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JOB CREATION AND DESTRUCTION IN SOUTH AFRICA

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Abstract
Analysts of the South African labour market have mainly used household surveys to analyse the labour market. It has been more difficult to explore the labour demand of firms, as a result of limited data availability. We use the Quarterly Employment Statistics survey, an enterprise survey conducted by Statistics South Africa, to explore how South African firms create and destroy jobs, thereby shedding light on many of the policy questions that are relevant in a high unemployment society like South Africa. We find that job creation and destruction rates are similar to those found in Organisation for Economic Co-operation and Development countries. There is little evidence that labour legislation creates rigidities that prevent firms from hiring or firing workers. We also find that larger firms are better net creators of jobs than small firms and that net job creation rates are negative in manufacturing. Our research has important policy implications – particularly for the South African National Planning Commission's 2030 plan, in which new jobs are envisaged to come mainly from small- and medium-sized firms. Our research suggests that this scenario is not likely without changes to policy or legislation.
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1. INTRODUCTION

The labour market in South Africa has received considerable scrutiny in the post-Apartheid period, partly as a result of the stubbornly high levels of unemployment, poverty and inequality, but also because of the release of substantial amounts of microdata from household surveys undertaken by Statistics South Africa (Stats SA) and academic researchers. Much of this analysis has been focussed on labour supply and has used cross-sectional household surveys, exploring changes in participation and employment (Casale *et al.*, 2004), as well as poverty and inequality (van der Berg and Louw, 2004; Ozler, 2007). The availability of household-level panel data has widened the scope of research, allowing researchers to explore mobility and labour market transitions (Cichello *et al.*, 2005; Banerjee *et al.*, 2008), as well as the importance of unobserved heterogeneity in explaining earnings differentials (Badaoui *et al.*, 2008; Kerr and Teal, 2012).

There have been some firm surveys conducted by academics and international organisations in South Africa, but these have been small, cross-sectional and limited to specific regions (Valodia and Velia, 2006; Edwards *et al.*, 2008). The surveys have been used to estimate elasticities of substitution between capital and different kinds of labour

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(Behar, 2010a), and the complementarity or substitutability of labour of different skill levels (Behar, 2010b).

What is missing from the analysis of the South African labour market is any exploration of the dynamics of labour demand, which requires firm-level panel data. Stats SA and its predecessors have collected firm-level data for several decades, but the microdata from these surveys have never been released.

In this paper, we provide the first analysis of firm-level panel data in South Africa and explore the extent of job creation and destruction in South African firms. Our data come from Stats SA. We use the Quarterly Employment Statistics survey (QES) data, which contains employment information on a nationally representative sample of enterprises from 2005 to 2011.[1]

Stats SA collects data at the enterprise level, rather than at the establishment level. This reflects total employment across all establishments owned by the same enterprise. We explore the extent of job creation and destruction in enterprises, the roles of small and large enterprises in job creation and destruction, the contribution of enterprise deaths to job destruction and enterprise births to job creation, and the variation in job destruction and creation over the business cycle. We find that small firms both create and destroy more jobs than large firms, but that net job creation is higher in the largest firms. This finding is partly qualified because there is undercoverage of firm births in the data we use and because our data preclude us from exploring job creation and destruction in all informal firms and in the very smallest formal firms.

2. LITERATURE REVIEW

Recent empirical investigations of the demand side of the labour market using firm-level panel data have shown that the changes in total stocks of employment are much smaller than the employment flows over the same period (Davis *et al.*, 1996, Organisation for Economic Co-operation and Development (OECD), 1996; Haltiwanger *et al.*, 2008). In this literature, a strong emphasis is placed on the changes in firm- or plant-level employment. Aggregate employment usually changes relatively slowly, but this slow change masks large changes at the firm level. Some new firms start up and grow while other firms shrink or die, emphasising the importance of heterogeneity at the firm level (Melitz, 2003).

Job creation occurs in firms that expand employment or in new firms while job destruction occurs in firms that contract their level of employment or by the death of a firm that closes down. Gross job creation rates of around 9% per annum were found by Davis *et al.* (1996) in their work in US manufacturing plants during the 1970s and 1980s, while gross job destruction rates were around 10% per annum. Thus, job reallocation rates, the sum of job creation and job destruction rates, were around 19% per annum. These very high rates of reallocation suggested a very dynamic economy experiencing constant change, both growth and contraction, despite total manufacturing employment shrinking by around 1% per annum over the period investigated. This work also suggested that a substantial amount of job destruction occurred in quite severe contractions, as plant deaths were found to account for about 23% of job destruction in US manufacturing (Davis *et al.*, 1996).

[1] The data are confidential, but our use of them is not exclusive.

A more recent study by Haltiwanger *et al.* (2008) compared job creation and destruction rates across 16 OECD, transition and Latin American countries. Using firm-level, rather than plant-level, data the authors found even higher yearly job reallocation rates using data from all industries – around 25%, 29% and 30%, respectively – in each of the three regions.

2.1 Job Creation and Destruction in Sub-Saharan Africa

There is a paucity of data for developing countries to answer questions about job creation and destruction. Thus, in sub-Saharan Africa, there are only a few papers exploring this question. Klapper and Richmond (2011) use data on Ivory Coast firms between 1977 and 1997, Shiferaw and Bedi (2009) use a manufacturing census from Ethiopia in the 1990s and 2000s, and Sandefur (2010) uses an 11-year manufacturing firm panel from Ghana over the 1990s and 2000s.

The results from Ivory Coast suggest that average gross job reallocation rates are around 30% per annum over the sample period, while showing that firm entry and exit play a more important role in job creation and destruction than in OECD countries. Shiferaw and Bedi (2009) found that gross job reallocation rates were around 28% per annum in Ethiopia and highlights that in many ways, the behaviour of Ethiopian firms is not dissimilar to firms in OECD countries. Sandefur (2010) finds much higher rates of job reallocation in smaller firms, but also higher net growth in smaller firms, consistent with a large reduction in average firm size between the two waves of the census. Sandefur (2010) argues that small firms do create more jobs in Ghana and that previous research did not come to this conclusion because the research used data that did not include entry of new firms which are predominantly small. It must be recognised that in the Ivorian and Ethiopian studies, only registered, in other words formal, firms are included and that employment in formal firms comprises a very low fraction of total employment, which is mainly concentrated in subsistence agriculture and informal self-employment (Kingdon *et al.*, 2006).

2.2 The Role of Small Firms in Job Creation

One of the more contentious aspects of the job creation and destruction literature is whether small firms are responsible for the creation of many or most of the new jobs created. Davis *et al.* (1996) argued, using data on US manufacturing plants, that while small firms do create many new jobs, they also destroy many jobs, with the main finding being that there is no systematic pattern between net job creation rates and the average size of plants in the United States.

Davis *et al.* (1996:62-70) note that part of the reason for the belief that small firms are responsible for much of the net job creation in the United States is that the calculations performed by many authors (cf. Birch, 1987) do not take account of the migration between size categories of firms, use "share of net job creation" statistics in a misleading manner and suffer from the regression to the mean fallacy because base year employment levels are used to calculate job creation rates. To avoid the first and third errors, Davis *et al.* (1996) suggest using average size over the sample period, which we follow in our analysis below.

The South African National Planning Commission's National Development Plan expects that small- and medium-sized firms will play an important role in job creation over the next 20 years (National Planning Commission, 2011:114). The QES data

provide an opportunity to explore whether this is indeed possible based on past employment outcomes. The QES can only be used to explore job creation and destruction in registered firms, however, because the sample frame is based on the Business Register maintained by Stats SA.

There may be high rates of job creation in informal firms, but we cannot measure this. However, Cichello *et al*. (2012) find that self-employment and casual employment, both of which are much more likely to be in informal firms not included in the QES, are much less stable than regular employment. Banerjee *et al*. (2008) obtain similar results using the Labour Force Survey panel, showing that the informally employed are much less likely to be informally employed six months later compared with the likelihood that an individual with a formal job would still be in a formal job six months later. This suggests that although job creation might be relatively high in informal businesses, job destruction is also higher. It is also important to remember that South Africa is an outlier with regards to informal employment in sub-Saharan Africa, with informal employment much less important that formal employment (Kingdon *et al*., 2006).

2.3 Do Job Flows Shed Light on Rigidities in the Labour Market?

Recent research by Haltiwanger *et al*. (2008) explores whether labour regulations affect job reallocation rates. The authors argue that while there are models that predict that more stringent labour regulation reduces job reallocation rates, this is an open question empirically. The data the authors use, from 16 countries, suggest that while industry effects and the size of firms can explain around half of the variance in job flows, there is evidence that more labour regulation reduces job flows, mainly through regulation's effects on entry and exit of firms.

Bhorat and Cheadle (2009) discuss the regulatory regime governing the South African labour market, finding that the level of regulation, as measured in the 1997 database discussed by Botero *et al*. (2004), and the Cost of Doing Business (CDB) survey by the World Bank from 2006, are not dramatically above the mean of the sample or the mean for countries with similar income levels. This does disguise some variation within different aspects of regulation. For example, Bhorat and Cheadle (2009) note that South Africa scores highly (*i.e.* is more regulated) in the areas of firing costs, trade union power and the provision of unemployment insurance in the 1997 data, although the overall score is at the thirtieth percentile of labour regulation. By 2006, the CDB data suggest that the South African labour market had become more regulated, although the country's position was still only at the fifty-eighth percentile in overall employment regulation. Interestingly, in the CDB survey, South Africa had relatively high rankings in firing and hiring regulations. Our estimates of job reallocation rates may thus shed some empirical light on the rigidities present in the South African labour market.

3. DATA

The QES is a nationally representative enterprise-level panel survey administered every quarter by Stats SA. The survey excludes agriculture and mining and all unregistered enterprises. Mining employment is, however, included in the formal non-agricultural employment series P0277 produced by Stats SA, with total mining employment figures obtained by Stats SA from the Department of Mineral Resources (formerly the Department of Minerals and Energy). These data are not available at the enterprise level

and thus is excluded from all of our analysis. The sample frame for the QES comes from the business register, which is kept up to date by Stats SA using data from the South African Revenue Service (SARS), the Department of Trade and Industry and the Department of Labour.[2] Very small enterprises are excluded because they are not required to register for value-added tax (VAT). In the first two samples, enterprises with annual turnover of less than R300,000 (roughly $33,000 at current exchange rates) were not required to register for VAT by SARS, but this threshold was raised to R1 million in 2009 by SARS and thus affected the third sample that began in 2010.

Around 18,000 private sector enterprises were sampled in the first quarter of 2005 and followed for the next four quarters, which represented about 12% of the total number of registered private enterprises in the sample frame and around 50% of the estimated total private employment in registered businesses outside agriculture and mining. A new sample was drawn from an updated sample frame in June 2006 and another in March 2010, with overlap across the samples as a result of sampling with certainty plants over a specified size that varied by Standard Industrial Classification (SIC) code. The overlaps between samples mean that of the 28,599 privately owned enterprises appearing in the data we use, 23% appeared in all three samples. We discuss attrition below.

The sampling procedure involved stratification on firm employment level, based on information on employee numbers from SARS or on turnover if employee data did not exist, as well as SIC code. The largest firms in each SIC were sampled with certainty. Sample design weights were adjusted for non-response by size and SIC, and we use these adjusted weights in our analysis.

In our analysis, we use the number of employees (both full time and part time) reported in the last month of each quarter. The SIC code is at varying degrees of disaggregation, partly to protect the confidentiality of enterprises, although most enterprises can be classified at the three-digit level in the data we use. Table 1 shows descriptive statistics from each wave of the sample, and Table 2 shows further descriptives from the first wave of each of the three samples.

The structure of the QES data and its relationship with the formal non-agricultural employment series P0277 released by Stats SA is illustrated in Figure 1. The mining employment series comes from the Department of Mineral Resources. Government departments, local municipalities and universities are part of the QES sample, and the employment in this group is shown in the "Public and University Employment" series. These two series, plus a weighted series of total private sector employment, contribute to the employment series P0277 released by Stats SA, which is approximated by the series "Total Weight Employment" in Figure 1. The series displays a discontinuity at the start of the second sample in June 2006, which is discussed, along with a revision of the series, in the Stats SA March 2007 P0277 release (Stats SA, 2007).

3.1 Descriptive Statistics

(i) Firm Deaths The percentage of enterprises with complete employment data is shown in Table 1 to rise after the initial wave and then decline, rising again at the start of the following two samples in wave 6 and wave 21. There are several processes contributing to

[2] In addition, government departments, local municipalities, higher education institutions and extra-budgetary government institutions are also included in the sample, but we ignore these in all our analysis.

Table 1. Descriptive statistics by wave

Wave	Year	Sample	Avg ent emp	Sample size	Positive responses	Births	Deaths	Fraction complete responses
1	2005	1	170.08	17974	15,274	12	88	0.85
2	2005	1	159.65	17974	16,290	0	151	0.91
3	2005	1	159.11	17974	16,016	0	134	0.89
4	2005	1	156.30	17974	15,714	0	102	0.87
5	2006	1	157.53	17974	15,340	0	93	0.85
6	2006	2	213.13	14439	12,216	144	86	0.85
7	2006	2	212.19	14439	12,131	0	78	0.84
8	2006	2	216.31	14439	12,498	0	137	0.87
9	2007	2	223.02	14439	12,477	0	136	0.86
10	2007	2	245.53	14439	11,812	0	136	0.82
11	2007	2	241.60	14439	12,043	0	123	0.83
12	2007	2	253.77	14439	11,774	0	87	0.82
13	2008	2	253.71	14439	11,634	0	43	0.81
14	2008	2	258.29	14439	11,596	0	197	0.80
15	2008	2	257.99	14439	11,256	0	116	0.78
16	2008	2	268.92	14439	11,154	0	159	0.77
17	2009	2	264.95	14439	10,979	0	107	0.76
18	2009	2	263.65	14439	10,882	0	95	0.75
19	2009	2	265.97	14439	10,602	0	114	0.73
20	2009	2	274.09	14439	10,479	0	55	0.73
21	2010	3	225.27	16985	14,232	0	242	0.84
22	2010	3	224.91	16985	14,581	0	143	0.86
23	2010	3	226.92	16985	14,401	0	118	0.85
24	2010	3	234.80	16985	14,022	0	106	0.83
25	2011	3	236.07	16985	13,796	0	81	0.81
26	2011	3	238.09	16985	13,674	0	82	0.81
27	2011	3	241.68	16985	13,464	0	65	0.79
28	2011	3	245.04	16985	12,721	0	52	0.75

Source: Own calculations from QES.

Table 2. Further enterprise descriptive statistics

	Wave 1	Wave 6	Wave 21
Industry proportions			
Manuf	0.356	0.418	0.347
Utilities	0.003	0.009	0.008
Construction	0.092	0.076	0.085
Trade	0.206	0.161	0.241
Transport	0.043	0.054	0.058
Finance	0.203	0.191	0.193
Services	0.097	0.090	0.069
Size category proportions			
1-19	0.395	0.324	0.295
20-49	0.207	0.201	0.207
50-99	0.150	0.170	0.176
100-249	0.142	0.161	0.171
250-499	0.055	0.074	0.078
500-999	0.027	0.037	0.038
1,000-2,499	0.014	0.019	0.022
2,500-4,999	0.006	0.007	0.008
5,000+	0.005	0.006	0.005
Age category proportions			
0-5	0.136	0.133	0.067
6-10	0.279	0.271	0.208
11-15	0.137	0.147	0.237
16-20	0.096	0.093	0.116
21-30	0.154	0.078	0.128
31-40	0.079	0.144	0.151
40+	0.120	0.134	0.093

Source: Own calculations from QES. Firm size is taken as the average of all quarterly observations of the firm.

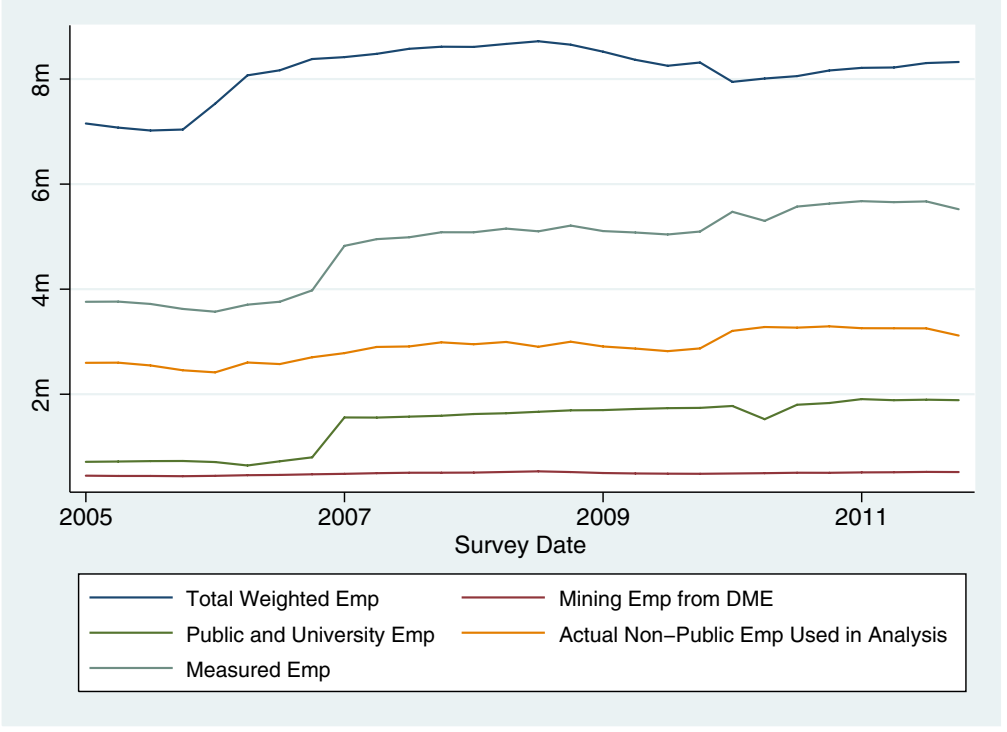

Figure 1. Employment totals from QES

declining levels of complete responses. Two important ones are enterprise deaths and enterprises that Stats SA finds are "untraceable." In addition, if an enterprise is sold or is the target of a merger, however, then Stats SA also ceases to collect employment information because this employment would be double counted in any analysis estimated total employment in all registered enterprises in South Africa, and thus these firms are also counted as not having responded.

We use the QES firm response codes to classify enterprises as having experienced a death if they are coded as having closed down, been liquidated or are dormant, and assign these observations zero employment. If an employment level in an enterprise for a particular wave is imputed by Stats SA, we set this value to missing for our analysis in this paper. Table 1 shows the number of deaths and percentage of completed responses with employment levels by wave. Firms deaths represent between 0.4% and 1.7% of the complete responses in any wave.

(ii) Firm Births The sample is only refreshed twice after the initial sample was taken. These two waves, as well as the initial wave, are the only times when new enterprises could be included in the sample. As a result, enterprise births are undersampled in the QES. There is also an asymmetry between births and deaths in the data – deaths can occur every quarter, while there are only three quarters in which births can enter the sample and contribute to the job creation numbers. Only two of these waves allow births to enter the job creation statistics because we do not have data on any firms prior to the first wave, and

even in the other two quarters the partial break with the previous samples, with only large firms appearing in old and new samples, means that births will be under-represented in the job creation statistics.

We can use "year of registration" in the Stats SA data to classify an enterprise as a birth, and assign it an initial value of zero employees, if the year of registration was a year earlier than the year the firm first appeared in the sample. This birth classification unfortunately only results in 295 births compared with over 3,200 deaths, indicating that the under-counting of births is an important problem in the QES data.

To get around this under-counting of births, we use the second and third samples to retrospectively impute births in the first and second samples, respectively. If a firm appears for the first time in the third sample but has a registration date between 2004 and 2009 inclusive, then we know that the firm was born during this period and should contribute to job creation from births in the year it was first registered. Similarly, if a firm appears for the first time in the second sample but has a registration date between 2005 and 2006 inclusive, then we know that the firm was born during this period and should contribute to job creation from births during this period. This method generates an extra 1,248 births in samples 1 and 2, meaning that in these samples we have 1,507 births and 2,299 deaths.

In imputing birth-related job creation, we do not know each firm's initial employment level or how this evolved until the firm appears for the first time in the second or third sample. We make the simple assumption that the employment level of the firm in the first wave it is observed in the QES is the job creation that resulted from the birth, and we assign this level of job creation to the four quarters of the year in which the firm was first registered. This method does mean that we will overestimate the contributions of these births to job creation, but will not overstate total job creation, because a firm must have created at least X jobs by the time it appears in the sample if it is of size X in that wave.

The imputations discussed above solve the major part of the undercounting of job creation resulting from enterprise births in the first and second samples, although we cannot impute births in the third sample. But under-counting job creation from births also occurs in the first and second samples because there will be firms that are born in these sample periods but then die before the third sample is selected and whose job creation (and destruction) we will miss in using our imputation method. Unfortunately, we are not able to do anything about this issue, but it will mean that our estimates of job creation and destruction rates are biased downwards.

(iii) Enterprise Size Across all enterprises in the sample, the median enterprise has seven employees while in manufacturing the median manufacturing enterprise has 10 employees. Hsieh and Klenow (2011) present similar data for manufacturing in the United States, Mexico and India, although they use establishment-level, not enterprise-level, data. They find that the median establishment employed 3 workers in India, 7 in Mexico but 48 in the United States. Sandefur (2010) shows that the industrial census suggests that the median manufacturing enterprise in Ghana employed between one and four workers in 2003 (see table 1 in Sandefur (2010)). This suggests that the distribution of size in South African manufacturing is not too different to that in middle-income or low-income countries.

However, the differences become more apparent when we explore the size of the enterprise where the median worker works. The QES data suggest that the median worker

Table 3. Job creation and destruction by size category and by two-digit manufacturing SIC

All firms					
Size category	**Weighted emp share**	**JC**	**JD**	**Birth contrib to JC**	**Death contrib to JD**
1-19	16.2	10.1	14.3	11.8	34.4
20-49	15.6	12.2	12.2	12.7	33.3
50-99	11.2	9.7	13.0	5.5	22.3
100-249	10.3	9.6	11.3	7.2	28.3
250-499	6.1	10.4	10.9	9.2	26.9
500-999	5.9	11.2	8.6	10.0	16.0
1,000-2,499	7.3	11.1	8.3	11.0	16.9
2,500-4,999	6.4	12.5	6.9	10.9	11.8
5,000+	20.9	6.7	4.0	10.3	7.1
Manufacturing firms only					
Two-digit SIC					
Food, beverage and tobacco	16.7	9.6	7.4	7.0	16.0
Textiles	9.8	6.4	12.7	6.8	25.4
Wood and paper	11.1	6.8	10.4	7.8	29.9
Petroleum and rubber	11.2	7.5	7.9	4.6	22.1
Non-metallic minerals	4.9	8.0	11.8	10.1	27.0
Metals	23.7	10.0	9.8	9.8	23.3
Electrical machinery	3.2	8.6	8.6	1.1	28.8
Communication and medical	1.3	8.8	8.7	10.1	21.7
Transport equipment	10.5	7.9	9.6	5.6	25.8
Miscellaneous	6.8	8.1	12.7	5.2	29.3
Manufacturing average		8.9	9.8	10.9	25.3
Manufacturing firms only					
Size category					
1-19	12.9	9.6	13.5	9.4	32.7
20-49	14.7	9.9	11.5	9.1	31.4
50-99	13.1	9.1	10.4	8.1	25.9
100-249	16.0	9.4	10.4	7.5	28.3
250-499	11.1	8.1	8.8	7.1	22.9
500-999	7.6	9.2	8.1	9.6	18.9
1,000-2,499	10.0	7.5	7.2	14.8	10.0
2,500-4,999	6.6	9.5	7.5	21.4	6.6
5,000+	8.0	6.0	5.4	13.9	0.0

Source: Own calculations from QES. These are weighted results.
JC: job creation; JD: job destruction; SIC: Standard Industrial Classification.

in South Africa works in an enterprise with 140 employees, while when limiting the sample to manufacturing the median worker works with 155 other employees. This is substantially higher than the establishment-level results of Hsieh and Klenow (2011), who find that the median worker in manufacturing worked in an establishment with 5 workers in India and 24 in Mexico, and higher than Ghana, where Sandefur (2010) shows that the median worker works in an enterprise with a size of between 20 and 29 employees. These differences are partly explained by the fact that we are using enterprise data, but it still seems true that the QES paints a picture of a much bigger large firm sector than other developing countries. What is lacking in South Africa, and which helps to explain the large levels of unemployment, is employment in informal micro-enterprises and informal self-employment (Kingdon and Knight, 2004; Magruder, 2012).

The second column of Table 3 shows the weighted employment shares for all enterprises and for manufacturing only. Firms with more than 5,000 employees employ over 20% of all those employed in registered businesses outside agriculture and mining. The share is much lower for manufacturing enterprises, the largest of which employ around 9% of all employees in registered manufacturing enterprises. The smallest category of enterprise employs only about 16% of the total employees in the QES.

3.2 Non-Response

We noted above that some firms do not report employment in every quarter. Of the roughly 440,000 firm-quarter observations we have, around 93,000 do not have an employment value. Not all of these are non-response, however. Around 32,500 are missing values following a firm death – so we know that a death has led to no employment being captured in the remaining sample periods. Another 19,000 are due to the firm being sold, reclassified outside the sample or the firm being found to be a secondary unit, in which case the firm's employment was not recorded and instead employment was collected at the parent unit to avoid Stats SA double counting employment in its estimate of total employment.

In around 8,000 quarters, firms were reported as having outstanding questionnaires but were not imputed, and in around 3,000 quarters firms were described as untraceable but were not imputed. This leaves around 31,000 quarters that were imputed. Only a small fraction of these were due to the response code "outstanding questionnaire." The rest are given imputation codes but without detail on why they were imputed. Discussions with the QES team at Stats SA suggested that these were also firms that did not return the questionnaire but which did not die. These imputations are spread over 9,000 firms, with the median being two missing values per enterprise in those enterprises that did have at least one imputed employment value. Younger enterprises, medium-sized enterprises and those with an SIC of trade were more likely to have an imputed value.

4. ANALYSIS

In this section, we explore job creation and destruction in the sample of QES firms.

4.1 Definitions

Following Davis *et al.* (1996), we define job creation at time t as employment gains summed over all enterprises that expand or start up between $t-1$ and t:

$$C_t = \sum_{i \in g^+} \Delta X_{it}. \tag{1}$$

We define job destruction as employment losses summed over all enterprises that contract or shut down between $t-1$ and t:

$$D_t = \sum_{i \in g^-} |\Delta X_{it}|. \tag{2}$$

To obtain job creation and destruction rates as a percentage of total measured employment of all firms in the sample, we divide by the average of employment at t and $t-1$, following Davis *et al.* (1996). We only allow employment from a firm to contribute to this average if employment at time t and at time $t-1$ is not missing for a firm. Firms with missing employment either at t or $t-1$ cannot contribute to job creation or destruction so they should not contribute to the average level of employment used to calculate the job creation and destruction rates.

We thus have a sample selection problem, in that we compute job creation and destruction rates for firms reporting employment in consecutive time periods. This issue is particularly problematic at the changes between the samples. For the first four quarters

of both the second and third samples, the job creation and destruction rates are calculated only for those firms present in the old and the new sample. This means that smaller firms will contribute less than they should to estimates of job creation and destruction in these waves. This particular issue was solved by Davis *et al.* (1996) by imputing employment for firms included in a sample but not present in the wave prior to this sample. We do not undertake this imputation in this paper.

Job reallocation is defined as the sum of job creation and destruction. Our estimates of job creation and destruction miss two important aspects of job reallocation, as is commonly pointed out in the literature (cf. Davis *et al.*, 1996; Hijzen *et al.*, 2010). First, our estimates miss out on any job reallocation that occurs within enterprises. We would require plant- or establishment-level data to measure this kind of job creation and destruction, but this is not currently collected by Stats SA. The magnitude of this omission may be quite large. Hijzen *et al.* (2010) find that plant-level changes in employment would raise job creation and destruction rates in the UK by about 50%, *i.e.* that these plant-level changes account for about one third of job creation and destruction.

Second, we will miss some job creation and destruction that takes place between t and $t-1$. We are measuring job creation and destruction at yearly intervals, implying that changes that occur at enterprises within this period will not be captured by our job creation and destruction statistics. However, we do have quarterly data and focus on reporting yearly changes for every quarter, partly ameliorating this problem. We also briefly discuss quarterly job creation and destruction rates below.

4.2 Estimates of Rates of Job Creation and Destruction

We have quarterly employment data from 28 quarters of the QES and explore job creation and destruction at yearly intervals in most of our analysis. Rates of yearly job creation and destruction by wave are shown in the top panel of Table 4. Job creation rates are about 9.9 % on average across the waves, while the job destruction rates suggest that, on average, around 10% of existing jobs are destroyed in a 12-month interval. This means that, on average, 20% of jobs are either created or destroyed over the course of a year.

This job reallocation figure is very similar to those calculated for US manufacturing plants by Davis *et al.* (1996) and is surprising given that South African firms rank labour regulation as a key regulatory constraint to business (Rankin, 2006). It is also surprising given the omission of within-enterprise job reallocation, which, as discussed above, would likely raise reallocation rates even further. Hijzen *et al.* (2010) find higher rates of job reallocation in UK enterprises, of around 28%, between 1997 and 2008. A more comprehensive study of enterprises in 16 countries by Haltiwanger *et al.* (2008) found gross reallocation rates of 25% in OECD economies, 28% in transition economies and 30% in Latin America. This means that our estimates of job creation and destruction rates for South Africa are below those found in transition and Latin American countries. It should be recalled, however, that we are missing a substantial amount of job creation coming from births, and reallocation as a result of the panel changes at each new sample. Including this reallocation would raise our estimates of job reallocation rates, as we discuss below.

Quarterly job creation and destruction rates are shown in the second panel of Table 4. These levels of job creation and destruction are around half those calculated in the yearly data. This difference in magnitude between the annual and quarterly rates is very similar to that reported by Davis *et al.* (1996).

Table 4. Job creation and destruction

Wave	Year	Sample	JC	JD	Birth contrib to JC	Death contrib to JD	JC without births
5	2006	1	13.1	7.0	16.6	6.2	10.9
6	2006	2	13.5	9.1	36.0	20.4	8.7
7	2006	2	13.4	8.4	36.5	24.9	8.5
8	2006	2	14.1	8.9	34.6	27.5	9.2
9	2007	2	13.1	6.8	33.1	30.6	8.7
10	2007	2	12.8	9.3	12.8	37.3	11.2
11	2007	2	12.7	9.9	12.7	36.3	11.1
12	2007	2	12.4	9.6	12.3	30.8	10.9
13	2008	2	11.3	8.9	12.5	27.9	9.9
14	2008	2	10.9	8.2	13.1	26.6	9.5
15	2008	2	10.7	9.5	13.3	29.9	9.3
16	2008	2	10.4	10.3	13.5	28.8	9.0
17	2009	2	8.4	11.5	0.6	34.1	8.4
18	2009	2	6.8	12.9	0.7	30.1	6.8
19	2009	2	6.9	12.9	0.7	27.5	6.8
20	2009	2	6.0	13.6	0.8	25.9	6.0
21	2010	3	6.3	12.8	0.0	26.0	6.3
22	2010	3	6.9	11.7	0.0	27.6	6.9
23	2010	3	7.1	10.8	0.0	24.5	7.1
24	2010	3	7.3	11.0	0.0	25.3	7.3
25	2011	3	8.0	9.6	0.0	21.2	8.0
26	2011	3	8.3	9.0	0.0	18.7	8.3
27	2011	3	8.3	8.9	0.0	22.0	8.3
28	2011	3	7.9	8.6	0.0	18.5	7.9
Average			9.9	10.0	10.4	26.2	8.5
Quarterly job creation and destruction							
2	2005	1	5.3	4.8	0.0	14.8	5.3
3	2005	1	5.1	3.5	0.0	12.9	5.1
4	2005	1	4.7	4.3	0.0	7.3	4.7
5	2006	1	6.5	4.5	31.0	1.7	4.5
6	2006	2	5.4	3.4	34.2	14.7	3.5
7	2006	2	3.8	3.4	0.0	18.9	3.8
8	2006	2	5.5	4.4	0.0	24.1	5.5
9	2007	2	5.9	5.3	25.0	11.8	4.4
10	2007	2	5.1	4.4	0.0	19.6	5.1
11	2007	2	4.6	3.6	0.0	8.0	4.6
12	2007	2	4.7	3.7	0.0	9.3	4.7
13	2008	2	5.4	5.0	25.4	4.7	4.0
14	2008	2	4.7	4.3	0.0	22.8	4.7
15	2008	2	3.9	4.9	0.0	25.3	3.9
16	2008	2	4.6	4.6	0.0	12.7	4.6
17	2009	2	3.6	6.9	1.3	18.0	3.6
18	2009	2	3.0	5.9	0.0	15.9	3.0
19	2009	2	3.4	4.9	0.0	18.8	3.4
20	2009	2	3.8	4.7	0.0	7.3	3.8
21	2010	3	3.6	6.8	0.0	19.1	3.6
22	2010	3	4.0	4.8	0.0	15.9	4.0
23	2010	3	3.8	4.6	0.0	9.0	3.8
24	2010	3	4.5	4.5	0.0	9.5	4.5
25	2011	3	3.7	4.8	0.0	6.9	3.7
26	2011	3	3.5	3.8	0.0	11.0	3.5
27	2011	3	3.8	3.9	0.0	10.4	3.8
28	2011	3	4.2	4.0	0.0	6.5	4.2
Average			4.4	4.6	4.3	13.2	4.2

Source: Own calculations from QES. These are weighted results.
JC: job creation; JD: job destruction.

We calculate the contributions to job creation and destruction of births and deaths, shown in columns 6 and 7 of Table 4. Enterprise deaths contribute an average across all waves of 27% to total yearly job destruction, a larger magnitude than reported by Hijzen *et al*. (2010) using enterprise-level data from the UK, and larger than the establishment-level results of Davis *et al*. (1996), who find 22% of job destruction coming from manufacturing plant deaths. Births contribute around 11% to yearly job creation rates in

the QES. This contribution of births to job creation that we calculate is substantially lower than the contribution of births estimated in the UK by Hijzen *et al.* (2010), who find that births contribute around 30% of job creation in the UK and lower than in US manufacturing plants where births were found to contribute to around 15% (Davis *et al.*, 1996). The finding of a low contribution of births to job creation is as a result of our inability to properly capture births and the main reason why we estimate a (very small) negative net employment growth rate. If the QES adequately captured births, then we would estimate a small positive net employment growth rate.

As mentioned above, our results are from a selected sample. Only those firms that reported employment at both time t and time $t-1$ (or quarter n and quarter $n-4$) can be included in our calculations. This problem is most severe following the change to a new sample. Thus, our results reported in the top panel of Table 4 in waves 6-9 and 21-24 are on a very selected sample – only those, mostly larger, firms that were selected in successive samples. We show below that larger firms have lower rates of gross job reallocation. This means that the average rates of reallocation we report in Table 4 are underestimating the rate of firm-level job reallocation in eight of the 24 waves we report creation and destruction rates for. We believe that the average gross reallocation rate could be between one and two percentage points higher if we were able to observe job creation and destruction rates for all firms in all waves.

We noted above that we cannot retrospectively impute births in the third sample. Our imputation of job creation from births also misses firms that were born in the first and second samples but died before the third sample was taken, and our job creation estimates overstate the contribution of the births we do capture, as a result of assigning a firm's total observed employment at the start of the third sample to birth-related job creation in the year a firm was born. Thus, our job creation estimates are further affected in all waves after wave 10, where it is obvious, from the sixth column of table 3, that our imputation methods are not generating anywhere near the actual amount of job creation coming from births. We believe that the average gross job creation rates would be between one and three percentage points higher if we were fully able to measure the job creation coming from births.

The large variation in birth contributions makes it very difficult to discern any trends across the business cycle. To remedy this, the final column of Table 4 shows job creation without any births. This shows an interesting pattern – relatively high rates of job creation and then a sharp decline following the recession that began at the end of 2008 (wave 16) – but we cannot investigate this further.

Given the limitations of the data we use, we find job reallocation rates that are roughly similar to those OECD countries explored in Haltiwanger *et al.* (2008) and slightly lower than those found in transition and Latin American countries in the same study. This is surprising, given South Africa's reputation for a highly rigid labour market.

(i) Job Creation and Destruction by Enterprise Size The first panel of Table 3 shows the rates of job creation and destruction by firm size categories, taking the average size over all waves the firm was observed and in which positive, non-imputed, employment was recorded, following Davis *et al.* (1996). Job destruction rates are significantly higher than job creation rates in smaller firms, implying that larger firms have higher net job creation rates in South Africa. When they are translated into actual employment numbers, these results mean, *e.g.*, that in the period between 2005 and 2011 the category including smallest firms (of size 1-19 employees) contributed an average of about 75,000 jobs to

yearly gross job creation, but around 110,000 jobs to yearly gross job destruction. The largest firms contributed only around 60,000 jobs to gross job creation on average per year – but also only 37,000 to gross job destruction. The final column of the second panel of Table 3 shows the contribution to job destruction of enterprise deaths and suggests that enterprise deaths are much more important contributors to job destruction in smaller firms than in larger firms.

As a result of the lack of coverage of enterprise births, we may be significantly understating the amount of job creation in small startups, in which case we might see a pattern closer to that in other countries (cf. Davis *et al.*, 1996; Hijzen *et al.*, 2010) in which small firms both create and destroy jobs at higher rates than large firms. Even if it were possible to better measure job creation from births, however, this would likely not be large enough to generate positive net employment creation rates in the small firms, given the very large negative net employment creation occurring in small firms. For example, to generate even zero net job creation in the smallest firms, births would have to contribute around 45% of job creation, which is unlikely. This implies that large firms would still have higher net employment creation rates. This has particular relevance to the South African National Planning Commission's National Plan for South Africa, which argues that the job creation required to make a substantive dent in the unemployment rate will come mainly from medium-sized and small firms (National Planning Commission, 2011:93).

(ii) Job Creation and Destruction in Manufacturing We explore job creation and destruction in manufacturing enterprises in the final panel of Table 3. Average job creation rates are similar to those in the full sample, with an average of nearly 9% of jobs being created in a 12-month period and nearly 10% being destroyed. Again these figures are only slightly lower than those from Davis *et al.* (1996). What is even more surprising is that the plant-level figures comparable with Davis *et al.* (1996) are likely to be even higher, given the findings of Hijzen *et al.* (2010) that plant level reallocation rates were 50% higher than firm reallocation rates in the UK.

Job creation is lower than job destruction in 15 of 24 quarters for which we can calculate job creation and destruction statistics in manufacturing compared with only 13 quarters in the full sample, suggesting that there was slightly more prolonged destruction in manufacturing over the period and providing some evidence that manufacturing employment in South Africa is in decline. Enterprise deaths contribute around 25% of job destruction in manufacturing while births contribute around 11% of job creation. Again, part of this difference may come from the fact that even with our birth imputation method, we cannot capture births adequately. Davis *et al.* (1996), however, also find deaths contributing a significantly higher amount to destruction than births do to creation (finding a contribution of 23% for deaths and 16% for births).

Job destruction is higher than job creation in all two-digit sectors, except for food and beverages and electrical machinery. Enterprise deaths contributed more than 20% to job destruction in several of the two-digit sectors, suggesting that job destruction can also be quite dramatic in manufacturing. This analysis reflects declining employment in manufacturing in general, illustrated by the fact that between June 2006 and December 2011, there was a decline in formal manufacturing employment, as measured in the QES, of about 7%.

When exploring manufacturing job creation and destruction by firm size, in the last panel of Table 3, the pattern is more similar to the US manufacturing patterns by firm

size, with smaller firms having higher job creation and destruction rates than larger firms. The job creation rates would likely be even higher if there was better coverage of births, most of which would be small firms.

5. CONCLUSION

In this paper, we have undertaken the first analysis of firm-level labour demand over time in South Africa using the QES data from Stats SA to explore job creation and destruction. We have shown that job creation and destruction is an important feature of the demand for labour in South Africa, with enterprises creating or destroying around 20% on average of the total number of jobs in a 12-month period. This figure would be higher by perhaps one to two percentage points if we were able to include data for all firms in all waves, rather than only having data for large firms at the time new samples are selected and if we had better data on firm births, which might further raise job creation rates by between one and three percentage points.

Exploring this job creation and destruction further, we find that enterprise deaths contribute a substantial amount to job destruction, around 27% in all enterprises and around 25% when limiting the sample to manufacturing enterprises. Internationally, job creation and destruction rates are higher in smaller firms, although there is mixed evidence as to whether net job creation is higher in small firms. We find similar results as regards higher rates of job destruction in smaller firms but not job creation, likely as a result of under-counting births. Perhaps our most interesting finding is that net job creation rates are higher in larger firms, although an important caveat is that we are under-counting enterprise births. Nevertheless, we conclude that even if births were better captured, it is unlikely that this would better the large and positive net job creation rates in the largest firms. This result suggests that the expectation of the South African National Planning Commission that small- and medium-sized firms will be the primary driver of employment growth in the future is misplaced.

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APPENDIX

The Calculation of Standard Errors for Total Employment, Job Creation and Job Destruction

Each of the three QES survey samples constitutes a large percentage of total formal employment outside of mining and agriculture. Although the larger enterprises are sampled with certainty, the QES is not a census because only a fraction of smaller enterprises are sampled. This means that our job destruction and creation rates are not

measured with certainty, even if there was no measurement error by enterprises or during the data entry process. Davis *et al.* (1996:208) derive standard errors both for total employment and job creation and destruction.

The estimated variance of the estimated employment change between two periods is given by Davis *et al.* (1996:209) as

$$s^2\left(\Delta\hat{X}\right) = \sum_{i \in E} W_{it}(W_{it} - 1)(\Delta X_{it})^2. \tag{3}$$

E is the universe of all enterprises, W_{it} is the weight of plant i at time t, and ΔX_{it} is the change in employment at enterprise i between $t-1$ and t. It is clear that a similar formula will hold for calculating job creation and destruction estimates, which are also an estimate of a total.

In calculating this expression for the estimated variance of the sampling error of the change in employment from the estimated variance of total employment, Davis *et al.* (1996) assume that the sample weights of plants in their sample do not change. However, they note that the sample weights do in fact change for some plants in an earlier period of the data they use, but argue that this is a minor issue. Enterprise weights do change in the QES, although weights do not change for around 60% of enterprises. Thus, we assume that this expression is a good approximation of the estimated variance of the estimated employment change.

It is clear from equation (3) that plants with weight 1, *i.e.* those in strata sampled with certainty, contribute zero to the estimated variance. The intuition is that there is no uncertainty surrounding the total employment in these types of enterprises because they are all sampled, and thus there is no sampling error.

Following Davis *et al.* (1996), we report relative standard errors for employment, job creation and job destruction in each wave of the data in Table 5. These are calculated as the square root of the estimated variance (*i.e.* the standard error) of the relevant statistic divided by the estimate of that statistic. Thus, for total employment, we show $s\left(\hat{X}\right)/\hat{X}$ for job creation $s\left(\hat{C}\right)/\hat{C}$ and for job destruction $s\left(\hat{D}\right)/\hat{D}$. They imply that the standard errors on estimated total employment are less than 0.05% in all waves and that the job creation standard errors are less than 0.15% in all waves. The standard errors on the gross job destruction are higher, but still less than 1% in all waves.

Table 5. Relative standard errors

Wave	Total employment RSE	Job creation RSE	Job destruction RSE
5	0.0212	0.0439	0.0499
6	0.02	0.0363	0.0733
7	0.0205	0.0368	0.0806
8	0.0213	0.0382	0.0765
9	0.0206	0.0374	0.0546
10	0.0202	0.0324	0.0594
11	0.0192	0.0288	0.0508
12	0.0191	0.032	0.0741
13	0.0194	0.0301	0.0534
14	0.0202	0.0343	0.0388
15	0.0215	0.0383	0.0359
16	0.0204	0.0508	0.039
17	0.0212	0.0681	0.0477
18	0.0208	0.039	0.0493
19	0.0211	0.0511	0.0544
20	0.0205	0.0376	0.0594
21	0.0085	0.0239	0.0284
22	0.0089	0.025	0.0256
23	0.0089	0.024	0.0251
24	0.0089	0.0244	0.0376
25	0.0091	0.0205	0.0327
26	0.0098	0.0246	0.0501
27	0.0102	0.022	0.0512
28	0.0102	0.0255	0.0633

Source: Own calculations from QES.
RSE: relative standard error.