and commerce. When we decompose aggregate productivity growth, we find that firms that expand productivity are decreasing their employment shares (i.e. they are becoming more productive at the expense of shedding labor), which is consistent with evidence from other countries.

In our dynamic decompositions, there is a decline in productivity growth over time – this is in line with actual GDP growth outcomes over the period. Differences between our two measures of productivity (value added per worker growth and TFP growth) come mainly from the within-term which is positive for TFP for all years (except a little negative in the first year). The within-firm improvement in productivity comes mainly from manufacturing, commerce and other services.

The between-firm differences in productivity are less pronounced and driven by mining and other services.

The larger contribution of within-firm differences in TFP productivity means that firms become more productive due to better efficiency in the use of capital (which overrides the declining labor productivity in the case of manufacturing and commerce when capital is not factored-in). In contrast, the larger contribution of between-firm differences in value-added per worker growth, which occurs mainly in the last year and due to manufacturing and business and finance, means that the movement of workers to more productive firms (measured by labor productivity) is less important when capital is factored-in. The negligible contribution of entry and exit to productivity dynamics is confirmed by the dynamic decompositions and requires further research.

In our regression analysis, we find that foreign firms and firms that export are larger than domestic or non-exporter firms, capital intensive firms are smaller, and we find no relationship between firm size and measures of labor and output markets concentration. On average, more productive firms are smaller, and our results suggest that productivity gains could be achieved at the expense of labor. In particular, our findings suggest that productivity gains are not achieved through scaling-up production or a more efficient use of inputs.

Firms that are younger, in sectors with lower concentration in terms of sales, and that are more productive, grow faster. Foreign firms grow faster, however, once labor productivity is controlled for, foreign firms grow at a slower pace than domestic firms. Larger firms are likely to pay less on average to their workers, which is robust to controlling for productivity. Finally, firms hiring workers do so at the expense of reducing average wages even when controlling for within productivity changes. However, firms that experience increasing productivity, increase their average wages, which suggests that productivity gains are shared with workers.

The contrast between some of the results of labor productivity and TFP is consistent with a demand-side problem. Firms investing in capital are unable to see their sales increase in a profitable manner. Given weak growth of the domestic economy, this would be plausible and highlights the importance of expanding demand, for example, through exports facilitated by an effective trade policy. In addition, the high level of concentration in industries is a huge barrier for firm entry and exit, which limits firm dynamism and hampers job creation. This indicates that part of creating an environment in which South African firms can create enough jobs for the economy requires robust and cohesive competition policy.

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Data Appendix

Variable definitions

Employment is the total sum of all unique IRP5/IT3(a) forms with positive and non-missing employment income per unique tax reference number. Temporary workers are weighted by the duration of their contract (see Pieterse et al., 2018).

Age is determined in reference to the birth year. Only when birth year is missing, age is considered to be entry (age 1) when firm is first observed in the data.[40].

Unit of observation is the firm. In the SARS-NT Panel, a firm is defined as a CIT-registered entity that has completed an IT14 and/or ITR14 form (Pieterse et al., 2018). In other words, each unique CIT reference number is associated with a firm.

Firm size is determined as the number of workers employed by a firm. The employment variable is used to construct the categories of firm's size. A firm-level labor indicator for the SARS-NT Panel is derived from the associated IRP5 forms (i.e. IRP5 and IT3a forms) submitted by PAYE-registered firms (Pieterse, 2018).

Firm size categories			**Age categories**		
1-19	1-9	1-9	1-5	1	1-5
20-99	10-19	10-19	6-9	2-5	6-9
100+	20-99	20-49	10+	6-9	10-19
	100+	50-249		10+	20-29
		250-499			30+
		500+			

Employment Growth is calculated following Davis and Haltiwanger (1992, 1999) by taking the difference in two consecutive years and divided by the average of employment in those two years. The measure is monotonically related to the conventional growth rate and a second order approximation of the logarithmic first difference. It has the convenient property of being symmetric around zero and bounded by values -2, and +2 avoiding any arbitrary treatment of outliers and mitigating the mean-reversion effect. Entry is set to maximum growth of +2 (previous unobserved year has employment zero), and exit has a growth rate of -2 year (with employment zero next year to last seeing in the data. This measure allows computing

[40] Because all firms are observed first the first year of the period, this is inferred only for years after the first year period.

meaningful growth rates for firms suffering sharp expansions or contractions, avoiding any arbitrary treatment of outliers. This measure has been extensively used to measure job creation and job destruction (see Davis and Haltiwanger,1992, and Davis, Haltiwanger and Schuh, 1999).

$$Eg_{it} = 2*(E_{it} - E_{it\ -1})/(E_{jt} + E_{it-1}) \qquad [1]$$

Net Job Creation is computed as the difference in firm's employment with respect to previous years. It is equal to employment if entry, and equal to minus employment if firm exited the previous year. Because the data commonly has gaps (firm re-entry after one or more years), net job creation refers to previous observed year even if it is not consecutive.

Firm entry is identified by the year the firm started operations.

Firm exit is identified using a firm's last year in the data set.[41]

Sales revenues are deflated to a common year's real values using a price deflator series.

Value Added is sales revenues less intermediary inputs including services. Intermediary inputs is producer's total expenditures on inputs (cost incurred in the current year adjusted by change in inventories).

Capital is the capital stock replacement value – it does not include new purchases but includes lease capital.

Wage is the average wage bills per worker.

Productivity variables include output per work "Y/L" (or sales per worker if output is not available), value added per worker "VA/L", and a measure of total factor productivity (TFP). Outliers for Y/L and VA/L are defined as those observations in the 1st and the 99th percentile at the two-digit sector level, for those sectors with 20 or more observations present. Using the natural log of the production variable, very large values greater than 16 or less than -16 are also identified as outliers and removed from the analysis.

- **TFPi** is a multilateral index developed by (Caves 1982) and used by Aw, Chen and Roberts (2001), Bartelsman et al. (2009). It expresses each firm's inputs and outputs as deviations from a single reference point. As the reference point, the multilateral index uses a hypothetical firm with input revenue shares that equal the arithmetic mean revenue shares over all observations and input levels that equal the arithmetic mean

[41] There is 0.4 percent missing data across the years. Thus, we are likely to overestimate exit – especially in last few years of the period 2009 to 2014. However, we cannot determine whether there is any exit in the last year.

of the log of the inputs over all observations. Each firm's output, inputs, and productivity in each year is measured relative to this hypothetical firm. The index is the proportional difference of the firm's output in year *t* and sector *j* relative to this hypothetical firm in the base period.

Herfindahl index is calculated for sales and labor. The normalized Herfindahl index sums the squared market share, either in terms of sales or labor, of each firm competing in the market resulting in a sectorial level measure of the amount of concentration that exists. A Herfindahl index greater than 0.25 is considered a highly-concentrated market.

Capital intense firms include those with a capital/labor ratio is equal or above the median of its 2-digit sector.

Sector codes are at the 4-digit level, which refers to the main activity performed by the firm matched to ISIC Version 4. Industry coded higher than 84 are not included in the category of services for descriptive analysis, but are included in the regressions where they are controlled for. These include firms in government administration, education, human health and social work activities; arts, entertainment and recreation; other service activities; activities of households as employers, undifferentiated goods- and services-producing activities of households for own use; and activities of extraterritorial organizations and bodies. These industries are left out in the sectoral description because they are generally either government run, or partially run, or non-governmental organizations (NGOs) and are therefore not run exclusively as profit maximizing firms. In regressions, where they are fully controlled for, they are included. Therefore, comparisons between manufacturing and services include only profit-maximizing firms.

Tradable sectors are those in agriculture, fishing, mining, manufacture, wholesale-retail-repair vehicles, water and air transportation, accommodation and food services, arts-entertainment-recreation, and repair of computers and household goods.

Note: Standardized variables are generated assuring comparability of definitions across countries. These include those related to firm characteristics, such as, age, size, sector, ownership, and legal status, as well as those related to productivity, output, employment breakdown, investment, and more. Categorical variables group firm's size or age in different categories; also sectors and locations.

Table A1: Summary statistics (2010-2014)

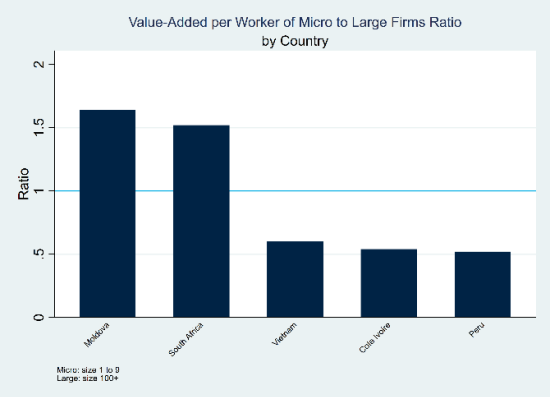
Variable		2010	2011	2012	2013	2014
Labour	N	122,516	130,387	129,860	126,484	108,150
	Mean	33.15	39.15	41.42	43.61	47.47
	St Dev.	352.69	470.41	509.49	529.64	575.69
	Min	2	2	2	2	2
	Max	39501	62675	67169	78995	75751
Age	N	122,516	130,387	129,860	126,484	108,150
	Mean	12.02	12.70	13.38	14.06	14.92
	St Dev.	9.76	10.00	10.14	10.25	10.47
	Min	-3	-2	-1	-1	1
	Max	111	112	113	114	115
Log Sales per worker (LCU 000)	N	102,090	107,327	110,996	112,727	98,260
	Mean	1.72	3.49	1.68	1.68	1.71
	St Dev.	1.05	3.94	1.04	1.04	1.04
	Min	-2.56	0.01	-2.06	-2.59	-2.32
	Max	7.06	266.50	7.31	7.17	6.77
Log Value-Added per worker (LCU 000)	N	88,794	107,327	110,503	111,980	97,234
	Mean	0.85	0.86	0.87	0.87	0.89
	St Dev.	0.89	0.89	0.89	0.89	0.88
	Min	-4.07	-4.36	-15.85	-15.85	-6.80
	Max	5.85	5.59	6.57	5.14	5.11
TFP (reference method - used in SARS paper)	N	79,927	93,464	94,206	93,389	81,204
	Mean	-0.07	0.00	0.04	0.03	0.04
	St Dev.	1.05	1.12	1.16	1.21	1.23
	Min	-3.39	-3.39	-3.37	-3.41	-3.41
	Max	8.57	8.73	8.45	8.06	8.72
Assets (real LCU 000)	N	104,071	113,608	113,471	115,127	99,859
	Mean	75.32	111.60	124.64	141.47	159.08
	St Dev.	4717.04	9282.07	10590.86	11802.92	13828.63
	Min	0.00	0.00	0.00	0.00	0.00
	Max	1363301	2576913	3008013	3350956	3727584
Sales (real LCU 000)	N	118,007	128,329	128,587	125,397	108,095
	Mean	332.20	393.41	419.55	463.90	512.41
	St Dev.	7351.08	6499.38	7146.04	7894.72	8506.24
	Min	0.00	0.00	0.00	0.00	0.00
	Max	2037612	991342	1175174	1248740	1281861
Intermediate materials (real LCU 000)	N	101,775	119,298	122,653	119,823	102,372
	Mean	241.64	296.28	290.74	308.03	354.16
	St Dev.	3217.36	8525.41	4895.04	5395.74	6083.27
	Min	0.00	0.00	0.00	0.00	0.00
	Max	418542	2527652	593719	678859	732104
Average labor cost per worker (real LCU 000)	N	109,964	120,704	120,333	121,757	105,747
	Mean	1.74	1.59	1.55	1.39	1.42
	St Dev.	5.12	2.75	3.12	2.80	3.50

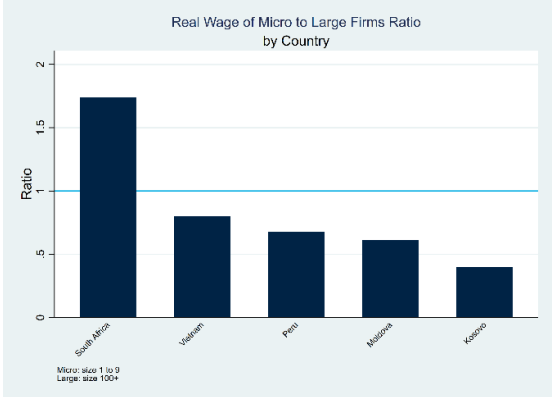
	Min	0.00	0.00	0.00	0.00	0.00
	Max	982.40	394.11	702.33	417.32	815.65
Domestic firms (1/0)	N	122,516	130,387	129,860	126,484	108,150
	Mean	1.00	1.00	1.00	0.99	0.98
	St Dev.	0.02	0.03	0.05	0.12	0.13
	Min	0.00	0.00	0.00	0.00	0.00
	Max	1.00	1.00	1.00	1.00	1.00
Foreign firms (1/0)	N	122,516	130,387	129,860	126,484	108,150
	Mean	0.000	0.001	0.003	0.014	0.017
	St Dev.	0.02	0.03	0.05	0.12	0.13
	Min	0.00	0.00	0.00	0.00	0.00
	Max	1.00	1.00	1.00	1.00	1.00
Exporter (1/0)	N	13,092	15,235	15,788	16,359	14,682
	Mean	1	1	1.00	1.00	1
	St Dev.	0	0	0.00	0.00	0
	Min	1	1	1.00	1.00	1
	Max	1	1	1.00	1.00	1

Source: SARS-NT Panel

Annexure A – Figures

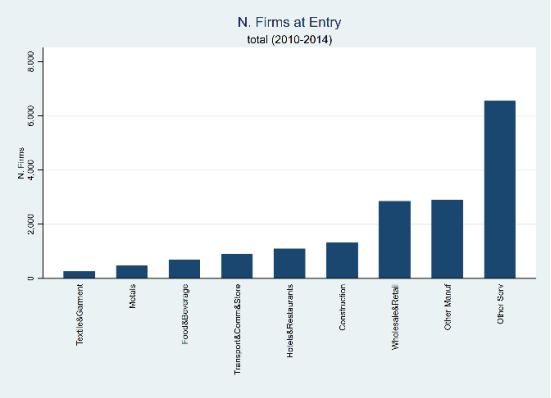
Figure A1





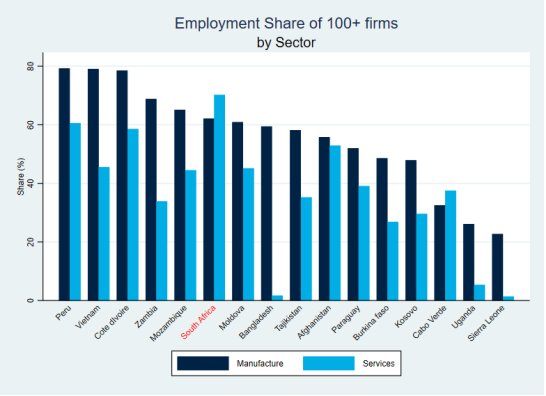
Source: SARS-NT Panel (own calculations)

Figure A2



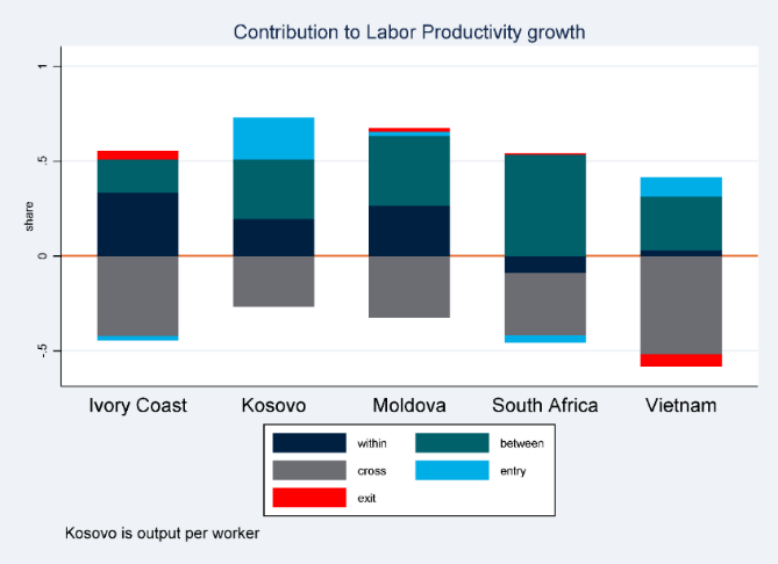
Source: SARS-NT Panel (own calculations)

Figure A3



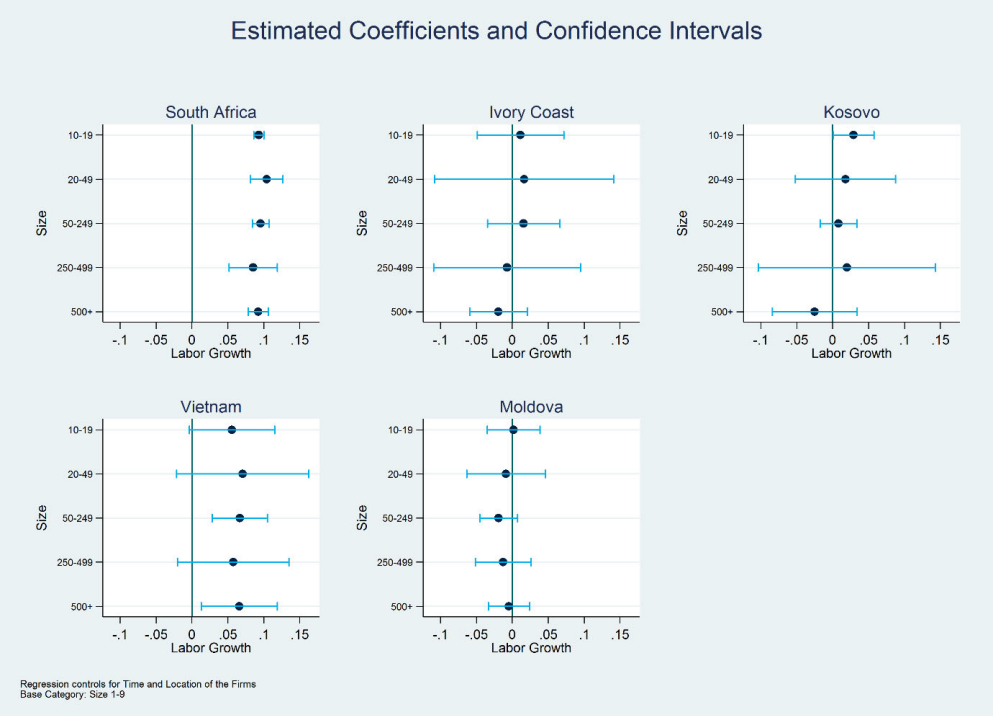
Source: SARS-NT Panel (own calculations)

Figure A4



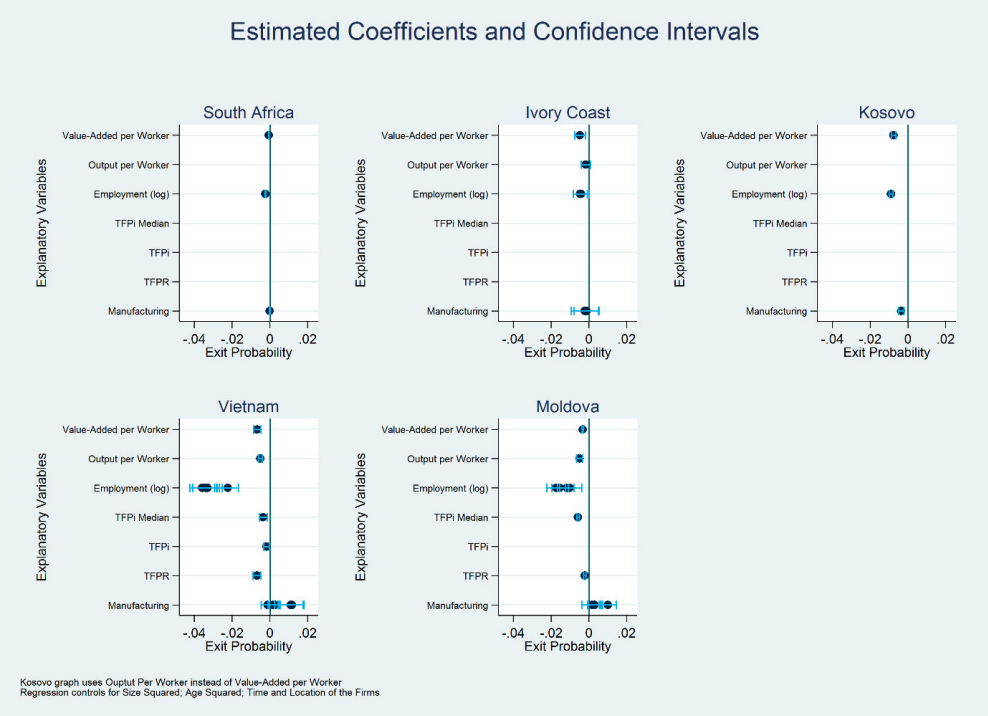
Source: SARS-NT Panel (own calculations)

Figure A5



Source: SARS-NT Panel (own calculations)

Figure A6



Source: SARS-NT Panel (own calculations)

Annexure B – Regression results tables

Table B1. Determinants Employment (log)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
age_6to9	0.133***	0.132***	0.133***	0.129***	0.132***	0.133***	0.0892***	0.0890***	0.0892***	0.0892***	0.0873***	0.0874***
	(0.00735)	(0.00743)	(0.0105)	(0.00716)	(0.00751)	(0.00757)	(0.00547)	(0.00549)	(0.00565)	(0.00566)	(0.00563)	(0.00562)
age_10to19	0.217***	0.213***	0.216***	0.212***	0.215***	0.216***	0.154***	0.154***	0.158***	0.158***	0.152***	0.152***
	(0.0127)	(0.0128)	(0.0210)	(0.0123)	(0.0127)	(0.0128)	(0.00953)	(0.00960)	(0.00983)	(0.00985)	(0.00954)	(0.00954)
age_20to29	0.262***	0.253***	0.258***	0.256***	0.258***	0.260***	0.190***	0.190***	0.198***	0.199***	0.185***	0.185***
	(0.0178)	(0.0177)	(0.0318)	(0.0174)	(0.0188)	(0.0189)	(0.0132)	(0.0133)	(0.0132)	(0.0132)	(0.0122)	(0.0122)
age_30plus	0.515***	0.498***	0.505***	0.512***	0.510***	0.516***	0.397***	0.397***	0.416***	0.417***	0.369***	0.370***
	(0.0368)	(0.0366)	(0.0771)	(0.0365)	(0.0389)	(0.0391)	(0.0283)	(0.0283)	(0.0286)	(0.0286)	(0.0200)	(0.0200)
Foreign	0.205***	0.204***	0.203***	0.204***	0.207***	0.208***	0.136**	0.135**	0.135**	0.135**	0.117***	0.118***
	(0.0571)	(0.0575)	(0.0187)	(0.0574)	(0.0580)	(0.0583)	(0.0551)	(0.0552)	(0.0567)	(0.0568)	(0.0371)	(0.0372)
AgricForestFish		0.0142										
		(0.213)										
MiningQuarrying		0.482*										
		(0.271)										
Utilities		-0.333*										
		(0.201)										
Construction		-0.168										
		(0.198)										
WholesaleRetail		-0.126										
		(0.196)										
TransportStorageComm		-0.0503										
		(0.214)										
HotelsRestaurants		0.111										
		(0.202)										
BusinessFinance		-0.329										
		(0.205)										
OtherServices		-0.376*										
		(0.198)										
Exporter			0.166***									
			(0.0185)									
Capital intense				-0.193***								
				(0.0117)								
Herfindahl_L					0.00447							
					(0.162)							
Herfindahl_S						-0.00539						
						(0.0672)						
Y/L_lag (log)							-0.0443***	-0.00192				
							(0.00463)	(0.0121)				
Y/Lsquared_lag								-0.0108***				
								(0.00265)				
VA/L_lag (log)									-0.0538***	-0.0448***		
									(0.00468)	(0.00571)		
VA/Lsquared_lag										-0.00562***		
										(0.00176)		
TFP_lag											-0.0464***	-0.0472***
											(0.00261)	(0.00300)
TFPsquared_lag												0.000463
												(0.000648)
Constant	1.812***	1.868***	1.800***	1.911***	1.721***	1.721***	2.344***	2.321***	2.327***	2.329***	2.315***	2.314***
	(0.196)	(0.182)	(0.459)	(0.195)	(0.136)	(0.137)	(0.207)	(0.207)	(0.207)	(0.207)	(0.195)	(0.195)
Observations	612,622	612,622	612,622	612,622	612,622	602,113	405,770	405,770	382,525	382,525	338,068	338,068
R-squared												
Sector dummies	YES	NO	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
Location dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of id	172,124	160,767	172,124	172,124	172,124	171,655	136,486	136,486	133,940	133,940	122,411	122,411
Between R2	0.0723	0.0514	0.0866	0.0692	0.0341	0.0332	0.0698	0.0670	0.0776	0.0763	0.0743	0.0743
Overall R2	0.0757	0.0555	0.0901	0.0734	0.0382	0.0380	0.0679	0.0655	0.0749	0.0738	0.0750	0.0749
Within R2	0.0879	0.0882	0.0882	0.111	0.0880	0.0883	0.0211	0.0230	0.0206	0.0214	0.0272	0.0272

Robust standard errors in parentheses; omitted: young (1-5), domestic, and manufacturing only in column 2.

*** p<0.01, ** p<0.05, * p<0.1

Table B2. Employment (Fixed Effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
age	0.0668***	0.0654***	0.0654***	0.0742***	0.0715***	0.0715***	0.104***	0.103***	0.103***
	(0.00207)	(0.00205)	(0.00204)	(0.00189)	(0.00207)	(0.00206)	(0.00168)	(0.00166)	(0.00166)
age_sq	-0.000929***	-0.000925***	-0.000922***	-0.000925***	-0.000918***	-0.000917***	-0.00101***	-0.00102***	-0.00102***
	(7.06e-05)	(7.07e-05)	(7.04e-05)	(6.96e-05)	(6.90e-05)	(6.88e-05)	(5.62e-05)	(5.83e-05)	(5.83e-05)
Y/L -log	-0.515***	-0.331***	-0.331***						
	(0.0206)	(0.0241)	(0.0241)						
Y/L (log) -squared		-0.0484***	-0.0487***						
		(0.00310)	(0.00310)						
Export share			-0.0398***			-0.0187***			-0.00266
			(0.00555)			(0.00531)			(0.00215)
VA/L (log)				-0.428***	-0.320***	-0.320***			
				(0.0136)	(0.0108)	(0.0108)			
VA/L (log) -squared					-0.0691***	-0.0692***			
					(0.00997)	(0.00997)			
TFP							-0.125***	-0.163***	-0.163***
							(0.00634)	(0.00739)	(0.00739)
TFP squared								0.0202***	0.0202***
								(0.00155)	(0.00155)
Constant	2.633***	2.530***	2.530***	2.013***	2.062***	2.062***	1.221***	1.213***	1.213***
	(0.0462)	(0.0427)	(0.0428)	(0.0220)	(0.0266)	(0.0266)	(0.0186)	(0.0188)	(0.0188)
Observations	568,168	568,168	568,168	539,928	539,928	539,928	468,277	468,277	468,277
R-squared	0.384	0.395	0.396	0.333	0.357	0.357	0.135	0.142	0.142
Number of id	153,185	153,185	153,185	150,724	150,724	150,724	137,111	137,111	137,111
R2	0.384	0.395	0.396	0.333	0.357	0.357	0.135	0.142	0.142
R2-adjusted	0.384	0.395	0.396	0.333	0.357	0.357	0.135	0.142	0.142
Between R2	0.0103	0.00773	0.00773	0.0553	0.0446	0.0444	0.0394	0.0372	0.0372
Overall R2	0.0178	0.0150	0.0150	0.0669	0.0578	0.0578	0.0430	0.0417	0.0417
Within R2	0.384	0.395	0.396	0.333	0.357	0.357	0.135	0.142	0.142

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B3: Determinants of Employment Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
sza_10to19	0.0203**	0.0208**	0.0115	0.0115	0.0203**	0.0203**	0.0263***	0.0354***	0.0168*
	(0.0102)	(0.0100)	(0.00917)	(0.00918)	(0.0102)	(0.0102)	(0.00980)	(0.00895)	(0.00886)
sza_20to49	0.0212	0.0224	0.00645	0.00644	0.0212	0.0211	0.0310	0.0485**	0.0188
	(0.0226)	(0.0227)	(0.0218)	(0.0218)	(0.0226)	(0.0226)	(0.0214)	(0.0202)	(0.0194)
sza_50to249	0.0217***	0.0229***	0.00736	0.00736	0.0217***	0.0212***	0.0380***	0.0657***	0.0264***
	(0.00518)	(0.00503)	(0.00587)	(0.00587)	(0.00518)	(0.00507)	(0.00657)	(0.00581)	(0.00453)
sza_250to499	0.0101	0.0124	-0.0134	-0.0134	0.0101	0.0100	0.0461*	0.0767***	0.0661**
	(0.0268)	(0.0267)	(0.0156)	(0.0156)	(0.0268)	(0.0269)	(0.0267)	(0.0256)	(0.0281)
sza_500plus	0.0247***	0.0286***	-0.00120	-0.00120	0.0247***	0.0252***	0.0776***	0.101***	0.129***
	(0.00942)	(0.00905)	(0.00791)	(0.00791)	(0.00941)	(0.00904)	(0.0199)	(0.0209)	(0.0313)
age_6to9	-0.113***	-0.113***	-0.129***	-0.129***	-0.113***	-0.113***	-0.114***	-0.113***	-0.100***
	(0.00428)	(0.00429)	(0.0109)	(0.0109)	(0.00428)	(0.00447)	(0.00420)	(0.00444)	(0.00410)
age_10to19	-0.151***	-0.152***	-0.174***	-0.174***	-0.151***	-0.151***	-0.157***	-0.155***	-0.139***
	(0.00644)	(0.00665)	(0.0146)	(0.0146)	(0.00644)	(0.00656)	(0.00583)	(0.00626)	(0.00619)
age_20to29	-0.168***	-0.169***	-0.198***	-0.198***	-0.168***	-0.168***	-0.171***	-0.169***	-0.156***
	(0.00748)	(0.00801)	(0.0192)	(0.0191)	(0.00748)	(0.00759)	(0.00670)	(0.00704)	(0.00734)
age_30plus	-0.175***	-0.177***	-0.204***	-0.204***	-0.175***	-0.175***	-0.200***	-0.200***	-0.165***
	(0.00805)	(0.00877)	(0.0181)	(0.0181)	(0.00805)	(0.00833)	(0.00720)	(0.00786)	(0.00916)
Foreign	0.0127**	0.0153**	0.00337	0.00336	0.0127**	0.0131**	-0.0679***	-0.0793***	0.0104*
	(0.00624)	(0.00646)	(0.00565)	(0.00565)	(0.00623)	(0.00645)	(0.00586)	(0.00524)	(0.00568)
Agriculture		0.00182							
		(0.0166)							
MinUtilConstr		-0.00226							
		(0.0180)							
Services		-0.00197							
		(0.0136)							
export share				-1.69e-05					
				(5.44e-05)					
normalised herfindahl index by sector and time L					-0.0117				
					(0.0650)				
normalised herfindahl index by sector and time rS						-0.130*			
						(0.0776)			
lnLPQ_lag							0.0947***		
							(0.00464)		
lnLPQ_lagsq							0.00270***		
							(0.00101)		
lnLPV_lag								0.0938***	
								(0.00264)	
lnLPV_lagsq								0.0143***	
								(0.00191)	
TFPi_lag									0.0212***
									(0.00138)
TFPi_lagsq									-0.00457***
									(0.000533)
Constant	0.159***	0.154***	0.205***	0.205***	0.159***	0.160***	0.00763	0.0490***	0.155***
	(0.0168)	(0.0124)	(0.0215)	(0.0215)	(0.0168)	(0.0167)	(0.0151)	(0.0149)	(0.0157)
Observations	367,099	367,099	54,236	54,236	367,099	363,399	341,605	327,284	286,154
Number of id	127,811	127,811	20,371	20,371	127,811	127,734	121,435	119,982	108,852
Sector dummies	YES	NO	YES	YES	YES	YES	NO	NO	NO
Location dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Between R2	0.0282	0.0267	0.0382	0.0382	0.0282	0.0280	0.0461	0.0518	0.0220
Overall R2	0.0212	0.0205	0.0288	0.0288	0.0212	0.0212	0.0599	0.0683	0.0213
Within R2	0.0140	0.0139	0.0212	0.0212	0.0140	0.0142	0.173	0.160	0.0215

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Column 3 and 4 are manufacturing only

Table B4: Determinants Productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent Variable	Value Added per Worker						Total Factor Productivity					
sz_10to19	-0.357***	-0.359***	-0.359***	-0.357***	-0.365***	-0.366***	-0.198***	-0.197***	-0.198***	-0.198***	-0.199***	-0.198***
	(0.0130)	(0.0132)	(0.0129)	(0.0130)	(0.0117)	(0.0117)	(0.00741)	(0.00787)	(0.00752)	(0.00740)	(0.00687)	(0.00666)
sz_20to49	-0.619***	-0.622***	-0.623***	-0.619***	-0.633***	-0.636***	-0.354***	-0.352***	-0.356***	-0.354***	-0.356***	-0.355***
	(0.0223)	(0.0217)	(0.0220)	(0.0223)	(0.0229)	(0.0229)	(0.0121)	(0.0124)	(0.0123)	(0.0121)	(0.0126)	(0.0126)
sz_50to249	-0.845***	-0.851***	-0.853***	-0.845***	-0.862***	-0.867***	-0.513***	-0.509***	-0.516***	-0.513***	-0.512***	-0.512***
	(0.0324)	(0.0319)	(0.0312)	(0.0324)	(0.0334)	(0.0336)	(0.0154)	(0.0156)	(0.0157)	(0.0154)	(0.0161)	(0.0160)
sz_250to499	-1.082***	-1.091***	-1.095***	-1.082***	-1.099***	-1.106***	-0.670***	-0.665***	-0.674***	-0.670***	-0.666***	-0.668***
	(0.0602)	(0.0609)	(0.0564)	(0.0602)	(0.0594)	(0.0592)	(0.0172)	(0.0177)	(0.0175)	(0.0172)	(0.0188)	(0.0186)
sz_500plus	-1.350***	-1.370***	-1.373***	-1.350***	-1.360***	-1.372***	-0.864***	-0.848***	-0.869***	-0.864***	-0.845***	-0.842***
	(0.127)	(0.128)	(0.121)	(0.127)	(0.119)	(0.119)	(0.0458)	(0.0480)	(0.0457)	(0.0458)	(0.0448)	(0.0463)
age_6to9	0.0737***	0.0746***	0.0725***	0.0737***	0.0741***	0.0740***	0.104***	0.103***	0.104***	0.104***	0.103***	0.104***
	(0.00386)	(0.00378)	(0.00397)	(0.00386)	(0.00374)	(0.00385)	(0.00743)	(0.00752)	(0.00741)	(0.00743)	(0.00731)	(0.00730)
age_10to19	0.104***	0.106***	0.101***	0.104***	0.105***	0.104***	0.164***	0.162***	0.163***	0.164***	0.161***	0.162***
	(0.00542)	(0.00550)	(0.00553)	(0.00541)	(0.00578)	(0.00574)	(0.0128)	(0.0131)	(0.0127)	(0.0128)	(0.0125)	(0.0123)
age_20to29	0.124***	0.127***	0.114***	0.124***	0.125***	0.125***	0.184***	0.181***	0.182***	0.184***	0.178***	0.179***
	(0.0103)	(0.0108)	(0.00964)	(0.0103)	(0.0115)	(0.0115)	(0.0190)	(0.0195)	(0.0188)	(0.0190)	(0.0189)	(0.0188)
age_30plus	0.278***	0.285***	0.254***	0.278***	0.283***	0.279***	0.199***	0.192***	0.194***	0.199***	0.187***	0.188***
	(0.0230)	(0.0244)	(0.0211)	(0.0230)	(0.0269)	(0.0269)	(0.0303)	(0.0313)	(0.0298)	(0.0302)	(0.0313)	(0.0309)
Foreign	0.145***	0.149***	0.140***	0.145***	0.150***	0.146***	0.0451*	0.0422*	0.0430*	0.0450*	0.0439*	0.0449*
	(0.0254)	(0.0245)	(0.0252)	(0.0254)	(0.0250)	(0.0249)	(0.0248)	(0.0248)	(0.0249)	(0.0248)	(0.0252)	(0.0257)
AgricForestFish		-0.0529						-0.0685				
		(0.0615)						(0.0454)				
MiningQuarrying		0.521***						0.0979				
		(0.0753)						(0.0609)				
Utilities		0.245***						-0.0533				
		(0.0905)						(0.0448)				
Construction		-0.211***						0.00275				
		(0.0606)						(0.0130)				
WholesaleRetail		-0.0181						-0.00221				
		(0.0732)						(0.0163)				
TransportStorageComm		0.453***						0.124**				
		(0.105)						(0.0533)				
HotelsRestaurants		-0.287***						-0.00952				
		(0.0764)						(0.0633)				
BusinessFinance		0.0454						0.0957***				
		(0.0631)						(0.0205)				
OtherServices		0.118*						0.0356				
		(0.0635)						(0.0282)				
Exporter			0.184***						0.0399***			
			(0.00891)						(0.00773)			
Share exports				-0.00343***						0.00533		
				(0.000641)						(0.00510)		
Herfindahl_L					0.944***						0.0789	
					(0.139)						(0.0780)	
Herfindahl_S						0.129***						-0.0183
						(0.0484)						(0.0252)
Constant	1.148***	1.143***	1.138***	1.148***	1.132***	1.148***	-0.0509	0.0312	-0.0531	-0.0511	0.0510**	0.0530**
	(0.0452)	(0.0580)	(0.0429)	(0.0452)	(0.0452)	(0.0461)	(0.0550)	(0.0193)	(0.0551)	(0.0550)	(0.0246)	(0.0247)
Observations	539,928	539,928	539,928	539,928	539,928	538,470	468,277	468,277	468,277	468,277	468,277	467,356
R-squared												
Number of id	161,215	150,724	161,215	161,215	161,215	160,900	146,646	137,111	146,646	146,646	146,646	146,363
Sector dummies	YES	NO	YES	YES	NO	NO	YES	NO	YES	YES	NO	NO
Location dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Between R2	0.0864	0.0660	0.0994	0.0864	0.0432	0.0404	0.0342	0.0329	0.0349	0.0343	0.0312	0.0314
Overall R2	0.100	0.0810	0.114	0.100	0.0593	0.0569	0.0348	0.0342	0.0355	0.0349	0.0335	0.0335
Within R2	0.227	0.174	0.174	0.168	0.171	0.171	0.0273	0.0276	0.0276	0.0270	0.0273	0.0273

Robust standard errors in parenthesesavg size; omitted: micro (1-9), young (1-5), domestic, and manufacturing only in columns 2 and 8.
*** p<0.01, ** p<0.05, * p<0.1

Table B5. Determinants Wage (log)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
sz_10to19	-0.318***	-0.320***	-0.321***	-0.328***	-0.326***	-0.156***	-0.0720***	-0.258***
	(0.0173)	(0.0180)	(0.0174)	(0.0163)	(0.0164)	(0.0280)	(0.0163)	(0.0188)
sz_20to49	-0.559***	-0.563***	-0.566***	-0.577***	-0.573***	-0.269***	-0.122***	-0.441***
	(0.0247)	(0.0245)	(0.0247)	(0.0248)	(0.0247)	(0.0326)	(0.0221)	(0.0372)
sz_50to249	-0.798***	-0.805***	-0.810***	-0.818***	-0.812***	-0.387***	-0.180***	-0.616***
	(0.0417)	(0.0410)	(0.0408)	(0.0425)	(0.0420)	(0.0430)	(0.0275)	(0.0530)
sz_250to499	-1.074***	-1.083***	-1.094***	-1.092***	-1.086***	-0.537***	-0.264***	-0.847***
	(0.0554)	(0.0545)	(0.0511)	(0.0546)	(0.0544)	(0.0537)	(0.0309)	(0.0809)
sz_500plus	-1.482***	-1.496***	-1.513***	-1.488***	-1.490***	-0.760***	-0.380***	-1.044***
	(0.119)	(0.115)	(0.112)	(0.111)	(0.108)	(0.139)	(0.0857)	(0.107)
age_6to9	0.0445***	0.0445***	0.0426***	0.0454***	0.0458***	0.00964	-0.000674	0.0290***
	(0.00514)	(0.00525)	(0.00510)	(0.00490)	(0.00483)	(0.00737)	(0.00638)	(0.00871)
age_10to19	0.0710***	0.0710***	0.0664***	0.0730***	0.0732***	0.0118	0.00281	0.0433***
	(0.00890)	(0.00947)	(0.00885)	(0.00822)	(0.00826)	(0.0128)	(0.0124)	(0.0132)
age_20to29	0.0935***	0.0927***	0.0820***	0.0947***	0.0952***	0.0204	0.0136	0.0652***
	(0.0145)	(0.0168)	(0.0139)	(0.0144)	(0.0143)	(0.0186)	(0.0158)	(0.0158)
age_30plus	0.293***	0.288***	0.266***	0.290***	0.293***	0.128***	0.110***	0.241***
	(0.0303)	(0.0361)	(0.0281)	(0.0344)	(0.0341)	(0.0292)	(0.0248)	(0.0210)
Foreign	0.339***	0.343***	0.332***	0.347***	0.350***	0.229***	0.262***	0.330***
	(0.0311)	(0.0305)	(0.0314)	(0.0310)	(0.0323)	(0.0352)	(0.0418)	(0.0444)
AgricForestFish		-0.102*						
		(0.0613)						
MiningQuarrying		0.416***						
		(0.0601)						
Utilities		0.379***						
		(0.0761)						
Construction		-0.175***						
		(0.0532)						
WholesaleRetail		-0.0317						
		(0.0700)						
TransportStorageComm		0.176*						
		(0.0906)						
HotelsRestaurants		-0.400***						
		(0.0686)						
BusinessFinance		0.118**						
		(0.0585)						
OtherServices		0.107*						
		(0.0586)						
Exporter			0.209***					
			(0.0121)					
Herfindahl_L				0.891***				
				(0.130)				
Herfindahl_S					0.149***			
					(0.0495)			
Sales per worker -log						0.467***		
						(0.0261)		
Value Added per worker -log							0.607***	
							(0.0220)	
Total Factor Productivity								0.181***
								(0.0154)
Constant	4.732***	4.740***	4.720***	4.724***	4.736***	-2.043***	-1.896***	-1.167***
	(0.0461)	(0.0543)	(0.0441)	(0.0435)	(0.0448)	(0.0559)	(0.0474)	(0.0399)
Observations	597,737	597,737	597,737	597,737	587,702	576,449	548,102	475,205
R-squared								
Sector dummies	YES	NO	YES	NO	NO	YES	YES	YES
Location dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Number of id	168,954	157,854	168,954	168,954	168,430	162,362	159,720	145,680
Between R2	0.0955	0.0729	0.107	0.0524	0.0507	0.390	0.556	0.194
Overall R2	0.101	0.0810	0.113	0.0615	0.0601	0.393	0.543	0.216
Within R2	0.112	0.114	0.110	0.112	0.112	0.330	0.363	0.260

Robust standard errors in parentheses

Omitted: micro (1-9), young (1-5), domestic, and manufacturing only in column 2.

*** p<0.01, ** p<0.05, * p<0.1

Table B6. Wage (log-Fixed Effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Employment (log)	-0.567***	-0.263***	-0.263***	-0.263***	-0.235***	-0.232***	-0.235***	-0.530***	-0.502***	-0.530***
	(0.00987)	(0.00619)	(0.00596)	(0.00618)	(0.00856)	(0.00725)	(0.00856)	(0.0116)	(0.0108)	(0.0116)
Y/L -log		0.440***	0.439***	0.441***						
		(0.00760)	(0.0108)	(0.00762)						
Y/L sq			0.000542							
			(0.00233)							
VA/L (log)					0.475***	0.467***	0.475***			
					(0.0110)	(0.0165)	(0.0110)			
VA/L _sq						0.00575				
						(0.00436)				
TFPi								0.129***	0.244***	0.129***
								(0.00882)	(0.00774)	(0.00882)
TFPi sq									-0.0582***	
									(0.00207)	
Share exports				0.0145**			0.00893			0.00587
				(0.00665)			(0.00638)			(0.00443)
Constant	5.916***	4.413***	4.414***	4.411***	4.689***	4.681***	4.689***	5.818***	5.829***	5.818***
	(0.0233)	(0.0231)	(0.0238)	(0.0231)	(0.0280)	(0.0236)	(0.0280)	(0.0272)	(0.0246)	(0.0272)
Observations	597,737	559,888	559,888	559,888	532,235	532,235	532,235	463,368	463,368	463,368
R-squared	0.195	0.270	0.270	0.270	0.303	0.303	0.303	0.234	0.273	0.234
Number of id	157,854	151,704	151,704	151,704	149,283	149,283	149,283	136,171	136,171	136,171
R2	0.195	0.270	0.270	0.270	0.303	0.303	0.303	0.234	0.273	0.234
R2-adjusted	0.195	0.270	0.270	0.270	0.303	0.303	0.303	0.234	0.273	0.234
Between R2	0.0229	0.268	0.268	0.268	0.409	0.412	0.409	0.0566	0.100	0.0567
Overall R2	0.0342	0.273	0.273	0.273	0.405	0.408	0.405	0.0708	0.116	0.0709
Within R2	0.195	0.270	0.270	0.270	0.303	0.303	0.303	0.234	0.273	0.234

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B7. Probability of Exit (marginal effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
sz_10to19	-0.0106***	-0.0102***	-0.00999***	-0.0102***	-0.00872***	-0.00888***	-0.0103***
	(0.000244)	(0.000227)	(0.000247)	(0.000242)	(0.000276)	(0.000265)	(0.000240)
sz_20to49	-0.0117***	-0.0114***	-0.0109***	-0.0111***	-0.00959***	-0.00980***	-0.0113***
	(0.000230)	(0.000207)	(0.000228)	(0.000220)	(0.000215)	(0.000210)	(0.000219)
sz_50to249	-0.00985***	-0.00968***	-0.00877***	-0.00891***	-0.00786***	-0.00799***	-0.00952***
	(0.000210)	(0.000192)	(0.000195)	(0.000192)	(0.000189)	(0.000187)	(0.000203)
sz_250to499	-0.00977***	-0.00962***	-0.00891***	-0.00904***	-0.00771***	-0.00783***	-0.00941***
	(0.000293)	(0.000319)	(0.000196)	(0.000192)	(0.000233)	(0.000230)	(0.000289)
sz_500plus	-0.00929***	-0.00917***	-0.00807***	-0.00818***	-0.00628***	-0.00641***	-0.00896***
	(0.000202)	(0.000217)	(0.000185)	(0.000182)	(0.000498)	(0.000475)	(0.000208)
age_6to9	0.00124***	0.00223***	0.000333		-0.000311		
	(0.000386)	(0.000429)	(0.000347)		(0.000401)		
age_10to19	-0.000561*	0.000379	-0.00130***		-0.00181***		
	(0.000338)	(0.000378)	(0.000319)		(0.000318)		
age_20to29	-0.00264***	-0.00175***	-0.00282***		-0.00324***		
	(0.000406)	(0.000434)	(0.000327)		(0.000341)		
age_30plus	-0.00269***	-0.00219***	-0.00332***		-0.00366***		
	(0.000755)	(0.000811)	(0.000391)		(0.000440)		
Foreign	-0.00512***	-0.00380**	-0.00426***	-0.00440***	-0.00381**	-0.00392**	-0.00397**
	(0.00135)	(0.00160)	(0.00155)	(0.00154)	(0.00156)	(0.00155)	(0.00165)
AgricForestFish		-0.000438					
		(0.000402)					
MiningQuarrying		0.00348**					
		(0.00140)					
Utilities		0.000965					
		(0.00128)					
Construction		0.00313***					
		(0.000282)					
WholesaleRetail		-0.000180					
		(0.000389)					
TransportStorageComm		0.00303***					
		(0.000537)					
HotelsRestaurants		0.00228***					
		(0.000506)					
BusinessFinance		0.00239***					
		(0.000265)					
OtherServices		0.00242***					
		(0.000235)					
Young				0.00126***		0.00162***	
				(0.000364)		(0.000382)	
VA/L (log)			-0.00376***	-0.00377***			
			(0.000202)	(0.000242)			
Young*VA/L				-0.000256			
				(0.000340)			
TFPi					-2.33e-05	6.82e-05	
					(0.000108)	(0.000100)	
Young*TFPi						-0.000988***	
						(0.000272)	
Exporter							-0.00684***
							(0.000323)
Observations	560,543	661,653	449,065	449,065	392,474	392,474	560,543
Sector dummies	YES	NO	YES	YES	YES	YES	YES
Location dummies	YES	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses; omitted: micro (1-9), young (1-5), domestic, and manufacturing only in column 2.
*** p<0.01, ** p<0.05, * p<0.1