

# Which Firms Create the Most Jobs in Developing Countries?

Evidence from Tunisia

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## Abstract

This paper examines private sector job creation in Tunisia over the period 1996–2010 using a unique database containing information on all registered private enterprises, including self-employment. In spite of stable growth of gross domestic product, overall net job creation was disappointing and firm dynamics were sluggish. The firm size distribution has remained skewed toward small firms, because of stagnation of incumbents and entrants starting small, typically as

one-person firms (self-employment). Churning is limited, especially among large firms, and few firms manage to grow. Post-entry, small firms are the worst performers for job creation, even if they survive. Moreover, the association between productivity, profitability, and job creation is feeble, pointing towards weaknesses in the re-allocative process. Weak net job creation thus appears to be due to insufficient firm dynamism rather than excessive job destruction.

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# Which Firms Create the Most Jobs in Developing Countries?

## Evidence from Tunisia

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## 1 Introduction and Motivation

Which firms create the most jobs in developing countries? The jury is out in spite of a growing body of evidence showing that firm dynamics vary dramatically across countries at different stages of development (Hsieh and Klenow, 2009, 2014). This is unfortunate because this question has important policy implications for governments trying to accelerate job creation and private sector development. Small and medium enterprise (SME) promotion programs, for example, are predicated on the notion that small firms generate the most jobs, even though empirical evidence for this proposition is limited (Beck et al., 2005).

Using a unique firm-level data set covering all private sector enterprises, including one-person firms (i.e. the registered self-employed), this paper examines job creation in Tunisia over the period 1996-2010. The aim of the paper is to unveil the mechanisms by which low aggregate employment growth materializes. We focus in particular on which firms create the most jobs and the role of firm size, an issue that is at the heart of the debate about how to tackle unemployment.

Examining which firms create jobs in a small developing country, suffering from high and persistent unemployment, offers new information about the constraints to job creation in emerging economies. One possibility is that firm dynamics are similar to those observed in more vibrant environments but that entry rates are lower. Alternatively, weak job creation could be predominantly due to stagnation among incumbent firms. Another possibility is that job creation is adequate but job destruction is excessive. Of course, the importance of these mechanisms may be heterogeneous across different types of firms, varying *inter alia* with firms' size and age (Haltiwanger et al., 2013). Examining which firms create the most jobs also sheds light on the efficacy of the re-allocative process; limited job creation could reflect distortions and frictions inhibiting the growth of productive firms, or attest to demand constraints, with productivity a potentially even more important determinant of firm growth and survival. While the data do not enable us to directly discriminate between these competing explanations, we can examine whether their implications are consistent with the patterns of employment growth we observe; for example, in the former case the relationship between productivity and employment growth would be weak, whereas in the latter case it would be strong.

Tunisia, a small open Northern African country which was at the forefront of the Arab Spring, provides a very relevant context to examine these issues. Like many other countries in the region, Tunisia had high unemployment despite stable and relatively strong growth. The economy grew approximately 4.8% per annum over the period considered, yet unemployment hovered between 16 and 14%, in part because the labor force expanded by 1.9% per annum.<sup>1</sup> As is typical of developing countries (Jütting et al., 2008) informal and small-scale non-agricultural employment are important (Angel-Urdinola et al., forthcoming), with self-employment accounting for just under a third of all jobs. The highly skewed distribution of firms by size in Tunisia is also typical of developing countries. For example, new evidence from India and Indonesia shows that 98 percent of firms have fewer than 10 workers and less than one percent of firms have more than 50 workers (Hsieh and Olken, forthcoming), the same pattern as we find in Tunisia. Tunisia is furthermore interesting because its government has pursued a very active industrial policy, of which exports and small business promotion were important pillars. At the same time, it is also known for having relatively burdensome business regulation, which is often applied arbitrarily, and for high levels of corruption (Rijkers et al., 2014). Last but not least, Tunisia is one of the few countries in the region with a high-quality firm-census and authorities willing to share those data with researchers.

Our results attest to limited dynamism. Although the private sector generated more than half a million net new non-agricultural private sector jobs over the period under consideration, labor supply also increased and the agricultural sector shrank in relative terms, such that unemployment did not decline drastically. Informality, measured as the share of employment that is not registered with the tax authorities, decreased. Self-employment rates were nonetheless very stable. The firm-size distribution has remained skewed towards small firms. Jump start self-employment was the dominant driver of job creation over the period considered, even after accounting for upward bias in recorded entry rates of small firms due to increases in registration rates. Post-entry, however, one-person firms are the worst performers in terms of net job creation, such that the aggregate net contribution to job creation of self-employment is much more modest than the gross entry numbers might suggest.

While we find a positive correlation between firm-size and net job creation, similar to that documented by Neumark et al. (2011) and Haltiwanger et al. (forthcoming) in the U.S., this

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<sup>1</sup> Labor force participation rates were relatively stagnant and, if anything, declined due to increasing educational attainment.

relationship is very sensitive to regression to the mean effects, and, moreover, entirely driven by firm entry; incumbents firms on average shed labor and small firms do so relatively rapidly. In other words, post-entry, large firms consistently outperform small firms in terms of job creation, even if we confine attention to surviving firms. Instead of aggressive market selection, our results indicate inertia; churning is limited, especially for larger firms, and very few firms manage to grow. In conjunction with most entrants starting very small, this lack of upward mobility helps explain why the firm size distribution has remained skewed towards small-scale production.

Our results nonetheless underscore the pivotal role of firm age that was first pointed out by Haltiwanger et al. (2013); we consistently document a strongly negative correlation between firm age and growth; young firms tend to grow the fastest and contribute the most to net job creation, in spite of their higher exit rates.

The lack of dynamism is also manifested in allocative inefficiency; firm size and age are not very strongly correlated with productivity and profitability. The process of creative destruction whereby resources are reallocated towards productive resources appears anemic. Productive firms and profitable firms' employment grows significantly faster, but the relationship between productivity, profitability and employment creation is weak. Although our proxies for productivity and profitability may be endogenous and suffer from substantial measurement error, taken at face value our estimates suggest that, *ceteris paribus*, doubling output per worker is associated with 1%-5% higher employment growth. Similarly, moving up a decile in the profitability distribution (by sector and year) is associated with an acceleration of employment growth of approximately 1-2% *ceteris paribus*. Controlling for productivity and profitability does not affect the qualitative pattern of size and age coefficients very much, and has only a very modest impact on the estimated coefficient estimates.

Overall, the results highlight the relationship between weak firm dynamics and insufficient net job creation in Tunisia. The highly skewed firm distribution, with the vast majority of firms being very small and only a small number of large firms, is indicative of a failure of firms to grow and move up the size distribution. The importance of self-employment for job creation, with little evidence of growth even among the more productive or more profitable firms, also speaks to the static firm environment. Similar aggregate statistics on labor force participation, unemployment, income growth, and firm characteristics across many of the countries in the Middle East and North

Africa imply that weak firm dynamics are likely to play an important role in explaining the poor jobs performance in much of the region.

The remainder of the paper is organized as follows. The next section reviews related literature, including a recent yet influential paper by Haltiwanger et al. (2013) on patterns of job creation by firm age and size. Section 3 presents an overview of broad labor market trends and assesses the evolution of informality and coverage of the data by comparing the evolution of employment recorded in firm census data, which covers all employment registered with the tax authorities (i.e. formal employment), with employment aggregates derived from Labor Force Surveys, which cover both registered (formal) and non-registered (informal) jobs. Section 4 describes the data in more detail and documents salient stylized facts regarding firm dynamics in Tunisia. Our econometric strategy is presented in section 5, while section 6 presents our principal results regarding the role of age and size. The role of productivity and profitability is explored in section 7, which also examines to what extent our findings regarding the relationship between size, age, and job creation, reflect productivity and profitability differences. A final section concludes.

## **2 Related Literature and Conceptual Considerations**

The ability of productive firms to expand is increasingly recognized as critical to a country's economic success. Allocative efficiency is typically higher in developed countries than in developing countries (see e.g. Bartelsman et al, 2013, and Hsieh and Klenow, 2009), and this is plausibly due to distortions or frictions preventing inputs being allocated to their optimal uses. Such frictions may not only induce misallocation, but may also undermine incentives to invest and grow (Freund and Rijkers, forthcoming); differences in the lifecycle of firms are an important mechanism by which differences in aggregate productivity materialize. Hsieh and Klenow (2014) for instance, estimate that if U.S. firms exhibited the same dynamics as Indian or Mexican firms, aggregate manufacturing TFP would be roughly 25% lower. An important question is therefore whether or not productive firms in developing countries are able to grow as quickly as those in developed countries.

A parallel literature has focused on whether small firms create the most jobs, and whether or not they have special benefits in terms of employment and productivity. This debate about the role

of small businesses in job creation started with the work of Birch (1979, 1981) who claimed that small firms were the most important source of job creation in the U.S. economy. Birch's work, and in particular his thesis that small firms grow faster than large firms, attracted considerable criticism, including by Davis et al. (1996) who pointed out several statistical pitfalls underpinning his analysis, such as attrition bias, and a failure to distinguish between gross and net job flows. They also pointed out that regression to the mean effects may yield a spurious inverse correlation between firm size and growth, since firms that experience a negative transitory shock (or whose size is measured with negative error) are more likely to (be observed to) grow, while firms that experienced a positive shock are more likely to shrink. As a consequence, estimates of the relationship between firm size and growth reliant on size-classifications based on the start year of the growth spell – often referred to as base-year size classifications – are likely to be biased upwards. Conversely, those using size classifications based upon the end year are likely to be biased downwards.

To avoid the attendant biases, Davis et al. (1996) propose to use the average of the firm size between the start and the end year of the growth spell as the basis of the size classification. While this reduces bias considerably, this methodology is not without limitations. In particular, since firms that traverse size classes are counted as having originated in a size class that is an average of the starting and the ending size class the contribution of firms in size classes on either extreme of the size distribution is likely to be underestimated. Differences in results obtained using average and base size classifications thus cannot be attributed to measurement error alone – for they would arise even in the absence of any such error.

Recently, Neumark et al. (2011) used both methods to study patterns of job creation in the U.S. based on the National Establishment Time Series, and found that small establishments create more jobs. Haltiwanger et al. (2013) replicate this finding using the Longitudinal Database of Firms, but also show the importance of firm age in accounting for the relationship between firm-size and job creation; once firm age is conditioned on, there is no longer evidence of a systematic relationship between firm size and firm growth. The key role for firm age is associated with firm births: new firms tend to be small and the inverse relationship between size and firm growth is due to most new firms being classified as small. They also document an “up or out” dynamic of young firms in the U.S.; such young firms grow much faster conditional on survival, but are also much more likely to exit.



To what extent the “up or out” dynamic reflects a process of competitive selection and whether the dynamic generalizes to developing countries are important open-ended questions. While a large number of studies have focused on the determinants of firm growth in developing countries, most of the literature has by necessity been based on data sets that are at best partially representative (a notable exception is Klapper and Richmond, 2012). In particular, microenterprises are typically not covered, which is unfortunate since such firms account for a large, and often growing, share of employment in developing countries. Moreover, most panels tend to be relatively short, and often only cover particular sectors, most notably manufacturing. Nonetheless existing studies point towards size, age, and productivity (e.g. see Sleuwagen and Goedhuys, 2002, Bigsten et al., 2007, van Biesebroeck, 2005, Ayyagari et al., 2013) as important determinants of firm growth, but the conclusions derived from this literature are not unequivocal. For example, using a panel of manufacturing firms from nine African countries Van Biesebroeck finds that larger firms grow faster, whereas Sleuwagen and Goedhuys (2002) conclude that small firms have the highest growth rates using a panel of firms from Côte d’Ivoire. While the jury is out on which firms create the most jobs, it is of interest to note that across the developing world, non-agricultural employment in small firms and informality are on the rise (Jütting et al., 2008). This trend appears indicative of high entry into small scale activities, yet it is not clear whether this tendency towards increased skewedness is offset or catalyzed by the post-entry performance of small firms.

### **3 Broad Labor Market Trends and the Evolution of Informality**

To contextualize the analysis that follows, we first describe broad labor market trends and then assess the evolution of informality and, in the process, data coverage. Since our analysis relies on administrative data on firms and entrepreneurs registered with the tax authorities, *the Répertoire National des Entreprises (RNE)*, discussed in more detail in the next section, accurate interpretation of the documented trends requires an understanding of how representative these data are and how data coverage may have changed over time. To this end, we compare aggregate employment trends documented using the RNE with those derived from Labor Force Surveys (LFS), which cover all employment, both registered (formal) and non-registered (informal). The comparison helps assess what share of employment is informal, i.e. not registered, and how this has evolved over time.

To set the stage Table 1 below first presents information on broad labor market trends and GDP growth in Tunisia over the period 1996-2010. Growth was consistently positive, hovering around 5% per year, with a deceleration in growth at the end of the sample period, perhaps in part reflecting the global trade collapse. Unemployment was consistently high but came down somewhat from approximately 16% in the late nineties to about 13% in 2010. The employment to population ratio remained roughly constant, fluctuating between 40 and 41%. The share of employment accounted for by self-employment was high yet relatively stable over the sample period, notably typically a little above 30%. Agricultural employment, which is excluded from our analysis, declined somewhat in relative terms, from an estimated 21.8% of all employment in 1997 to 17.6% in 2010. In spite of minor fluctuations, public sector employment remained roughly stable over time (in relative terms), accounting for approximately just over one-fifth of all jobs. These statistics attest to a relatively stagnant labor market characterized by excess labor supply and limited job creation in relative terms in spite of substantial output growth.

Nonetheless, there was substantial job creation in absolute terms as is documented in Table 2 which records the evolution non-agricultural private sector employment aggregates derived from the Labor Force Surveys (LFS) with those derived from the *Répertoire National des Entreprises (RNE)* for 1997, 2001, 2005 and 2010, years for which we obtained access to the raw LFS microdata.<sup>2</sup> Both surveys document an expansion of employment in excess of half a million jobs between 1997 and 2010. Comparing the aggregate employment numbers derived from both instruments helps assess what share of aggregate employment is formal, defined here as being registered with the tax authorities, and assess to what extent employment trends documented using the RNE might be driven by differences in registration rates over time.

The comparison unveils substantial informality, which has been declining over time.<sup>3</sup> In 1997 31% of all employment was not-registered, whereas by 2010 informality defined as non-registration had reduced to 24%. While the reduction in informality is welcome, it implies that (relative) job creation rates derived from the RNE are likely overly optimistic, as they in part reflect improvements in data coverage over time. According to the LFS, employment grew by 44%

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<sup>2</sup> We obtained the LFS data from the Institut National de la Statistique and the World Bank (2014).

<sup>3</sup> This is also manifested in a reduction in the Schneider index which estimates the size of the shadow economy as a percentage of GDP from 38.7% in 1999, the first year for which data available, to 35.5% in 2007, the last year for which data were available.

between 1997 and 2010, while registered employment recorded in the RNE grew by 60% over that same period. Nonetheless, due to its imperfect coverage the RNE still underestimates aggregate job creation in absolute terms.

Given our focus on firm size, of particular concern are differences in data coverage (trends) across different types of firms. While the Labor Force Surveys do not contain information on firm-size, they do allow us to distinguish, albeit crudely, between wage and self-employment. Somewhat paradoxically, informality rates measured by non-registration with the tax authorities have consistently been higher for wage employment than for self-employment and the gap has widened slightly over time. In 1997, 37% of all wage jobs were not registered and by 2010 this percentage had declined to 31%. Non-coverage of self-employment decreased from 16% in 1997 to only 5% in 2010. This implies that in the RNE database small-scale (self-)employment is relatively overrepresented. Analysis of job creation trends based on the RNE database is thus likely to overestimate the relative importance of entry, and small firm entry in particular. In sum, small firms are not only better represented in the RNE to start with, RNE coverage of them has also expanded more rapidly than RNE coverage of wage employment.

The high registration rates of especially small firms reflect both low costs of registration and high penalties for non-compliance. Moreover, the tax burden on micro-firms is limited since firms can opt to operate in the so-called *régime forfaitaire* in which they pay a fixed fee of about \$38 USD (60 dinars) per year but do not have to pay any additional profit or output taxes provided that output does not exceed a certain sector-specific threshold. Registration provides access to public health insurance (including for family members), and is necessary to compete for publicly tendered contracts and to apply for loans. Improvements in tax administration and expansion of public health insurance for registered workers likely have contributed to improvements in registration over time.

Registration rates recorded in the RNE are somewhat exaggerated since the *Répertoire* also contains firms that are no longer economically active, despite still being registered (so-called “*Faux Actives*”). These firms are typically one-person firms, and account for roughly 8% of all one-person firms in any given year and less than 1% of firms employing wage workers. The prevalence of such falsely active firms, also called zombie firms, has not changed much over time. As a robustness check, we present informality rates in which we attempt to correct for the existence of zombie firm by reducing the number of registered formal wage jobs by 1% and the number of self-employment jobs by 8%. While this results in slightly higher overall informality rates, driven by higher informality among the self-employed, we obtain the same qualitative pattern of results.

Although coverage of the RNE is imperfect, a key takeaway from the comparison is that coverage of the RNE is decent overall, especially when one considers that discrepancies in employment aggregates are predominantly accounted for by informality in the construction sector as is documented in Table 3 which provides a breakdown of informality rates (and consequently RNE coverage) defined as non-registration by sector for the years 1997 and 2010. In construction, under-reporting is rife and informal jobs account for approximately three-quarters of all employment. Excluding the construction sector, only 9% of all employment was informal in 2010.

## 4 Data and Descriptive Statistics

### 4.1 Data

The main data set used for this paper is the Tunisian registry of firms, the *Répertoire National des Entreprises (RNE)* for the period 1996-2010 collected by the Tunisian *Institut National de la Statistique (INS)*. The RNE draws on information from a host of constituent administrative databases including from the social security fund (*Caisse Nationale de la Sécurité Sociale – CNS*) which is the source for the employment data, as well as from Tunisian Customs, the Tunisian Ministry of Finance, and the Tunisian Investment Promotion Agency (*l'Agence de Promotion de l'Industrie et de l'Innovation – APII*), containing data on all firms registered with the tax authorities (see INS (2012) for detailed information on its construction). It has information on inter alia the employment, age and main activity of all registered private<sup>4</sup> non-agricultural firms, except cooperatives. A major and unique advantage of the *Répertoire* is that it has no floor in terms of size and records information on firms without paid employees, i.e. the registered self-employed, which account for the bulk of all enterprises. This renders it feasible to examine the dynamics of these firms, which are often not covered by firm censuses, and to assess their contribution to aggregate net job creation, which we will demonstrate to be very important.

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<sup>4</sup> While the RNE also collects information on publicly owned enterprises, it does not reliably record their employment, which, according to INS estimates accounts for 21% of overall employment. We drop such firms from the analysis.

Another key strength of the *Répertoire* is that it is comprehensive. It covers all non-agricultural sectors and spans a relatively long time period. The database also allows us to track and entry and exit over time, and thus to avoid survival bias.

To assess the role of productivity and profitability, which are widely recognized to be critically important but not routinely available in firm census data, the RNE was merged with profit and turnover data from the Tunisian Ministry of Finance spanning the universe of private firms' tax records for the period 2006 through 2010. Combining these different data-sources enables us to assess to what extent the striking relationships between firm size, age and growth documented by Haltiwanger et al. (2013) reflect performance differences associated with scale and across the life cycle.

Some features of the data have to be borne in mind when interpreting the results. As already alluded to, the *Répertoire* only provides information on registered employment. Consequently, it does not document informal employment, which is substantial in Tunisia as was shown in the previous section. The employment numbers (and flows) in our data are likely to be biased downwards both due to under-reporting of labor by registered firms and because some firms may not register at all. In addition, the superior coverage of self-employment in our data compared to wage employment suggests that estimates of the skewedness of the size distribution are likely somewhat exaggerated. Underreporting may also impact estimates of the relationship between firm size and net job creation; if the extent of underreporting conditional on being formal increases with firm size, results regarding the relationship between firm size and growth might be biased downwards. On the other hand, microenterprises that register may be more successful than ones that choose to remain informal, which may bias recorded employment growth of small firms upwards.

Second, our database is a database of firms, not establishments; we thus do not observe job-reallocation due to plant openings or closings. In addition, the INS data contain information on the number of salaried employees, but not on the number of unpaid employees or the number of firm owners. In fact, the vast majority of firms do not report employing any salaried employees because they are one-person firms in which the proprietor also supplies all the labor. To arrive at a measure of employment we assume that all firms employ at least one unpaid worker (in the case of self-employment, this implies we count the proprietor as employee). This assumption is not accurate since some firms do not employ any unpaid workers, which would result in upwards bias in the

employment numbers, whereas others may employ multiple such workers, which would imply downwards bias in our employment estimates. Yet, this assumption enables us to estimate the contribution of registered self-employment, which we will show to be very large. Moreover, it ensures that absolute size differentials in terms of the number of salaried workers are preserved and that we do not have to divide by zero.

Data on turnover and profits are not available for all firms, even though the database we obtained access to is the most comprehensive database of turnover and taxes available in Tunisia. The reason that such data are missing for a number of firms is that the tax obligations for these firms do not depend on their output and turnover and tax inspectors consequently do not have strong incentives to verify the tax declarations of such firms, which provide the basis for the output and profit data from the Ministry of Finance.<sup>5</sup> In addition, the reporting quality is low for those firms in this category that do report. In the analysis that uses profitability and productivity measures, we therefore exclude this group of firms. We also discard firms that do not report hiring any paid laborers, firms which exhibit extreme volatility in gross output per worker, as well as extreme values relative to the sector-year-average when using information on turnover and profits.<sup>6</sup> In interpreting results, it is therefore important to bear in mind these are only representative for the subgroup of firms for which these data are available and reliable; this group is not representative of the entire universe of all private Tunisian firms.

Finally, because the RNE is based on administrative data, the timing of firm exit is a concern; the legal date of firm closure may lag the termination of economic activity.<sup>7</sup> The INS has a deterministic model to identify zombie firms, which we employ to exclude such firms from the analysis. That is, we assume they exit in the year they are first observed to be “falsely active” rather than the year that they in fact disappear from the data. Firms that are always “falsely active” are excluded from the analysis altogether.

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<sup>5</sup> These are firms in the regime “*totalement exportatrice*”, commonly referred to as “offshore” firms, and firms in the “*regime forfaitaire*”.

<sup>6</sup> We exclude firms which had a jump in gross output per worker in excess of 100% that did not persist the subsequent period. We also exclude firms who on average experiencing swings in gross output per worker in excess of 150%. Moreover, we exclude the top and bottom 1% of firms in terms of gross output per worker and profits by sector-year.

<sup>7</sup> As discussed in section 3, surveys conducted by the INS suggest that at most 1% of firms which report employing at least one wage workers are in fact inactive. For the registered self-employed that do not use any wage labor, the number of such “falsely active” firms is 8%.

We also adjust the year of exit of firms that have ever employed salaried workers to the year after they stop doing so, rather than the year they legally cease to exist, provided they do not record producing output in that or any subsequent year. The reason for making this adjustment is that our employment imputation procedure exacerbates the potential problem of misclassifying firms as being active when in fact they are inactive (remember that we assume that each firm in the RNE employs at least one unpaid worker). Unfortunately, we cannot make this adjustment for the registered self-employed that have never used any paid labor, and we are consequently likely to overestimate the longevity of such firms somewhat, at least in the short-run. These data-cleaning procedures thus inevitably introduce a degree of asymmetry between firms that have never employed wage workers and the ones that have, but we obtain the same qualitative pattern of results when we focus the analysis strictly on wage employment, as is shown in Appendix B. The main text focuses on the analysis of data that includes the self-employed, which we believe to allow for a more comprehensive analysis of the Tunisian labor market.

## 4.2 Descriptive Statistics

A first look at the firm data yields a number of surprising stylized facts. To start with, the Tunisian firm-size distribution, presented in Table 4, is severely skewed towards employment in small firms. Over the period 1996-2010, one-person firms (i.e. the registered self-employed) account for approximately 83% of all firms, and 28% of employment. Of course, the recorded skewedness partially reflects the superior coverage of small firms in the *Répertoire* documented in Section 3. Nonetheless, substantial skewedness is also observed in the upper parts of the firm-size distribution manifested in the very limited number of large firms; on average, in each year there were approximately only 51 firms that employed at least a thousand workers. These relatively large firms, which tend to be older on average, account for an important share of registered employment; for example, even though fewer than 0.2% of all firms employ more than 200 workers, such firms account for more than a quarter of all employment. Overall, however, employment is concentrated in small firms.

Second, the firm size distribution has remained skewed towards small-scale production, as is demonstrated in Figure 1 which depicts the evolution of the firm size distribution graphically. While

the figure suggests that the distribution has become more right-skewed as the share of firms that are one-person enterprises has increased, this might be due to the more rapid expansion of coverage of self-employment compared to wage employment documented in section 3; recall that according to the Labor Force Surveys, the share of the population that is self-employed has remained roughly constant (see Table 2).

A third stylized fact is that employment is disproportionately concentrated in young firms. Table 5 documents the distribution of employment by firm size and age over the period 1996-2010, demonstrating that most jobs were concentrated in old, large firms and relatively young, one-person firms (i.e. self-employment). New firms account for 3.7% of all jobs on average, while firms that are younger than 10 years old account for approximately half of all jobs in total. This finding in part reflects improvements in registration over time, since some of the newly registered firms might have existed for a while prior to being recorded in the firm census, in which case their registered age will be an underestimate of their real age.

Fourth, *prima facie*, the correlation between size, age and firm performance in terms of productivity and profitability appears relatively weak, which may reflect measurement error. Table 6 provides descriptive statistics on real gross output per worker and real profits per worker,<sup>8</sup> reported for the sub-sample of firms for which such declarations are likely to be reliable, which is not representative of the entire Tunisian private sector. To start with, the largest firms are neither necessarily the most productive nor the most profitable. The relationship between mean output per worker and firm size is not monotonic. Once we demean output per worker by the relevant sector average and focus on medians, we observe a mildly positive relationship between firm size and output per worker, although the very largest firms record the lowest levels of output per worker. This points to the presence of measurement error, which is also suggested by the fact that large firms consistently report lower average profits per worker than small firms.

Another manifestation of limited dynamism is that output per worker does not appear to rise very much with firm age, though age is underestimated for firms that operated informally prior to registering with the tax authorities. Profits per worker do seem to increase with age, at least for the youngest firms. This might reflect higher investment activity among younger firms (note that firms can deduct the costs of investment spending from the profits they report to the tax authorities such

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<sup>8</sup> Since we do not observe capital and material inputs, estimating Total Factor Productivity, which would be our preferred productivity proxy, is not feasible.



that low reported profits may be due to high investment spending). Consistent with the evolution of profits per worker, older firms are also on average less likely to report losses than smaller firms, save again for the very oldest firms.

While we should be cautious in interpreting these findings regarding productivity and profitability given the nature of the data, they do not appear to be driven by measurement error alone. Mouelhi (2012) documents very similar patterns of output per worker and profits by firm-size and age using the Tunisian Annual Enterprise Survey, which is an extensive survey containing detailed information on output, labor usage and profitability conducted among a sub-sample of approximately five thousand firms.

A fifth stylized fact is that aggregate job creation has been disappointing and driven mostly by entry as is shown in Figure 2, which decomposes net job creation into the contributions of entering firms, exiting firms and continuing firms. With the exception of 2001, almost all of the net new jobs were in entering firms. The important role of entry, which accounts for 99,1% of all net job creation, remains even if we account for the fact that some of these firms might already been operating informally prior to registering by subtracting from the recorded entry rates the share that is plausibly due to improved coverage; for example, if we subtract from the net job creation numbers the approximately 154,000 jobs that are due to improvements in registration over time (registration rates improved by 7.75% over the period) and assume these are all accounted for by entrants, the dominant role of job creation due to entry, as job creation by entrants would still account for 98,6% of all net job creation.

Sixth, the bulk of net job creation is driven by entry of one-person firms (self-employment)<sup>9</sup> as is demonstrated in Table 7 which documents total net job creation by firm-size and age over the period 1996-2010, using size classifications based on last year's (base) size and average size. Figure 3 shows these results graphically for the base-size classification.<sup>10</sup> The table and graph show that subsequent to entry, such firms exhibit far less growth, such that the net contribution to job creation of one-person firms is much more modest, especially when using the average size classification.

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<sup>9</sup> Note that the contributions of one-person firms to job creation are estimated to be even higher when using the average size classification, because new firms are classified at the average of their size. For example, firms that enter as a two-person firm will be counted as contributing to job creation by one-person firms.

<sup>10</sup> The advantage of the base size classification relative to the average size classification in this context is that it does not exaggerate the contribution of start-up self-employment.

Across size classes net job creation is typically concentrated among the youngest firms. In addition, it appears as though the contribution of relatively old small firms to net job creation is limited in absolute terms, as most of the net new job creation by older firms is concentrated in relatively larger firms.

While the improvements in the registration rate documented in section 3 lead to inflated entry numbers, they do not drive the qualitative patterns we observe; for instance, if we subtract from the aggregate net job creation due to entry the amount that is plausibly due to improvements in coverage, notably approximately fifty-eight thousand new one-person firms and ninety-four thousands of jobs in firms with more than worker<sup>11</sup> we arrive at the same qualitative conclusions.<sup>12</sup>

Seventh, mobility is limited. Table 8 presents transitions of firms between broad size-classes both annually (the top panel) and between 1996 and 2010 (the bottom panel), the longest period available in our database. Most firms do not grow, even in the long-run. Only a few firms change size class, even during a fourteen-year period; the self-employed are least likely to expand into a larger size class, perhaps in part reflecting that traversing size classes would effectively amount to a doubling of firm-size for them. Micro and small firms hardly ever grow large. For example, only 2% of all firms employing between 10 and 50 people in 1996 employed more than 100 workers by 2010. The lack of mobility may in part be driven by very restrictive labor regulations that make firing both costly and difficult. The transition matrices also show that smaller firms are more likely to die,<sup>13</sup> but overall exit rates seem quite low,<sup>14</sup> perhaps in part due to complex bankruptcy procedures and a lack

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<sup>11</sup> Recall that the improvement in RNE coverage between 1997 and 2010 is 10,8% for self-employment and 6.5% for wage employment which accounted for respectively, 541.466 and 1.444.415 jobs in 2010 according to the Labor Force Surveys

<sup>12</sup> In the case of the contribution of jump start self-employment to net job creation, they become quantitatively even more dramatic; if we do not correct for improved coverage jump-start self-employment accounts for 73% of all net job creation using the base-size classification and 80% using the average-size classification. Once we correct for improvements in registration and assume these are all accounted for by entrants (which is likely an overcorrection), the percentages increase to 84% for the base size classification and 92% for the average size classification respectively.

<sup>13</sup> Note that the relationship between firm size and firm exit is not strictly monotonic in the short-run, which is due to our corrections for the timing of exit (see also Appendix B).

<sup>14</sup> Note that the exit rates reported here are not out of line with those documented for other countries in the Middle East and Northern Africa region (see e.g. World Bank, 2012, Hallward-Driemeier and Thompson, 2009), which are low by international comparison.

of competition. Prima facie, these statistics are at odds with the existence of a very strong up-or-out dynamic.

Thus, at first sight, the meager net job creation that underpins Tunisia's disappointing aggregate unemployment reduction record does not appear due to excessive job destruction, but rather reflects a lack of mobility and limited entry, especially of large firms.

## 5 Econometric Strategy

Our goal is to examine the drivers of job creation, assessing the role of size, age, productivity and profitability. To this end, we estimate employment-weighted firm-level regressions of net employment growth, using as our measure of firm-level employment growth,  $g_{ist}$  the change in employment from year  $t-1$  to year  $t$ , divided by average size:  $g_{ist} = 2 \frac{E_{ist} - E_{ist-1}}{(E_{ist} + E_{ist-1})}$  where  $E_{ist}$  denotes employment in firm  $i$  of type  $s$  at year  $t$  (following Davis et al., 1996, and Haltiwanger et al., forthcoming).<sup>15</sup> This measure is symmetric, bounded by  $-2$  and  $2$ , and accommodates both entry and exit.<sup>16</sup> By virtue of employment weighting the mean of the dependent variable is equal to the appropriate employment weighted mean, and coefficient estimates can consequently be interpreted as employment weighted conditional means.<sup>17</sup>

To assess to what extent the observed relationship between firm size and firm growth is due to firm size per se or to other firm characteristics, we consider progressively elaborate sets of explanatory variables. Following Haltiwanger et al. (forthcoming) we first include size and age

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<sup>15</sup> The desirable features of this growth rate measure, which is a second order approximation of the log difference for growth rates around zero, are discussed in detail in Davis, Haltiwanger and Schuh (1996). The underlying statistical properties are discussed in detail in Tornqvist, Vartia and Vartia (1985).

<sup>16</sup> To see this, note that for firms that enter at year  $t$ ,  $E_{it-1} = 0$ , while for firms that exit  $E_{it} = 0$ , such that for entering firms  $g_{it} = 2$ , while for exiting firms  $g_{it} = -2$ .

<sup>17</sup> As explained by Davis et al. (2006) using this measure, it is straightforward to generate aggregate measures of job creation and destruction at any level of aggregation by using appropriately employment weighted summations of this measure. For example, the job creation rate of firms of type  $s$  at time  $t$  can be computed as  $JC_{ist} = \sum_i \frac{X_{ist}}{(\sum_i X_{ist})} \max\{0, g_{ist}\}$ , where  $\frac{X_{ist}}{(\sum_i X_{ist})}$  represents the relative employment share of firm  $i$  of type  $s$  at time  $t$ .

dummies separately and subsequently jointly. We use both size dummies based on average firm size, that is, the average of firm size between year  $t$  and year  $t-1$ , and based on last year's size to examine the impact of measurement error and regression to the mean effects. These variables are available for the period 1997-2010. Subsequently, we examine the impact of productivity and profitability, proxied by gross output per worker and profits per worker respectively, variables which are available for a subset of firms for the period 2006-2010. These are not only of interest in and of themselves, but also help us assess to what extent the striking correlations between firm-age, firm-size and growth documented by Haltiwanger et al. (2013) reflect the importance of size and age per se, or rather reflect performance differences associated with scale and/or the lifecycle of firms.

We first include these measures separately and then jointly. Our most general specification thus takes the form;

$$g_{ist} = \beta_S \text{Size} + \beta_A \text{Age} + \beta_P \text{Productivity} + \beta_\pi \text{Profitability} + \beta_\tau \tau + \beta_I I + e_{it}$$

Where *Size* is a vector size dummies, *Age* is a vector of age dummies,  $\tau$  is a vector of time dummies, *I* a vector of industry dummies, and *Productivity* and *Profitability* are proxies for these concepts. How these proxies are defined depends on which size classification is used; for the base-year classification we use last period's log output per worker and rank in the profits per worker distribution respectively, except for entrants for whom we use contemporaneous values since lagged values are not available. The use of the profitability rank, as opposed to levels, helps reduce the impact of extreme observations and thus measurement error whilst allowing for both negative and positive values. When using the average size classification we opt instead to use the average of log output per worker and the profitability rank over the period over which the growth spell is defined. This serves to minimize the impact of potential measurement error. For entrants, we again use the contemporaneous values of these variables, whereas for exiting firms we use their last observed values.

This specification, and the models it nests, enable us to test a range of hypotheses; for example, based on the existing literature one might expect the coefficient estimate on small firms to be larger than that of large firms  $\beta_{Ssmall} > \beta_{Slarge}$ , when we only control for firm size. Including

controls for age is likely to reduce the magnitude of firm size effects (the  $\beta_S$  estimates) and may well reverse their ordering (that is  $\beta_{Ssmall} < \beta_{Slarge}$ ). If the most productive firms expand quickly after entry, or if the most successful entrants increase both in terms of size and output per worker, one might expect that including controls for productivity would suppress the magnitude of the impact of both size and age dummies.

Note that the resulting coefficient estimates should be interpreted as conditional correlations, rather than as causal relationships. The productivity and profitability variables are possibly endogenous and there may be omitted variables, such as demand and entrepreneurial talent, that we are not able to control for.

## 6 Regression Analysis

### 6.1 Size vs Age

Figure 4 presents the results of regressions of net job creation on firm-size and age dummies. The underlying regressions are presented in Table 9. Given the large number of observations, the estimated coefficients are always statistically significant at the 1% level. Note that the omitted category for firm size is that of firms with more than 1,000 employees which have been operating for at least 30 years. The coefficients are thus relative to this group of firms. When displaying these regression estimates graphically, we follow Haltiwanger et al. (2013) and do not report the omitted category at zero but rather at its unconditional average, which we also add to all other size coefficients. This does not affect the relative pattern of coefficient estimates, yet enables one to better gauge the relative magnitude of the effects. Of course, we have to bear in mind that the results may in (small) part reflect differences in coverage of the RNE over time, with small firms being more likely to be included in the survey to start with and their coverage improving disproportionately over time, which implies that they are more likely to be recorded to contribute to job creation.

The graph shows a number of interesting findings. To start with, the contribution of self-employment to net job creation stands out, as is evidenced by the fact that job creation rates are highest for one-person firms; the coefficient estimates suggest that job creation by one-person firms is 20.3% higher than that of firms which employ more than 1000 employees when using the base size classification, but only 4.5% when using the average size classification. The vast difference in estimated employment growth premia between the different classification methods is suggestive of substantial measurement error. While both graphs are crudely consistent with an inverse relationship between firm-size and net job creation, the association is weak when the average size classification is applied. According to estimates reliant on the latter classification, the net job creation rate of firms employing between 10 and 19 workers is approximately only 1.7% higher than that of the very largest firms, while the corresponding employment creation premium for firms with between 200 and a thousand workers is 0.2%.

Controlling for firm age results in a significantly positive relationship between firm age and size, regardless of which firm size methodology is used. Using the base size classification, the contribution of net job creation by the self-employed is now 3.3% lower than that of the largest firms whereas it is 17.2% lower using the average-size classification. Note, however, that once firm age is conditioned on the relationship between firm size and age fully reverses (albeit that the relationship between size and age is not monotonic when using the base size classification).

That young firms contribute the most to job creation is shown in Figure 5, which depicts the association between firm age and growth, demonstrating that it is strongly downward sloping. Controlling for firm-size strengthens the association between age and growth. The reason is that smaller firms, which tend to be younger, grow less quickly than large firms post-entry, as we shall demonstrate in the next section.

## **6.2 Different Margins of Adjustment: Exit and the Contribution of Continuing Firms**

The importance of controlling for age and the importance of firm entry suggested by the descriptive statistics presented in section 3 beg the question to what extent the dynamics reflect entry and exit. In this section we explore this question by separately documenting the contributions to net job creation by continuing and exiting firms.

Figure 6 depicts the relationships between net job creation by firm size separately for continuing firms and firms that exit. The underlying regressions are presented in the Appendix (See Tables A1 and A2). Remarkably, the relationship between firm-size and net job creation is now generally positive for both continuing and exiting firms, as is evidenced by the mildly upward sloping graph for continuing firms and the strongly upward sloping graph for firms that exit. The former result is surprising for it shows that even among firms that survive, large firms outperform small firms in terms of job creation. The latter result is of course consistent with the pattern of exit rates documented in Table 8 since net job creation due to firm exit can be interpreted as an employment weighted exit rate. In sum, among incumbents, large firms consistently create more jobs than small firms.

Controlling for firm age reduces the strength of the correlation between firm size and exit, because younger firms are more likely to die, as is shown in Figure 7, and because small firm tend to be younger than old firms. Interestingly, controlling for firm age appears to strengthen the correlation between firm size and growth among continuing firms. The explanation for this finding is that young firms tend to grow faster, and that small firms are on average younger. Conversely, controlling for firm size mutes the correlation between firm age and net job creation due to firm exit.

To summarize, unconditionally, we document an inverse relationship between firm size and growth when using the base year size categorization, which diminishes dramatically when one instead uses an average size classification, although the important contribution of self-employment to job creation is salient in both cases. Controlling for age, we find a negative relationship between firm size and growth irrespective of which size-class methodology we use. This reflects the fact that post-entry firms stagnate and that small firms are more likely to exit and less likely to grow; they destroy more jobs than large firms *ceteris paribus*. The overall picture of job creation is thus bleak; incumbent firms do not grow on average and ultimately disappear.

## **7 Productivity and Profitability**

To assess to what extent the results presented in the previous section reflect a process of creative destruction whereby the most productive firms expand and the least efficient producers are

weeded out, we explore the role of productivity and profitability in this section. To minimize the impact of measurement error and misreporting, we confine the analysis to firms which employed at least one salaried employee, and whose tax obligations vary with their level of output and profits. We also exclude from the analysis firms which reported implausibly large changes in gross output per worker, as well as extreme observations. The resulting sample of firms accounts for roughly two-fifths of all output and roughly a third of all employment.

The regressions are presented in Table 10; we first estimate regressions which separately control for productivity and profitability and include year as well as sector dummies. These regressions can be interpreted as providing insight into whether, within sectors, jobs are being created in firms that are more productive and profitable. When doing so, one has to bear in mind the potential endogeneity of these performance measures; the coefficient estimates should be interpreted as conditional correlations rather than causal relationships. Subsequently we add controls for age and size. To assess to what extent changes in the sample drive our results, we also present models which control for firm age, size, sector and year, but not for productivity and profitability.

The specifications presented in columns 1, 2, and 3 demonstrate that firms that are more productive and more profitable generate more jobs. Note, however, that the explanatory power of these variables is low, as is evidenced by the low R<sup>2</sup>'s. Although strongly statistically significant, the relationship between employment creation, productivity and profitability is weak. For example, a doubling of the amount of output per worker is associated with a 3.9% increase in employment growth *ceteris paribus*. Similarly, moving a decile upwards in the profitability distribution is associated with a 1.2% increase in job creation. While these weak relationships may in part reflect measurement error (perhaps due to misreporting) in the productivity and profitability variables resulting in attenuation bias, taken at face value they suggest the reallocation process is not efficient in (re-)allocating labor to its most productive and profitable uses. This is consistent with the weak firm dynamics documented above.

Controlling for firm age and size, as is done in columns, 5, 6, and 7, results in marginally higher coefficients on both productivity and profitability. Note that the coefficients on firm-size and age coefficients are not very different from those obtained from a specification which does not control for productivity and profitability (presented in column 4) most likely because productivity and profitability are not very strongly correlated with size. The growth premium associated with young firms increases somewhat, reflecting the fact that while they tend to grow faster, such firms



also tend to be less profitable and productive on average. Nonetheless, these impacts are certainly not large.

Using a base-year size classification, as is done in Table 11, yields stronger correlations between productivity, profitability and job creation. This is to be expected if there is measurement error in our employment measure resulting in a spurious correlation between output and profits per worker and subsequent growth. Nonetheless, the resulting correlations remain rather weak.

In sum, these results are suggestive of a severely attenuated process of creative destruction and an extremely rigid reallocative process, which is consistent with the lackluster firm dynamics documented in preceding sections.

## **8 Conclusion**

Using a unique database containing information on all registered private sector employment in Tunisia, we analyze which patterns of firm dynamics and job creation underpin weak aggregate employment growth. Instead of private sector vibrancy, we observe inertia and the firm size distribution remaining skewed towards small firms. In spite of substantial GDP growth and a reduction in informality in terms of non-registration with the tax authorities, job creation did not substantially outpace the growth of the labor force and firm dynamics are sluggish.

Although our results are consistent with the notion that small firms generate the most jobs, albeit that this relationship is sensitive to measurement error, this relationship is driven by firm entry and the fact that most entrants start small. Post-entry, small firms are the worst performers in terms of net job creation even if they survive, in spite of being much more likely to exit than large firms. Moreover, exit rates in Tunisia are modest and mobility is limited, with few firms managing to grow, even if we consider a very long time horizon.

Our results are nonetheless consistent with Haltiwanger et al.'s (2013) finding that firm age is a far better predictor of firm growth than firm size, as young firms consistently create the most new jobs. Once firm age is conditioned on, the relationship between firm size and age fully reverses.

Our results furthermore suggest that the process of creative destruction is weak in Tunisia. Although the data we have on output and profits are noisy, only available for a sub-sample of all

firms, and cannot be interpreted as demonstrating causality, allocative efficiency appears low, in the sense that the relationship between size and firm performance in terms of productivity and profitability is not very pronounced. While both profitability and productivity are positively associated with net job creation, these correlations are weak. Consistent with the idea that the best firms have difficulties expanding and gaining market share, we observe that average productivity does not rise rapidly with firm age, and, if anything, reduces for firms that have been in existence for more than four years, even though average profitability appears to rise with firm age.

In sum, weak aggregate job creation is not due to excessive job destruction, but rather seems the result of insufficient dynamism, manifested in a lack of upward mobility and stagnation among incumbents. Uncovering what obstructs the process of market selection and what explains the weak firm dynamics documented in this paper is an important area for future research.

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## Tables and Graphs

Table 1: Labor Market Trends and Output Growth in Tunisia

<b>Labor Market Trends and Output Growth in Tunisia</b>															
	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10
<b>Growth (%)</b>															
GDP growth	7.1	5.4	4.8	6.1	4.7	4.9	1.8	5.6	6.1	4.0	5.3	6.3	4.6	3.0	3.0
<b>Labor Force Participation, Population Growth and Unemployment (%)</b>															
Unemployment rate		15.9		16.0	15.7	15.1	15.3	14.5	13.9	14.2	12.5	12.4	12.4	13.3	13.0
Labor force participation rate	51.2	51.2	51.0	50.8	50.5	50.3	50.1	49.8	49.6	49.3	49.5	49.8	50.0	50.3	50.6
Employment to population ratio, 15+	40.9	40.9	40.0	40.3	40.2	40.2	39.8	39.9	40.0	40.2	40.5	40.7	40.9	40.7	41.0
Population growth	1.5	1.4	1.3	1.3	1.1	1.1	1.1	0.6	0.9	1.0	1.0	1.0	1.0	1.1	1.0
<b>Agricultural and Public Employment (% of total)</b>															
Share of employment in agriculture		21.8*				22.0*				18.7	19.3	18.3	17.7	18.1	17.6
Share of employment in the public sector		23.8*				21.8*				23.8*					20.0*
<b>Structure of Employment (% of total)</b>															
Self-employed				31.2	31.0	32.3	32.3	35.6	23.7	31.0		30.3	29.6		31.5
Wage and salaried				68.4	68.1	67.6	67.7	64.3	75.5	68.7		69.5	69.5		68.5
<b>Informality (%)</b>															
Schneider Index**				38.7	38.4	37.8	37.8	37.4	36.9	36.7	35.9	35.4			

Source: World Bank Development Indicators (WDI), \* Authors own calculations using Labour Force Survey data,  
 \*\* The Schneider index is a proxy for informality an estimate of the share of output that is produced informally  
 (Schneider et al., 2010)

**Table 2: The Evolution of Employment and Informality**

<b>The Evolution of Non-Agricultural Private Sector Employment</b>				
<i>Labor Force Surveys (cover both registered and non-registered employment)</i>				
<i>vs Firm Census Data (RNE) (covers registered employment only)</i>				
<i>Total Number of Workers</i>				
	<b>1997</b>	<b>2001</b>	<b>2005</b>	<b>2010</b>
<b>Labor Force Surveys (LFS)</b> (both registered and non-registered employment)				
Self employment <sup>1</sup>	371516	408934	446843	541467
Wage employment <sup>2</sup>	1007422	1121717	1231902	1444415
Total employment	1378938	1530651	1678745	1985881
<b>Firm Census Data (RNE)</b> (registered employment only)				
Self-employment <sup>3</sup>	312041	350775	422625	513032
Wage employment <sup>4</sup>	634384	804130	826230	1003911
Total employment	946425	1154905	1248855	1516943
<b>The Evolution of Informality</b>				
Measured as the share of employment that is not-registered				
<i>% of employment</i>				
	<b>1997</b>	<b>2001</b>	<b>2005</b>	<b>2010</b>
<b>Self-employment share</b> ( <i>LFS self-employment/LFS total employment</i> )				
Self employment share	26.94%	26.72%	26.62%	27.27%
<b>% Non-Registered Employment</b> (= <i>RNE Employment Aggregate/ LFS Employment Aggregate</i> )				
Self employment	16.00%	14.22%	5.42%	5.25%
Wage employment	37.03%	28.31%	32.93%	30.50%
Total employment	31.37%	24.55%	25.61%	23.61%
<b>% Non-Registered Employment– Corrected for Zombie Firms*</b>				
Self employment	22.73%	21.08%	12.99%	12.83%
Wage employment	37.66%	29.03%	33.60%	31.19%
Total employment	33.64%	26.91%	28.11%	26.19%

Notes: LFS=Labor Force Surveys, RNE=*Répertoire National des Entreprises*, Tunisia's firm census

<sup>1</sup> Self-employment is calculated as the sum of individuals declaring themselves to be sole proprietors or employers, excluding people working for the government or state owned enterprises and people engaged in agricultural activities (e.g. those working in '*Exploitation agricole*' or '*Chantier agricole*').

<sup>2</sup> Wage employment is a residual category including apprentices unpaid family helpers (which account for approximately 2% of all non-agricultural employment), apprentices and others (which jointly account for less than 1% of all non-agricultural employment) again excluding those working for the government or state owned enterprises or and people engaged in agricultural activities (e.g. those working in '*Exploitation agricole*' or '*Chantier agricole*').

<sup>3</sup> Self employment in the firm census (RNE) is calculated as the number of firms in the regime "*Personne Physique*" and "*Société Unipersonnel a Responsabilité Limitée*".

<sup>4</sup> Wage employment in the firm census (RNE) is the sum of all salaried employment (which comes from the Social Security Database).

\* The correction for zombie firms, which are firms that are recorded in the RNE but are no longer economically active, is to assume that 8% of registered self-employment is in inactive firms and that 1% of all registered wage employment is in inactive firms. The adjustment is based on research conducted by the INS.

**Table 3: The Evolution of Informality – measured as non-registration - by Sector**

Year	1997			2010		
	Firm Census (RNE) (a)	LFS (b)	Informal (a-b)/a	Firm Census (RNE) (a)	LFS (b)	Informal (a-b)/a
	# registered jobs ('000s)	# all jobs ('000s)	%	# of jobs ('000s)	# of jobs ('000s)	%
<b>Agriculture</b>						
Agriculture	23	20	-17%	28	21	-29%
<b>Manufacturing</b>						
Agro-industries	45	43	-3%	59	68	13%
Manufacturing - Textiles	153	255	40%	210	248	15%
Manufacturing - Other	140	179	22%	245	271	9%
<b>Construction</b>						
Construction	88	284	69%	106	433	76%
<b>Trade</b>						
Trade	239	245	2%	349	373	6%
<b>Services</b>						
Transport & Telecom	76	68	-12%	129	117	-10%
Hotels and restaurants	71	81	13%	92	122	25%
Other Services	111	204	45%	300	332	10%
<b>Total</b>	<b>946</b>	<b>1379</b>	<b>31%</b>	<b>1516</b>	<b>1986</b>	<b>24%</b>
Total excluding construction	858	1094	22%	1411	1553	9%

Notes: LFS=Labor Force Surveys, RNE=*Répertoire National des Entreprises*, Tunisia's firm census. LFS aggregates are computed excluding employment in the public sector and agricultural establishments. "Informal" is a proxy for the share of employment that is not registered, measured as the differential between employment aggregates obtained from the LFS and the RNE as a share of total employment in the LFS. Note that this differential is sometimes negative because the LFS is a survey, not a census, such that there is some estimation error. In addition, the LFS classification is based on self-reporting, whereas the RNE classification is based on the firms' reporting. Potential mismatch between self-reported sector classifications of workers and firms is especially likely for workers employed by labor intermediation agencies (such as Manpower and Adecco), who will most likely classify themselves based on the sector they are dispatched to, rather than the sector in which the firm they have an official contract with is operating.



**Table 4: Firm Size and Employment Distributions: 1996-2010 (Annual Averages)**

<i>Size category</i> # of workers	<b># of Firms</b>	<b>% of Firms</b>	<b># of jobs</b>	<b>% of employment</b>	<b>Age (years)</b>	<b>Entry rates</b>
1	344684	83.30%	345753	28.02%	8.04	12.11%
2	29318	7.46%	56290	4.76%	12.59	5.34%
[3, 4]	16505	4.07%	53696	4.44%	10.64	5.92%
[5, 9]	10223	2.52%	64010	5.29%	11.4	3.92%
[10, 19]	4657	1.15%	61661	5.12%	12.08	2.93%
[20, 49]	3077	0.77%	94056	7.82%	13.3	2.36%
[50, 99]	1362	0.34%	95241	7.92%	13.63	2.03%
[100, 199]	898	0.23%	126078	10.55%	15.85	1.63%
[200, 999]	636	0.16%	228812	18.93%	15.88	1.01%
>= 1000	51	0.01%	86874	6.98%	18.95	0.83%
<i>Total</i>	411412		1212472		8.46	11.06%

Note: the statistics presented in this table are annual averages over the period 1996-2010. Entry rates are measured as the share of new firms in year t of the total number of firms that are economically active in year t. For each firm, jobs are measured as the sum of all paid employment +1, on the assumption that each firm employs at least one worker who does not receive a salary. The number in the fourth column presents the aggregate total by firm size category. Age is measured as the difference between the calendar year and the year of startup.

**Table 5: Employment by Firm Size and Age – Annual Averages 1996-2010**

Age (years)	Size (# of workers)										Total # of workers	Share
	1	2	[3,4]	[5,9]	[10,19]	[29,49]	[50,99]	[100, 199]	[200 ,999]	>= 1000		
0	35022	2566	1568	1429	1170	1552	1256	944	1666	69	47242	3.90%
1	30602	3508	3182	3548	3181	4670	4055	3902	6723	2177	65548	5.41%
2	27485	3485	3235	3822	3401	5356	4820	5577	8449	3482	69113	5.70%
3	24990	3323	3095	3741	3457	5372	5206	6093	10013	4526	69816	5.76%
4	22857	3138	2880	3641	3236	5071	4715	5805	9129	4390	64863	5.35%
5	21006	2982	2734	3449	3264	4841	4674	5948	8139	2840	59877	4.94%
6	19243	2819	2648	3299	3174	4610	4638	5615	8403	2788	57238	4.72%
7	17665	2711	2484	3146	3053	4472	4595	5998	7843	2361	54328	4.48%
8	16022	2539	2367	2984	2908	4272	4407	5738	8173	2527	51935	4.28%
9	14432	2333	2252	2819	2749	4022	4075	5693	7854	1983	48213	3.98%
[10-14]	53337	10202	9583	11652	11477	16475	16270	22315	37119	6132	194564	16.05%
[15-19]	29998	7315	7317	8172	8008	12334	12357	16273	30577	6417	138768	11.45%
[20-29]	25528	6965	7673	8667	8653	14182	14847	21126	47069	25913	180624	14.90%
>=30	7566	2405	2677	3641	3929	6827	9325	15050	37655	21269	110343	9.10%
Total # of workers	345753	56290	53696	64010	61661	94056	95241	126078	228812	86874	1212472	
Share	28.52%	4.64%	4.43%	5.28%	5.09%	7.76%	7.86%	10.40%	18.87%	7.17%		

Note: Firm size is measured as the sum of all paid employment +1, on the assumption that each firm employs at least one worker who does not receive a salary. Age is measured as the difference between the calendar year and the year of startup. The statistics presented in this table are annual averages over the period 1996-2010. For example, the interpretation of the number 35022 in the top left cell in the Table (0 years of age, 1 worker) is that, on average, new firms employing one worker only employed 35022 workers annually between 1996 and 2010.

**Table 6: Productivity and Profitability by Size and Age 2006-2010**

2006-2010	Productivity				Profitability		
	Ln(Y/L)		Ln(Y/L) demeaned by sector average		Profits per worker		
	Mean	Median	Mean	Median	Median	Rank	Incurring a Loss
N=142823	(millimes of TND)		(millimes of TND)		(TND)	(1=lowest, 100=highest)	(proportion of firms)
<b>By Size (wage workers)</b>							
1	18.27	18.27	0.10	0.06	43271	68	0.22
2	18.12	18.11	0.00	0.06	30175	60	0.21
[3,4]	18.11	18.12	0.05	0.10	24650	56	0.21
[5,9]	18.09	17.97	0.10	0.09	17441	50	0.22
[1,19]	18.14	18.03	0.18	0.20	15521	48	0.24
[20,49]	18.04	17.98	0.18	0.21	11807	44	0.28
[50,99]	17.94	17.91	0.20	0.30	9635	42	0.29
[100,199]	17.82	17.79	0.17	0.32	5475	37	0.32
[200,999]	17.62	17.65	0.11	0.39	2863	35	0.32
>= 1000	17.28	17.48	-0.38	-0.17	1140	33	0.33
<b>By Age (years)</b>							
0	18.14	18.15	0.11	0.13	17309	49	0.35
1	18.11	18.09	0.07	0.09	20697	51	0.28
2	18.14	18.10	0.10	0.11	23506	53	0.25
3	18.16	18.13	0.12	0.14	25291	54	0.23
4	18.14	18.12	0.10	0.12	26404	54	0.21
5	18.14	18.12	0.09	0.10	26505	55	0.21
6	18.13	18.10	0.10	0.09	26626	55	0.21
7	18.06	18.02	0.02	0.03	27422	55	0.19
8	18.06	18.04	0.02	0.04	27467	56	0.19
9	18.07	18.03	0.02	0.05	26703	56	0.18
[10-14]	18.16	18.12	0.09	0.11	27923	56	0.18
[15-19]	18.16	18.10	0.12	0.16	27097	55	0.20
[20-29]	18.16	18.15	0.09	0.15	28722	57	0.19
>=30	18.18	18.13	0.11	0.14	21357	53	0.23
Total	18.14	18.11			25,200		0.23

Note: The sample is confined to firms which employ at least one wage workers and whose tax obligations vary with their gross output and/or profits. Y is measured as gross output declared to the tax authorities. Profits are measured as the profits declared to the tax authorities. One millime of TND is equal to 1/1000 Dinar. Incurring a loss is a dummy variable that takes the value 0 if the firm reports non-negative profits and 1 if it reports negative profits. TND=Tunisian Dinar. TND:USD exchange rate on December 17, 2010 1 TND:0.692 USD.

**Table 7: Total Net Job Creation by Size and Age 1997-2010**

<b>Average Size (# workers)</b>											
<b>Age (years)</b>	<b>1</b>	<b>2</b>	<b>[3,4]</b>	<b>[5,9]</b>	<b>[10,19]</b>	<b>[20,49]</b>	<b>[50,99]</b>	<b>[100,199]</b>	<b>[200,999]</b>	<b>&gt;=1000</b>	<b>Total</b>
0	538051	17081	15438	17184	17318	23684	13959	10560	13780		667055
1	-25133	19239	23714	31551	33425	52094	40475	40177	53750	9665	278956
2	-30304	2990	4887	6712	9100	17549	20103	16768	27457	6613	81875
3	-23967	467	1018	3010	3001	7909	8352	9164	21313	10138	40404
4	-20083	-332	-49	932	457	1192	5221	3642	1683	7251	-86
5	-18259	-948	-626	-178	-539	813	-426	962	-6247	-256	-25703
6	-16050	-1070	-826	-1052	-1414	-3010	669	288	4576	2341	-15547
7	-13735	-1351	-1133	-845	-1124	-1398	-1113	803	-1178	-402	-21476
8	-11901	-1227	-474	-1184	-1244	-2512	-2814	431	399	1989	-18538
9	-10166	-1321	-767	-1104	-1187	-3204	-3039	277	1308	-966	-20168
[10-14]	-34812	-4493	-3759	-5877	-7655	-12446	-11523	-7748	-1270	-1305	-90887
[15-19]	-21556	-4131	-3544	-5012	-5542	-8327	-11918	-9719	490	374	-68882
[20-29]	-17093	-4397	-4132	-5888	-6452	-11274	-13957	-10351	-7341	3915	-76969
>=30	-8304	-2347	-2375	-3312	-4577	-8338	-8896	-10253	-13847	5094	-57155
Total #jobs	286689	18161	27372	34939	33569	52733	35092	45001	94871	44451	672877
<b>Base Year Size (# workers)</b>											
<b>Age (years)</b>	<b>1</b>	<b>2</b>	<b>[3,4]</b>	<b>[5,9]</b>	<b>[10,19]</b>	<b>[20,49]</b>	<b>[50,99]</b>	<b>[100,199]</b>	<b>[200,999]</b>	<b>&gt;=1000</b>	<b>Total</b>
0	494329	35822	21857	19929	16429	22264	18324	13761	23301	1040	667055
1	89570	36497	23432	23816	22956	33522	20133	15596	10074	3359	278956
2	-3317	4996	5867	7626	10074	17479	15033	8527	14425	1165	81875
3	-6105	421	1568	4189	7003	7154	7085	3763	11312	4014	40404
4	-6228	-495	228	939	1375	2829	2273	1461	-2643	177	-86
5	-7131	-1841	-525	1010	271	1558	-1094	-1602	-10894	-5455	-25703
6	-6805	-1455	-1315	-83	-44	-304	-504	-2989	-3399	1350	-15547
7	-6238	-1933	-1123	-925	-36	-261	-95	-2039	-7309	-1517	-21476
8	-4232	-1753	-875	-814	-179	-1206	-1198	-5055	-3916	690	-18538
9	-4111	-1495	-862	-1022	-747	-1703	-976	-2926	-3979	-2349	-20168
[10-14]	-10562	-5970	-3853	-4941	-5154	-8875	-11641	-12413	-18894	-8584	-90887
[15-19]	-6546	-5250	-3726	-5423	-4472	-6298	-8960	-12717	-9729	-5763	-68882
[20-29]	-5649	-4686	-4594	-5050	-5959	-6722	-8143	-13074	-23133	42	-76969
>=30	-3225	-2200	-2437	-2888	-3576	-4541	-6556	-9290	-22446	4	-57155
Total #jobs	513749	50660	33640	36364	37941	54896	23682	-18998	-47230	-11828	672877

Note: The statistics presented in this table represent total number of jobs created over the period 1997-2010 by firm size and age. Age is measured as the difference between the calendar year and the year of startup. Average firm size is measured as the average of the firm's contemporaneous size (i.e. their size in year t) and size in the previous calendar year (i.e. size in year t-1) for incumbent firms. For entering firms last year's size is zero, such that average size is half of the contemporaneous size. For firms that exit in year t their average size in year t is half their size in year t-1. Base year size is measured as firm size in the previous year (i.e. year t-1) for incumbents and firms that exit in year t, while for entrants it is their contemporaneous (i.e. year t) size.

**Table 8: Employment Transitions**

<b>EMPLOYMENT TRANSITIONS</b>								
<i>Short-Run: Annual Transitions</i>								
<i>Cells indicate what % of firms in row category i in year t end up in column category j in year t+1</i>								
<i>Size in year t</i> <i>(row category i)</i>	<i>Size in year t+1 (column category j)</i>							
	Exit	1	[2-5]	[5,9]	[10,49]	[50,99]	[100,999]	>=1000
1	6.51	91.98	1.34	0.10	0.06	0.01	0.01	0.00
[2-5]	8.16	7.82	79.61	3.93	0.44	0.02	0.01	0.00
[5,9]	6.91	1.30	14.18	68.75	8.71	0.10	0.04	0.00
[10,49]	3.79	0.90	1.80	8.76	80.51	3.73	0.49	0.00
[50,99]	2.72	0.61	0.43	0.50	16.04	67.84	11.84	0.01
[100,999]	1.83	0.37	0.21	0.26	1.91	8.31	86.56	0.56
>=1000	1.59	0.00	0.14	0.14	0.14	0.14	11.56	86.27

<i>Long-Run: 1996-2010</i>								
<i>Cells indicate what % of firms in row size class i in 1996 end up in column category j in 2010</i>								
<i>Size in 1996</i> <i>(row category i)</i>	<i>Size in 2010 (column category j)</i>							
	Exit	1	[2-5]	[5,9]	[10,49]	[50,99]	[100,999]	>=1000
1	59.25	37.81	2.45	0.31	0.15	0.01	0.02	0.00
[2-5]	53.36	15.59	25.44	4.29	1.21	0.05	0.07	0.00
[5,9]	53.69	2.59	14.64	18.07	10.21	0.53	0.27	0.01
[10,49]	46.54	2.18	5.71	9.69	28.93	4.92	2.02	0.02
[50,99]	43.42	1.77	2.65	1.87	18.96	19.16	12.18	0.00
[100,999]	38.11	1.17	1.93	1.17	7.37	10.30	38.44	1.51
>=1000	18.75	0.00	0.00	0.00	3.13	0.00	37.50	40.63

Note: Firm size is measured as the sum of all paid employment +1, on the assumption that each firm employs at least one worker who does not receive a salary.

**Table 9: Net Job Creation - all firms 1997-2010**

<b>Net Job Creation All Firms 1997-2010</b>						
	<i>Average size classification</i>			<i>Base year size classification</i>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<i>Size</i>						
1	0.0452		-0.1721	0.2033		-0.0331
2	-0.0028		-0.0942	0.0523		-0.0631
[3,4]	0.0135		-0.0666	0.0299		-0.0467
[5,9]	0.0175		-0.0557	0.0136		-0.0455
[10,19]	0.0166		-0.0515	0.0071		-0.0426
[20,49]	0.0171		-0.0420	-0.0001		-0.0417
[50,99]	0.0022		-0.0394	-0.0051		-0.0376
[100,199]	0.0009		-0.0266	-0.0218		-0.0393
[200,999]	0.0018		-0.0165	-0.0054		-0.0211
<i>Age</i>						
0		2.0542	2.1400		2.0799	2.0884
1		0.4023	0.4664		0.1225	0.1310
2		0.1298	0.1797		0.0113	0.0201
3		0.0825	0.1268		0.0046	0.0130
4		0.0402	0.0819		-0.0233	-0.0154
5		0.0120	0.0531		-0.0486	-0.0406
6		0.0230	0.0628		-0.0247	-0.0162
7		0.0144	0.0529		-0.0235	-0.0152
8		0.0157	0.0528		-0.0199	-0.0116
9		0.0124	0.0476		-0.0192	-0.0109
[10-14]		0.0097	0.0417		-0.0147	-0.0064
[15-19]		0.0056	0.0316		-0.0142	-0.0064
[20-29]		0.0050	0.0217		0.0040	0.0077
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	6211700	6211700	6211700	6211700	6211700	6211700
R2	0.0048	0.2964	0.3039	0.0196	0.3711	0.3714

Note: The dependent variable is the Davis-Haltiwanger-Schuh growth rate. Regressions in columns 1, 2, and 3 are weighted by the average size of the firm over the period over which the growth spell is measured (i.e. the current year and last year), while the regressions presented in columns 4, 5 and 6 are weighted by the base size employment (e.g. last year's employment, save for entrants, for which we use contemporaneous employment since lagged employment is not available). The resulting coefficients are thus interpretable as conditional average net jobs flows. Standard errors are not presented since all coefficient estimates are significant at the 1% level due to the large number of observations.

**Table 10: Net Job Creation, Productivity and Profitability –2007-2010 - onshore firms employing wage workers**

<b>Net Job Creation</b>						
<b>Onshore firms employing wage workers (e.g. excluding the self-employed) -2007-2010</b>						
<i>Average Size Classification</i>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b><i>Productivity and Profitability</i></b>						
Productivity (ln(Y/L))	0.0057			0.0288		0.0154
Profitability rank		0.0009			0.0015	0.0013
<b><i>Size</i></b>						
1			-0.2693	-0.2799	-0.2920	-0.2945
2			-0.1063	-0.1132	-0.1261	-0.1270
[3,4]			-0.0568	-0.0643	-0.0740	-0.0756
[5, 9]			-0.0292	-0.0370	-0.0415	-0.0439
[10,19]			-0.0064	-0.0169	-0.0174	-0.0215
[20,49]			-0.0010	-0.0126	-0.0108	-0.0156
[50,99]			0.0198	0.0086	0.0096	0.0051
[100,199]			0.0127	0.0011	0.0036	-0.0013
[200,999]			0.0423	0.0343	0.0327	0.0298
<b><i>Age</i></b>						
0			2.1667	2.1831	2.1837	2.1901
1			0.7181	0.7371	0.7324	0.7405
2			0.2338	0.2503	0.2428	0.2504
3			0.1448	0.1592	0.1526	0.1592
4			0.0672	0.0794	0.0727	0.0785
5			0.0494	0.0593	0.0537	0.0584
6			0.0673	0.0754	0.0730	0.0765
7			0.0663	0.0725	0.0698	0.0727
8			0.1065	0.1128	0.1088	0.1119
9			0.1073	0.1148	0.1103	0.1139
[10-14]			0.0636	0.0708	0.0651	0.0688
[15-19]			0.0769	0.0809	0.0770	0.0791
[20-29]			0.0561	0.0608	0.0569	0.0593
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	129516	129516	129516	129516	129516	129516
R2	0.0068	0.0092	0.3360	0.3395	0.3432	0.3440

Note: The dependent variable is the Davis-Haltiwanger-Schuh growth rate. Regressions are weighted by the average size of the firm over the period over which the growth spell is measured (i.e. the current year and last year). Standard errors are not presented since all coefficient estimates are significant at the 1% level due to the large number of observations. The average size classification categorizes firms into different bins depending on the average of their size in year t and year t-1. For entrants, average firm size is simply their size at t divided by 2, while for firms that exit in period t their average size is their size at t-1 divided by 2. “Onshore” firms are all firms that are not participating in the tax-exempted “offshore” regime which requires firms to export at least 70% of their output or sell it to other “offshore” firms. Productivity is measured as log output per worker. The profitability rank runs from 1 (lowest) to 100 (highest).

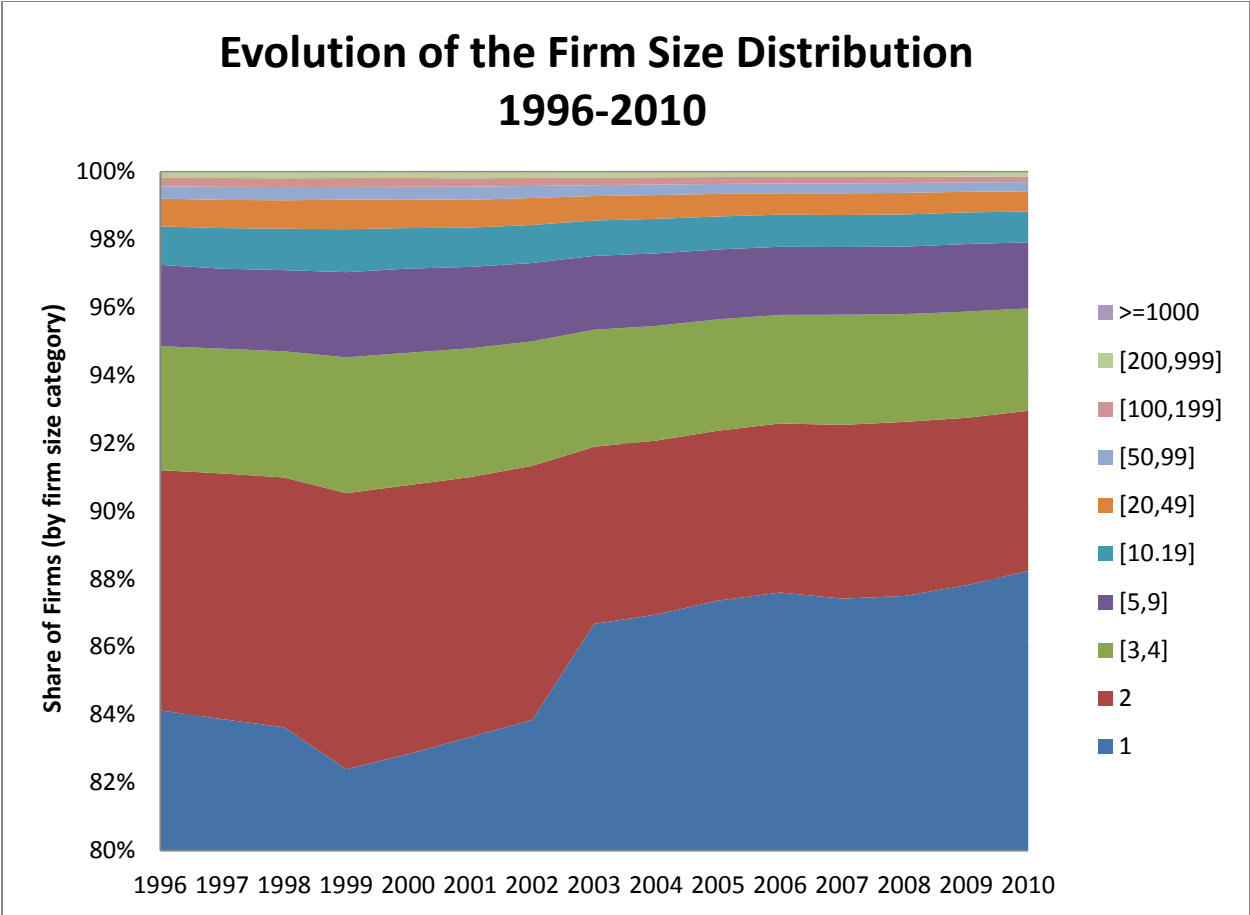
**Table 11: Net Job Creation, Productivity and Profitability –1997-2010 - onshore firms employing wage workers**

<b>Net Job Creation</b>						
<b>Onshore firms employing wage workers (e.g. excluding the self-employed) -2007-2010</b>						
<i>Base Size Classification</i>						
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b><i>Productivity and Profitability</i></b>						
Productivity (ln(Y/L))	0.0392			0.0555		0.0444
Profitability rank		0.0012			0.0017	0.0011
<b><i>Size</i></b>						
1			-0.1145	-0.1419	-0.1413	-0.1539
2			-0.0645	-0.0813	-0.0867	-0.0924
[3,4]			-0.0417	-0.0581	-0.0615	-0.0677
[5,9]			-0.0280	-0.0446	-0.0418	-0.0502
[10,19]			-0.0180	-0.0392	-0.0302	-0.0430
[20,49]			0.0132	-0.0105	0.0022	-0.0129
[50,99]			0.0020	-0.0215	-0.0092	-0.0241
[100,199]			0.0002	-0.0221	-0.0101	-0.0244
[200,999]			0.0155	-0.0022	0.0040	-0.0062
<b><i>Age</i></b>						
0			2.0602	2.0896	2.0768	2.0945
1			0.2434	0.282	0.2598	0.2850
2			0.0305	0.0626	0.0412	0.0631
3			0.0053	0.0343	0.0142	0.0343
4			-0.0959	-0.0698	-0.0900	-0.0712
5			-0.0942	-0.0734	-0.0892	-0.0744
6			-0.0590	-0.0422	-0.0522	-0.0411
7			-0.0571	-0.0428	-0.0527	-0.0428
8			-0.0033	0.0099	-0.0014	0.0085
9			0.0002	0.0141	0.0033	0.0133
[10-14]			-0.0293	-0.0145	-0.0270	-0.0159
[15-19]			-0.0127	-0.0044	-0.0125	-0.0060
[20-29]			-0.0207	-0.0113	-0.0203	-0.0129
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	129516	129516	129516	129516	129516	129516
R2	0.0100	0.0081	0.4159	0.4261	0.4231	0.4287

Note: The dependent variable is the Davis-Haltiwanger-Schuh growth rate. Regressions are weighted by base year firm size (i.e. last year's size for continuing and exiting firms and contemporaneous firm size for entrants). Standard errors are not presented since all coefficient estimates are significant at the 1% level due to the large number of observations. The base size classification categorizes firms into different bins depending on their size in the previous year. For entrants, base year firm size is set equal to their contemporaneous (year t) size. "Onshore" firms are all firms that are not participating in the tax-exempted "offshore" regime which requires firms to export at least 70% of their output or sell it to other "offshore" firms. Productivity is measured as log output per worker. The profitability rank runs from 1 (lowest) to 100 (highest).



Figure 1: Evolution of the Firm Size Distribution



Note: The graph depicts the evolution of the firm size distribution between 1996 and 2010.

Figure 2: Aggregate Job Creation Patterns

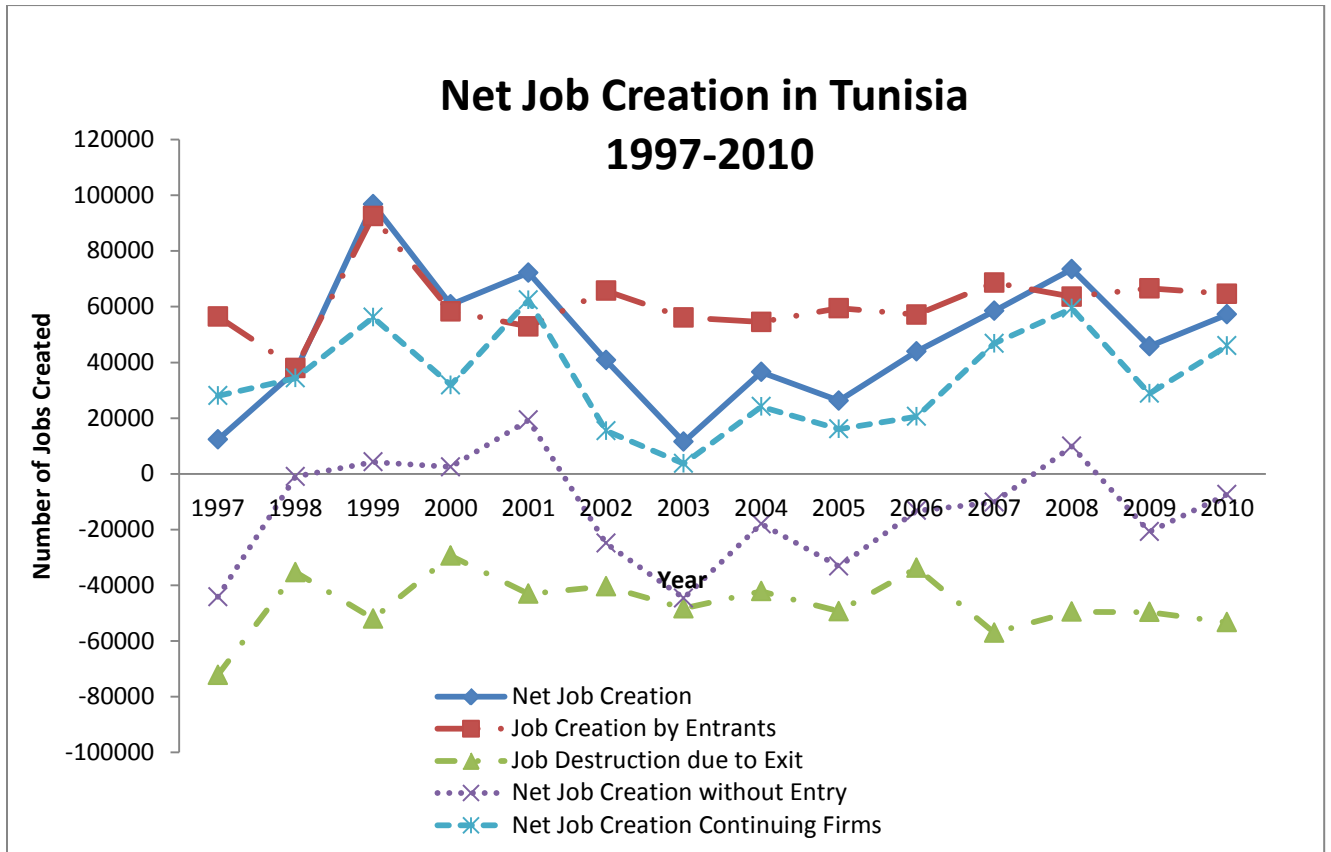
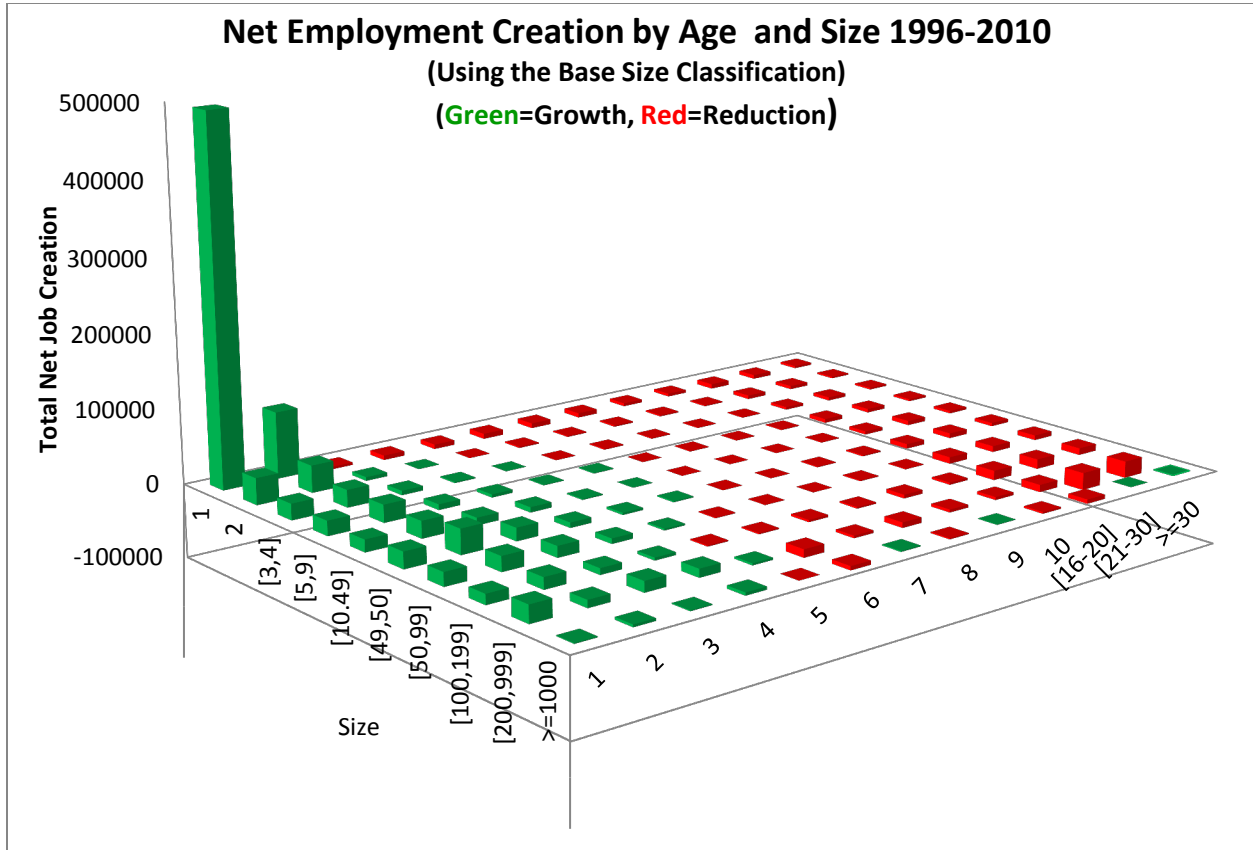
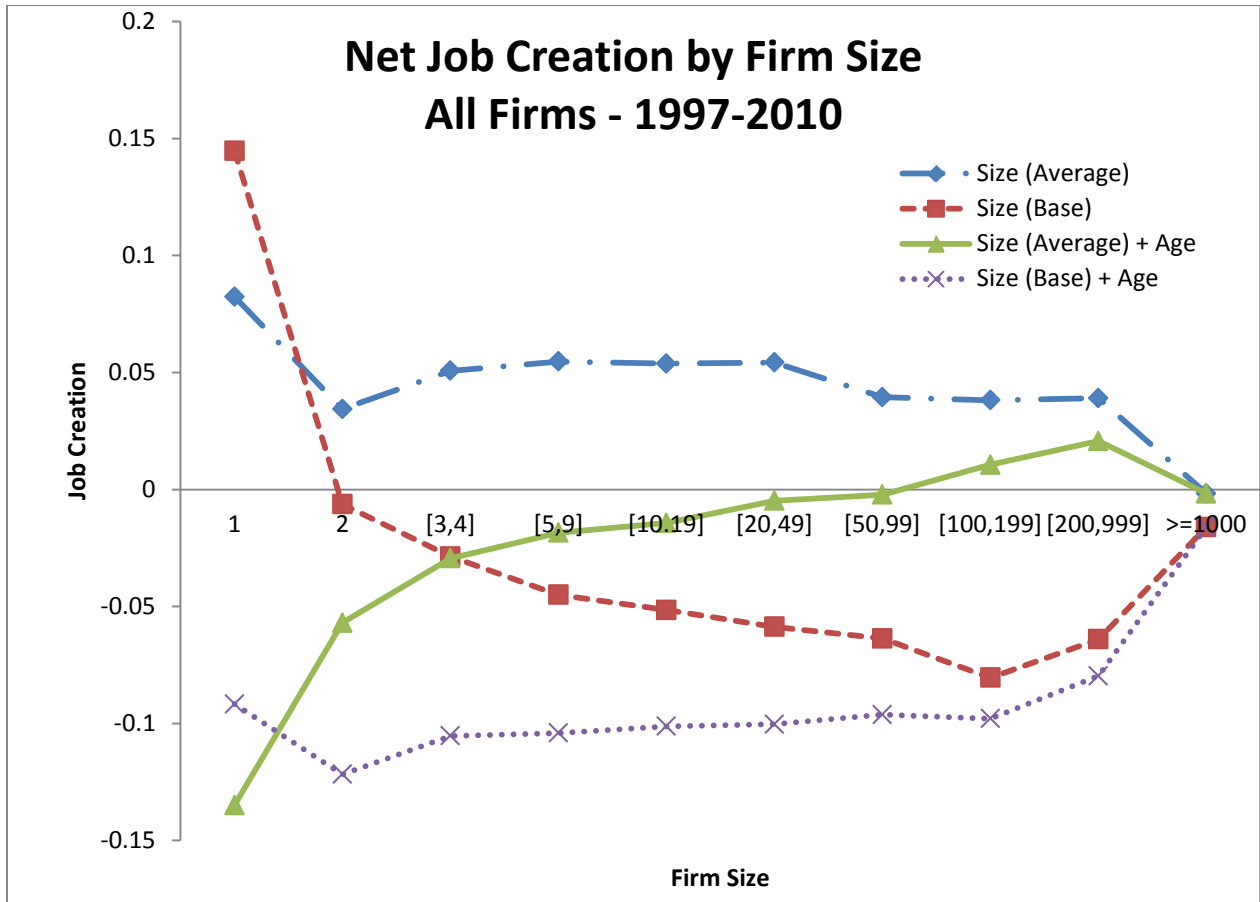


Figure 3: Net Job Creation by base size and age



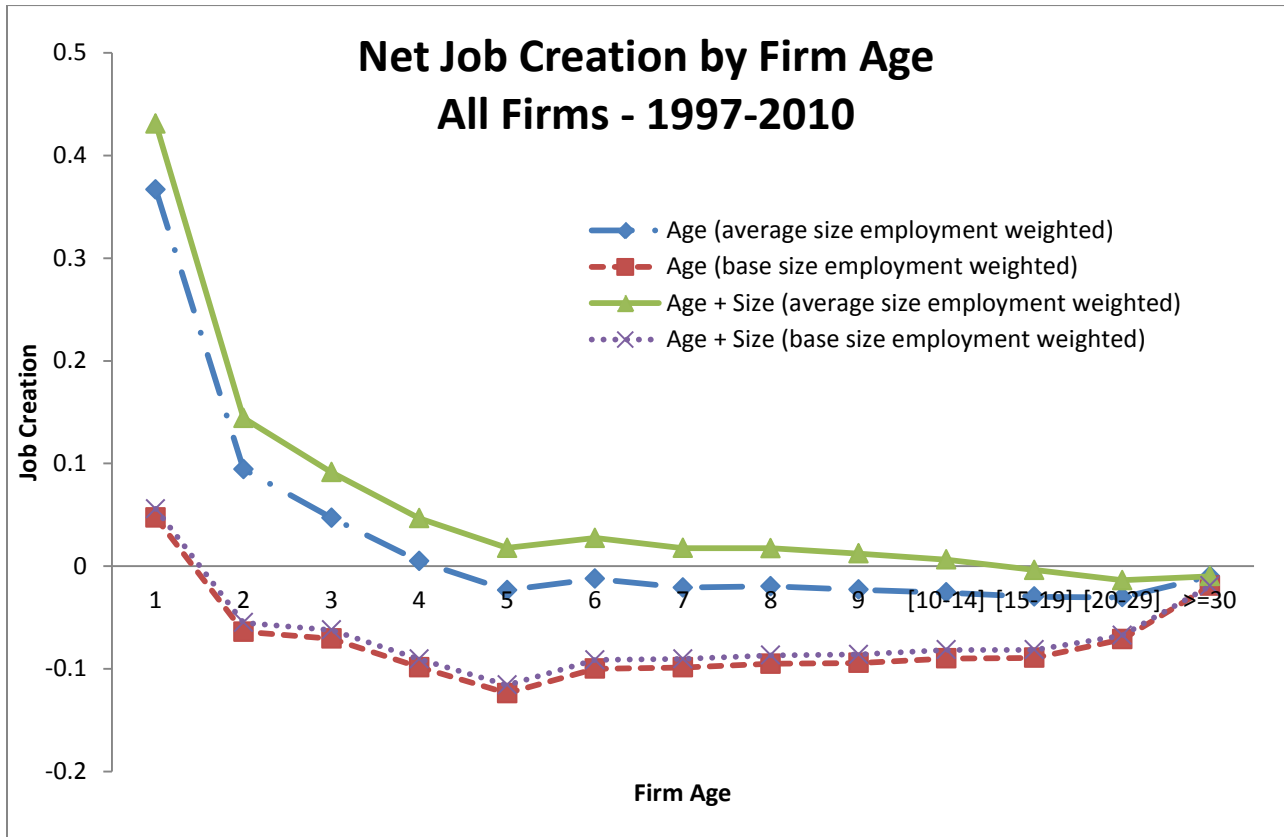
Notes: The figure plots total net jobs created by firm size and age between 1997 and 2010. The underlying data are presented in Table 7.

Figure 4: Net Job Creation by firm size



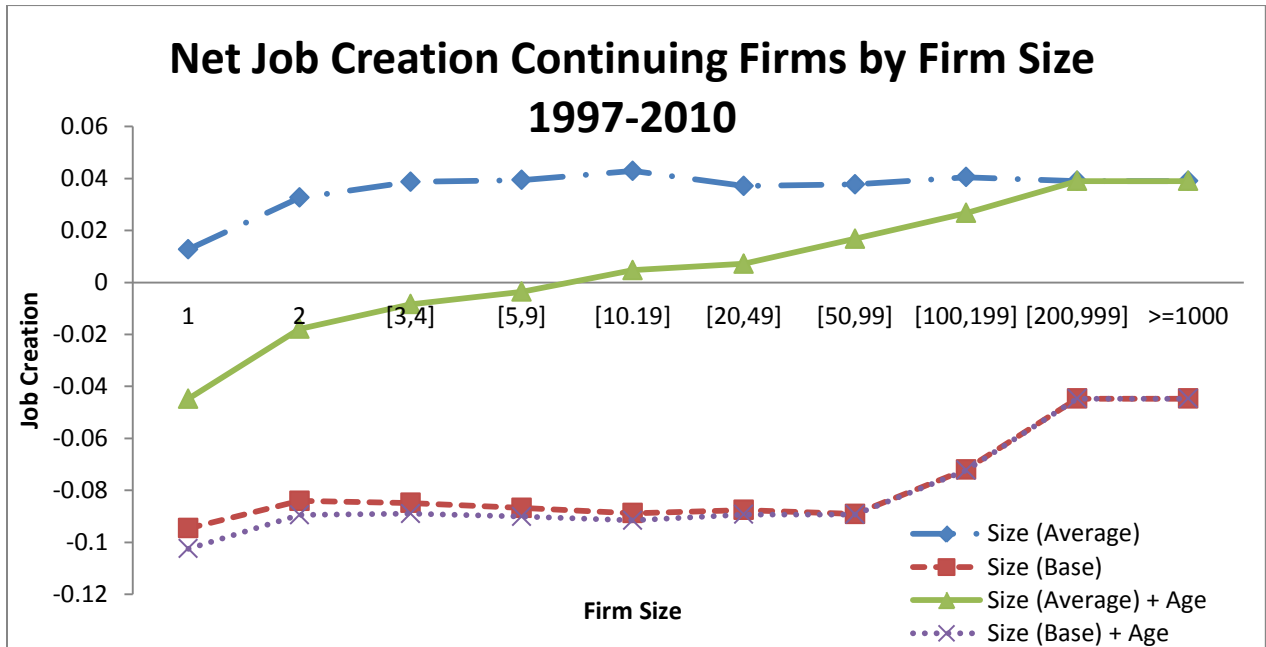
Notes: The figure plots weighted regression coefficients of net job creation, measured by the Davis-Haltiwanger-Schuh growth rate, on firm size and age dummies, controlling for sector and year. The underlying regression coefficients are presented in Table 9. The unconditional mean of the omitted category (firms with at least 1000 workers) is added to all coefficients to facilitate interpretation.

Figure 5: Net Job Creation by firm age

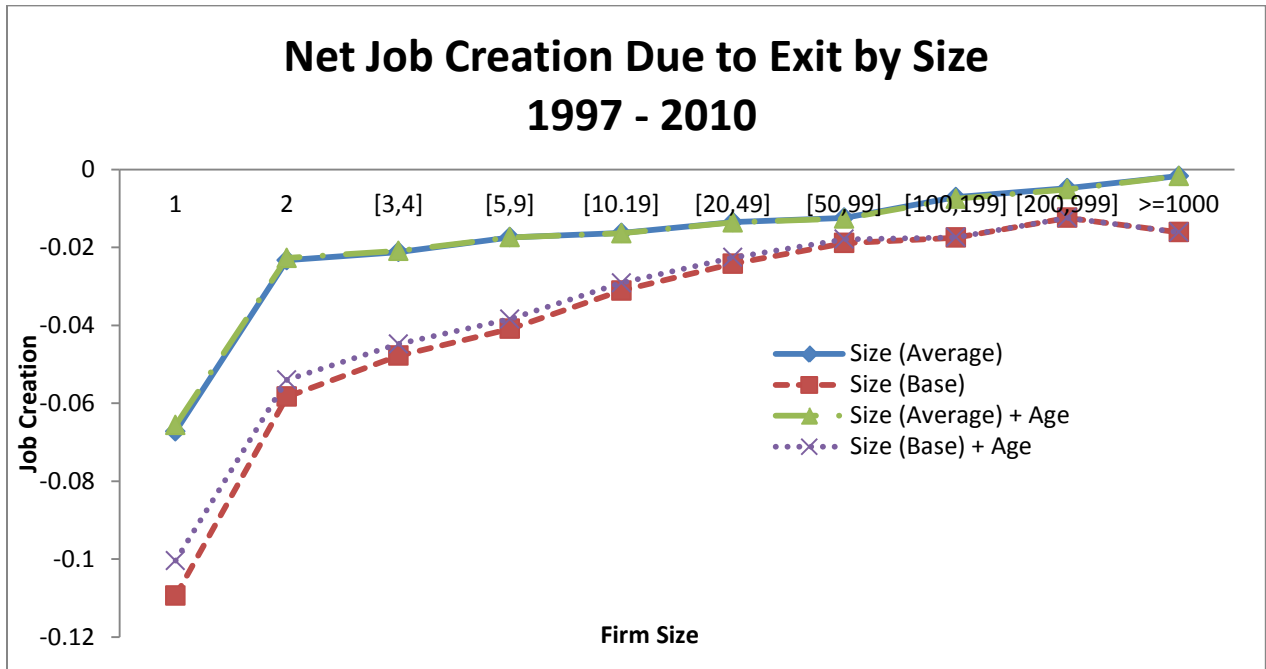


Notes: The figure plots weighted regression coefficients of net job creation, measured by the Davis-Haltiwanger-Schuh growth rate, on firm size and age dummies, controlling for sector and year. The underlying regression coefficients are presented in Table 9. The unconditional mean of the omitted category (firms which are at least 30 years old) is added to all coefficients to facilitate interpretation.

Figure 6: Net Job Creation by firm size – Continuing Firms and Exiting Firms

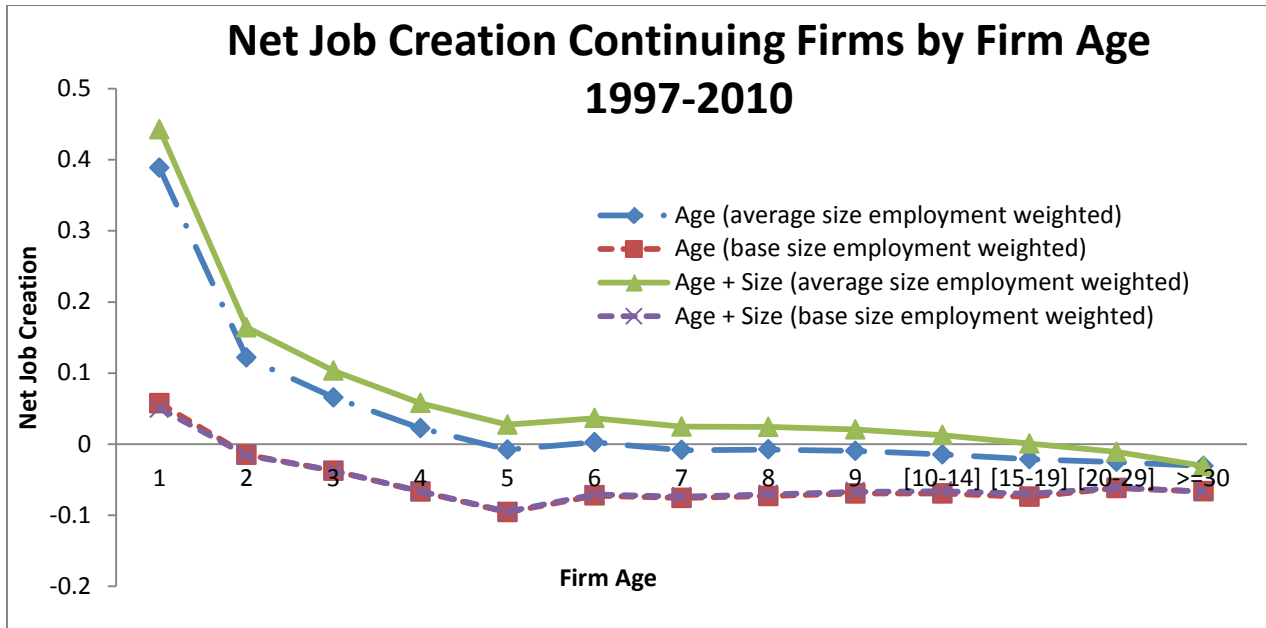


Notes: The figure plots weighted regression coefficients of net job creation, measured by the Davis-Haltiwanger-Schuh growth rate, on firm size and age dummies, controlling for sector and year. The underlying regression coefficients are presented in Table A1. The unconditional mean of the omitted category (firms with at least 1000 workers) is added to all coefficients to facilitate interpretation.

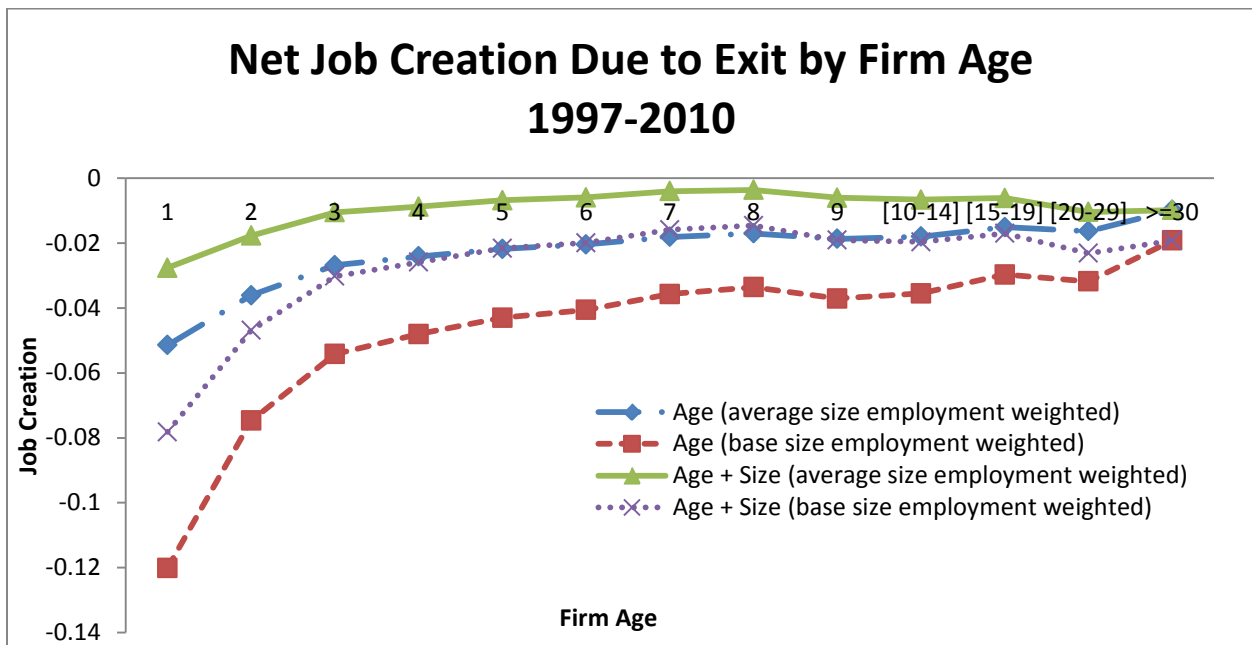


Notes: The figure plots weighted regression coefficients of net job creation, measured by the Davis-Haltiwanger-Schuh growth rate, on firm size and age dummies, controlling for sector and year. The underlying regression coefficients are presented in Table A2. Job creation due to firm exit is consistently negative because by definition exiting firms destroy jobs. The unconditional mean of the omitted category (firms with at least 1000 workers) is added to all coefficients to facilitate interpretation.

Figure 7: Net Job Creation by firm age – Continuing Firms and Exiting Firms



Notes: The figure plots weighted regression coefficients of net job creation, measured by the Davis-Haltiwanger-Schuh growth rate, on firm size and age dummies, controlling for sector and year. The underlying regression coefficients are presented in Table A1. The unconditional mean of the omitted category (firms which are at least 30 years old) is added to all coefficients to facilitate interpretation.



Notes: The figure plots weighted regression coefficients of net job creation, measured by the Davis-Haltiwanger-Schuh growth rate, on firm size and age dummies, controlling for sector and year. The underlying regression coefficients are presented in Table A2. Job creation due to firm exit is consistently negative because by definition exiting firms destroy jobs. The unconditional mean of the omitted category (firms which are at least 30 years old) is added to all coefficients to facilitate interpretation.

## Appendix A: Tables Underpinning Figures 4 and 5

Table A1: Net Job Creation Continuing Firms – All Firms 1997-2010

Net Job Creation: Continuing Firms 1997-2010						
	Average size classification			Base year size classification		
	1	2	3	4	5	6
<i>Size</i>						
1	-0.0263		-0.0838	-0.0499		-0.0578
2	-0.0064		-0.0569	-0.0394		-0.0448
[3,4]	-0.0003		-0.0474	-0.0402		-0.0443
[5,9]	0.0004		-0.0426	-0.0421		-0.0454
[10,19]	0.0039		-0.0343	-0.0441		-0.0469
[20,49]	-0.0019		-0.0318	-0.0429		-0.0446
[50,99]	-0.0013		-0.0222	-0.0444		-0.0446
[100,199]	0.0015		-0.0123	-0.0273		-0.0276
[200,999]	0.0000		0.0000	0.0000		0.0000
<i>Age</i>						
1		0.4194	0.4736		0.1240	0.1168
2		0.1524	0.1950		0.0516	0.0508
3		0.0962	0.1339		0.0291	0.0293
4		0.0530	0.0885		-0.0003	0.0001
5		0.0230	0.0581		-0.0293	-0.0285
6		0.0333	0.0673		-0.0060	-0.0044
7		0.0223	0.0553		-0.0092	-0.0074
8		0.0231	0.0548		-0.0066	-0.0044
9		0.0212	0.0513		-0.0030	-0.0006
[10-14]		0.0162	0.0435		-0.0030	0.0003
[15-19]		0.0094	0.0315		-0.0076	-0.0035
[20-29]		0.0055	0.0197		0.0047	0.0054
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	5265688	5265688	5265688	5265688	5265688	5265688
R2	0.0093	0.0592	0.0699	0.0085	0.0108	0.0127
Adjusted R2	0.0093	0.0592	0.0699	0.0085	0.0108	0.0127

Note: The dependent variable is the Davis-Haltiwanger-Schuh growth rate. Regressions in columns 1, 2, and 3 are weighted by the average size of the firm over the period over which the growth spell is measured (i.e. the current year and last year), while the regressions presented in columns 4, 5 and 6 are weighted by the base size employment (e.g. last year's employment, save for entrants, for which we use contemporaneous employment since lagged employment is not available). The resulting coefficients are thus interpretable as conditional average net jobs flows. Standard errors are not presented since all coefficient estimates are significant at the 1% level due to the large number of observations.



**Table A2: Net Job Creation Due to Firm Exit – All Firms 1997-2010**

<b>Net Job Creation Due To Firm Exit: All Firms Except Entrants 1997-2010</b>						
	<i>Average size classification</i>			<i>Base year size classification</i>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<i>Size</i>						
1	-0.0655		-0.0639	-0.0933		-0.0843
2	-0.0216		-0.0210	-0.0422		-0.0379
[3,4]	-0.0195		-0.0192	-0.0317		-0.0287
[5,9]	-0.0157		-0.0157	-0.0248		-0.0223
[10,19]	-0.0146		-0.0147	-0.0150		-0.0130
[20,49]	-0.0118		-0.0119	-0.0081		-0.0065
[50,99]	-0.0107		-0.0109	-0.0028		-0.0018
[100,199]	-0.0054		-0.0058	-0.0014		-0.0013
[200,999]	-0.0031		-0.0034	0.0037		0.0037
<i>Age</i>						
1		-0.0416	-0.0178		-0.1009	-0.0590
2		-0.0263	-0.0079		-0.0555	-0.0277
3		-0.0170	-0.0007		-0.0350	-0.0110
4		-0.0143	0.0010		-0.0288	-0.0067
5		-0.0120	0.0030		-0.0238	-0.0024
6		-0.0106	0.0039		-0.0214	-0.0007
7		-0.0083	0.0058		-0.0165	0.0033
8		-0.0072	0.0062		-0.0144	0.0046
9		-0.0089	0.0038		-0.0179	0.0001
[10-14]		-0.0082	0.0032		-0.0163	-0.0004
[15-19]		-0.0053	0.0037		-0.0105	0.0022
[20-29]		-0.0065	-0.0006		-0.0126	-0.0039
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	5542320	5542320	5542320	5542320	5542320	5542320
R2	0.0152	0.0086	0.0158	0.0231	0.0175	0.0248
Adjusted R2	0.0152	0.0086	0.0158	0.0231	0.0175	0.0247

Note: The dependent variable is the Davis Haltiwanger Schuh growth rate which takes the value -2 if firms exit and 0 otherwise. Regressions in columns 1, 2, and 3 are weighted by the average size of the firm over the period over which the growth spell is measured (i.e. the current year and last year), while the regressions presented in columns 4, 5 and 6 are weighted by the base size employment (e.g. last year's employment, save for entrants, for which we use contemporaneous employment since lagged employment is not available). The resulting coefficients are thus interpretable as conditional average net jobs flows. Standard errors are not presented since all coefficient estimates are significant at the 1% level due to the large number of observations.

## Appendix B: Wage employees only

As a robustness check, we document the main results when we exclude self-employment from the analysis and focus on firms with salaried workers only. The overall pattern of results we obtain is qualitatively similar to the results that include the self-employed.

The mobility matrices presented in Table B1 using wage employment as a measure of employment suggest a somewhat more vibrant private sector than Table 7 suggests, with higher shares of firms transiting to inactivity/exit, and more dynamism among the smallest firm-size categories. Yet, job creation regressions presented in Table B2 and Figures B1 and B2 yield qualitatively similar patterns of results as those obtained when including the self-employed; small firms create the most jobs, but only if we use the base-size classification. The estimated relationship between firm-size and net job creation is fairly flat when we use the average-size classification. Once we condition on firm age, the relationship between firm-size and net job creation becomes positive, irrespective of the size classification used. The regressions also show that young firms create the most jobs, a result which obtains both with and without size controls.

**Table B1: Alternative Transition Matrices**

<b>EMPLOYMENT TRANSITIONS</b>									
<b>Size measures based on wage employment only (e.g. excluding self-employment)</b>									
<b>Short-Run: Annual Transitions</b>									
<i>Cells indicate what % of firms in row category i in year t end up in column category j in year t+1</i>									
<i>Size in year t</i>	<i>Size in year t+1 (column category j)</i>								
<i>(row category i)</i>	Exit/No paid workers	1	[2-5]	[5,9]	[10,49]	[49,99]	[100,999]	>=1000	
1	21.68	71.04	6.62	0.46	0.17	0.02	0.01	0.01	0.00
[2-5]	11.77	9.83	70.99	6.50	0.86	0.03	0.02	0.02	0.00
[5,9]	9.21	1.44	13.98	64.76	10.43	0.14	0.05	0.05	0.00
[10,49]	5.07	0.55	1.81	8.46	79.49	4.08	0.54	0.00	0.00
[50,99]	3.55	0.31	0.31	0.47	15.86	67.63	11.86	0.01	0.01
[100,999]	2.31	0.20	0.13	0.27	1.86	8.2	86.47	0.56	0.56
>=1000	1.59	0.14	0.14	0.00	0.14	0.14	11.56	86.27	86.27
<b>Long-Run: 1996-2010</b>									
<i>Cells indicate what % of firms in row size class i in 1996 end up in column category j in 2010</i>									
<i>Size in 1996</i>	<i>Size in 2010 (column category j)</i>								
<i>(row category i)</i>	Exit/No paid workers	1	[2-5]	[5,9]	[10,49]	[49,99]	[100,999]	>=1000	
1	75.67	15.91	6.69	1.12	0.51	0.04	0.06	0.00	0.00
[2-5]	58.01	10.59	21.9	6.76	2.50	0.09	0.14	0.01	0.01
[5,9]	56.90	3.75	11.74	15.62	10.92	0.74	0.33	0.00	0.00
[10,49]	48.36	2.40	4.69	8.98	28.04	5.33	2.19	0.02	0.02
[50,99]	45.70	1.21	1.42	1.62	18.3	19.31	12.44	0.00	0.00
[100,999]	38.75	1.27	1.44	1.10	7.36	10.15	38.41	1.52	1.52
>=1000	18.75	0.00	0.00	0.00	3.13	0.00	37.5	40.63	40.63

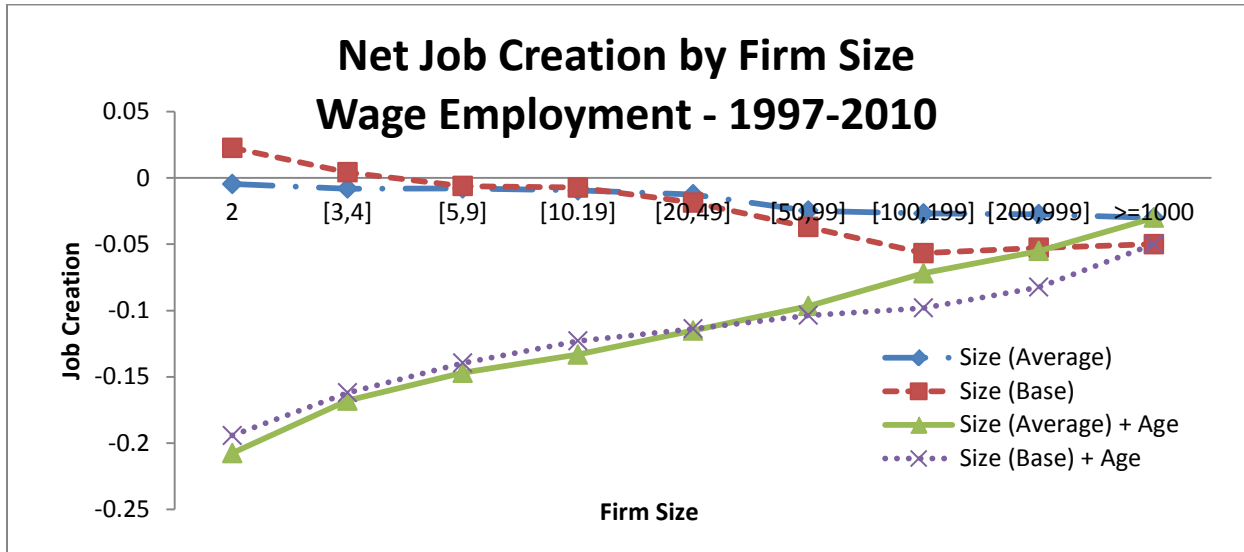
Note: Firm size is measured as the sum of all paid employment.

**Table B2: Net Job Creation – Wage Employment Only**

<b>Net Job Creation - Wage Employment</b>						
<b>All Firms Hiring Wage Workers (e.g. excluding self-employment) 1997-2010</b>						
	<i>Average size classification</i>			<i>Base year size classification</i>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<i>Size</i>						
1	0.0528		-0.3422	0.0969		-0.2340
2	0.0555		-0.1776	0.0728		-0.1444
[3,4]	0.0519		-0.1380	0.0543		-0.1121
[5,9]	0.0521		-0.1170	0.0439		-0.0897
[10,49]	0.0506		-0.1032	0.0428		-0.0730
[49,50]	0.0476		-0.0851	0.0315		-0.0638
[50,99]	0.0352		-0.0667	0.0130		-0.0537
[100,199]	0.0333		-0.0419	-0.0067		-0.0481
[200,999]	0.0327		-0.0252	-0.0027		-0.0324
<i>Age</i>						
0		2.0196	2.1366		2.0512	2.1099
1		0.6172	0.6894		0.1818	0.2406
2		0.1369	0.1899		-0.0436	-0.0063
3		0.0895	0.1350		-0.0435	-0.0119
4		0.0335	0.0754		-0.0884	-0.0603
5		0.0241	0.0649		-0.0819	-0.0546
6		0.0327	0.0715		-0.0540	-0.0275
7		0.0238	0.0605		-0.0576	-0.0327
8		0.0241	0.0591		-0.0546	-0.0310
9		0.0299	0.0626		-0.0382	-0.0157
[10-14]		0.0219	0.0518		-0.0369	-0.0161
[15-19]		0.0269	0.0532		-0.0218	-0.0035
[20-29]		0.0266	0.0415		-0.0084	0.0014
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	1148020	1148020	1148020	1148020	1148020	1148020
R2	0.0067	0.2989	0.3126	0.0067	0.3828	0.3873

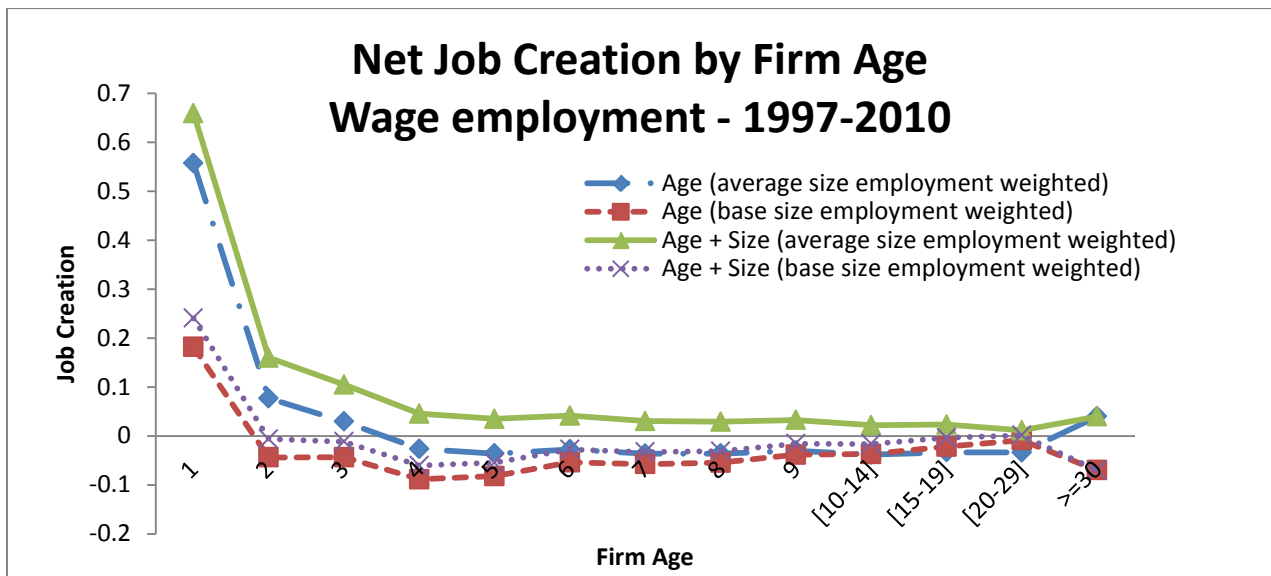
Note: The dependent variable is the Davis Haltiwanger Schuh growth rate computed over the number of wage employees which takes the value -2 if firms exit and 0 otherwise. Regressions in columns 1, 2, and 3 are weighted by the average size of the firm over the period over which the growth spell is measured (i.e. the current year and last year), while the regressions presented in columns 4, 5 and 6 are weighted by the base size employment (e.g. last year's employment, save for entrants, for which we use contemporaneous employment since lagged employment is not available). The resulting coefficients are thus interpretable as conditional average net jobs flows. Standard errors are not presented since all coefficient estimates are significant at the 1% level due to the large number of observations.

Figure B1: Net Job Creation by Firm Size – Wage Employment (e.g. Excluding Self-employment)



Notes: The figure plots weighted regression coefficients of net job creation, measured by the Davis-Haltiwanger-Schuh growth rate, on firm size and age dummies, controlling for sector and year. The underlying regression coefficients are presented in Table B2. The unconditional mean of the omitted category (firms with at least 1000 employees) is added to all coefficients to facilitate interpretation.

Figure B2: Net Job Creation by Firm Age – Wage Employment (e.g. Excluding Self-employment)



Notes: The figure plots weighted regression coefficients of net job creation, measured by the Davis-Haltiwanger-Schuh growth rate, on firm size and age dummies, controlling for sector and year. The underlying regression coefficients are presented in Table B2. The unconditional mean of the omitted category (firms which are at least 30 years old) is added to all coefficients to facilitate interpretation.