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Abstract

This paper carries out a detailed descriptive analysis of employment dynamics of new firms, using comparable and highly representative data for 19 countries. It does so by using a novel analytical decomposition of the contribution of new firms to job creation, which allows to separately focus on different margins. In particular, the contribution of new firms to job creation can be expressed as a combination of four different elements: start-up ratio; survival share; average size of firms at entry; and average post-entry growth rate of survivors. This comprehensive characterization of entrants employment dynamics points to regularities and differences in business dynamism across countries, and can be used as an important diagnostic tool by policy makers.

Keywords: Start-ups; Employment dynamics; Entrepreneurship; Firm demographics.

JEL codes: L11; L26; D22.

1 Introduction

The recent industrial organization and firm dynamics literature has devoted considerable attention to studying the firm entry, its determinants and its economic impacts. Recent contributions to the literature have emphasized the key role of start-ups and young firms for job creation. However, comprehensive analyses of these dynamics across countries are still limited.

This paper tackles this gap and carries out a detailed descriptive analysis of new firms employment dynamics, using comparable and highly representative data across 19 countries. It does so by using a novel analytical decomposition of new firms' contribution to the job creation, which allows to separately focus on different margins. In particular, the contribution of new firms to job creation can be expressed as a combination of four different components: start-up ratio (with respect to total employment); survival share; average size of firms at entry; and average post-entry growth rate of survivors.

This comprehensive characterization of employment dynamics of entrants points to regularities and differences in business dynamism across countries, and uncovers a number of important stylized facts.

On the one hand, the analysis points to some features that are common across the countries under scrutiny. First, even though the large majority of surviving entrants do not grow, the few that do contribute disproportionately to job creation across countries. Second, the survival share of entrants appears rather homogeneous across economies and it approximately equals 60% after 3 years, 50% after 5 years, and 40% after 7 year, with the relative probability of exit peaking before the third year of activity and decreasing steadily afterwards. Third, in the first years of activity average employment growth is also higher but much more volatile. Fourth – extending country-specific US-based analyses (e.g. Decker et al., 2014) – the evidence confirms declining entry rates across countries over the last decade. Finally, across countries, average size at entry is small, with a certain degree of heterogeneity related to specific sectors of the economy (such as basic pharmaceuticals or transport equipment).

On the other hand, some features appear more heterogeneous across countries. Importantly, the analysis shows that economies with similar aggregate contribution of new firms to the creation of new jobs have a different interplay of different margins. This highlights the fact that *heterogeneity* not only across firms (Dosi et al., 2010), but also across countries appears to be a crucial characteristic of start-up employment dynamics. Furthermore, although for all countries most growth appears to happen in the first 2 or 3 years of activity, there are significant differences in the extent to which new firms continue to growth afterwards.

These findings are particularly relevant and original as they rely on a novel database that is based on highly representative data sources (typically business registers) and is built using a single statistical routine that provides comparable and harmonised definitions across countries at a unique level of detail (Criscuolo et al., 2015). They therefore represent an important novel building block for the evidence base for policy in this area, given their unique breadth in coverage of both the underlying business population within countries and

the extensive number of countries included. Finally, the richness and replicability of the micro-aggregation procedure makes it a unique tool for longitudinal cross-country analysis.

The descriptive analysis presented in this work is particularly relevant from a policy perspective. Existing cross-country differences in start-up employment dynamics appear particularly evident along two elements of the proposed decomposition: the start-up ratio and the post-entry growth margins. This suggests that policies may play a significant role in determining these channels. In fact, the evidence presented quite clearly suggests that the bottleneck for a dynamic business environment relates for some countries to entry, while in others to the scale-up performance. These differences might entail that in the first group of countries policies should focus on either overcoming structural factors that make entry more difficult or alleviate policy challenges and institutional features that might discourage entry (e.g., entry barriers, red tape, tax wedges, access to early-stage finance, etc.). The second group might want to make particular attention to obstacles to employment growth driven by policy, such as hiring and firing costs, access to growth finance, unintended effects of size-contingent policies, etc. In addition, some policies – such as civil justice efficiency, contract enforcement, and bankruptcy legislation – can be beneficial to both group of countries. Our decomposition can therefore be used as a diagnostic tool by policy makers, allowing to benchmark performance in these areas and focus policy interventions to improve either the start-up ratio, the scale-up success, or both.

The paper is organized as follows. The next section briefly discusses the main contributions to the literature related to this study. Section 3 illustrates the recently collected DynEmp v.2 database. Section 4 presents an overview of start-ups' employment dynamics across countries, describing and exploiting a novel algebraic decomposition of entrants' contribution to net job creation and separately focusing on each of its components, with particular attention paid to the post-entry growth of entrants. Finally, Section 5 concludes the findings and proposes avenues for future research.

2 Related literature

The recent industrial organization and firm dynamics literature has devoted considerable attention to the study of entry, its determinants and its economic impacts (see Santarelli and Vivarelli, 2007 and Van Praag and Versloot, 2007 for reviews and Nightingale and Coad, 2013 for a critical analysis).

Recent contributions to the literature have emphasized the key role of young firms for job creation and employment dynamics. Focusing on the United States, Haltiwanger et al. (2013) show that, once controlling for firm age, there is no systematic relationship between firm size and growth. Haltiwanger et al. (2013) highlight the critical role of start-ups for employment growth and their typical "up-or-out" dynamics, with high growth conditional on survival coexisting with high probability of exit. Across a large sample of OECD and emerging economies, young-small firms – rather than small firms as a whole – reveal to be net job creators, even during the Great Recession (Criscuolo et al., 2014 for evidence on 17

OECD countries and Brazil; see also Lawless, 2014 for related evidence for Ireland). In this context, a detailed characterization of employment dynamics of entrants and young firms across countries appears particularly interesting and relevant.

This paper contributes to the line of research on cross-country differences in economic dynamism and allocative efficiency based on comparative firm demographics. This line of research is based on "distributed micro-data" projects, where large administrative databases are processed by national expert using a common statistical protocol to derive comparable results. The field was pioneered by Bartelsman et al. (2005) and carried on, among others, by Bassanini (2010) and Criscuolo et al. (2014).

Most relevantly, the study by Bartelsman et al. (2005) is particularly related to this analysis. The authors present evidence on the firm size distribution, firm demographics, and post-entry performance of firms across 10 OECD countries between 1989 and 1994. By taking advantage of an harmonised database based on a distributed micro-data collection exercise, the authors highlight that despite firm size differs across countries, similar degrees of firm churning exist. Furthermore, Bartelsman et al. (2005) show that post-entry growth rates appear higher in the United States than in Europe. They argue this could be indicative of barriers to growth (rather than barriers to entry).

A distinctive feature of our paper is its cohort approach. In particular, a great part of this study focuses on the employment dynamics of cohorts of entrants across countries. Comprehensive understanding of the performance of cohorts of firms across countries is still very limited. A closely connected study, which focuses on the job dynamics of cohorts of entrants born in 1998 after their first 10 years of life in six European countries, is realised by Anyadike-Danes et al. (2015). The authors develop a measurement framework, somehow related to the one proposed in this study, which allows accounting for differences in employment growth due to heterogeneity in "initial conditions" (average size at birth by size class and distribution of firms by size class) and "transforming factors" (survival and growth by size class). By focusing on size class' specific dynamics, Anyadike-Danes et al. (2015) highlight three main findings: i) smallest firms play a relatively important role in accounting for overall employment growth; ii) a small number of small firms play a critical role accounting for differences across countries in employment growth; iii) differences in the initial size distributions and survival shares appear to play a more limited role.

This paper is also related to the stream of research that focuses on the quality of jobs created by new businesses, generally highlighting a negative wage premium associated with new firms (see for instance Nyström and Elvung, 2014, Brixy et al., 2007 and Van Praag and Versloot, 2007 for further discussion).

Finally, this paper is broadly linked to the literature on firm size at entry and probability of survival (see Agarwal and Audretsch, 2001), on entrepreneurship (for instance Acs et al., 2009; Decker et al., 2016), and on firm growth patterns (Mata et al., 1995; Mata and Portugal, 2004; Coad, 2009; Bottazzi et al., 2010; Coad et al., 2014).

3 Data: the DynEmp v.2 database

The data used in this paper stem from the second round of data collection within the framework of the OECD DynEmp (Employment Dynamics) project. The DynEmp project is based on a distributed data collection exercise aimed at creating a harmonized cross-country micro-aggregated database on employment dynamics from confidential micro-level data where the primary sources of firm and establishment data are national business registers. These data provide the most comprehensive coverage of economic activity in any country, aimed at including the universe of businesses. However, due to the confidential nature of the information concerned, access to such data is often restricted. Furthermore, national sources are not directly comparable *per se*, and harmonization of the data is required.

DynEmp tackles these limitations. A network of national experts run common Stata routines developed centrally on the confidential micro data to which they have access (see also Criscuolo et al., 2015). The experts also implement country-specific procedures in order to ensure that confidentiality is respected. This paper uses a part of the DynEmp v.2 database which contains "transition matrices" of cohorts of units. The transition matrices summarize the growth trajectories of cohorts of units from year t to year $t+j$, where t takes by default the values 2001, 2004, and 2007 and j is equal to 3, 5, or 7.[1] The matrices contain a number of statistics (number of units in the cell, median employment at t and at $t+j$, total employment at t and at $t+j$, and mean growth rate) for different combinations of age and size classes at time t and $t+j$, and also statistics focusing on the dynamics of high-growth units.

In the DynEmp database, age is defined as the difference between the birth year and the current year. The birth year is equal to the one reported in the source database or, wherever that is missing, to the first year that indicates positive employment. The possible censoring of the birth year variable is appropriately taken into account.

At the time of finalizing this paper, 19 countries have been successfully included in the DynEmp v.2 database (namely, Austria, Belgium, Brazil, Canada, Denmark, Finland, France, Hungary, Italy, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Turkey, the United Kingdom and the United States). For most countries the time period between 2001 and 2011 is covered.[2]

As emphasized by Criscuolo et al. (2014), the advantages of using harmonized micro-aggregated data from business registers for the study of business employment dynamics are manifold. First of all, the different channels of employment variation can be identified separately, distinguishing between gross job creation and job destruction, and between the extensive (firm entry and exit) and the intensive margin (post-entry growth). Furthermore, the role of firm age and size can be examined. Finally, each of these elements can be compared

[1] Therefore, if data are available, transition matrices are calculated for the periods $2001-2004$, $2001-2006$, $2001-2008$; $2004-2007$, $2004-2009$, $2004-2011$; $2007-2010$; $2007-2012$; $2007-2014$.

[2] The time horizon for Austria, Brazil, Denmark, Luxembourg, Norway, Sweden and the U.S. is longer. Only a limited number of statistics is available for Canada. Details about temporal coverage by country are summarized in Table A2, in the Appendix.

across countries, sectors and over time.

Measuring entrepreneurship and its economic effects in terms of job creation is not an easy task and appropriate data, taking into account the age and not only the size of businesses, are necessary. Furthermore, very few databases allow researchers to follow cohorts of the different units of analysis over time, despite the wide recognition that this is crucial when studying business dynamics, especially in the case of entrants (see for instance Bartelsman et al., 2011). Even fewer databases combine a cohort approach with a detailed industry disaggregation. The DynEmp v.2 database provides a unique infrastructure for this type of investigation.

4 Start-ups and employment: deconstructing job creation from entrants

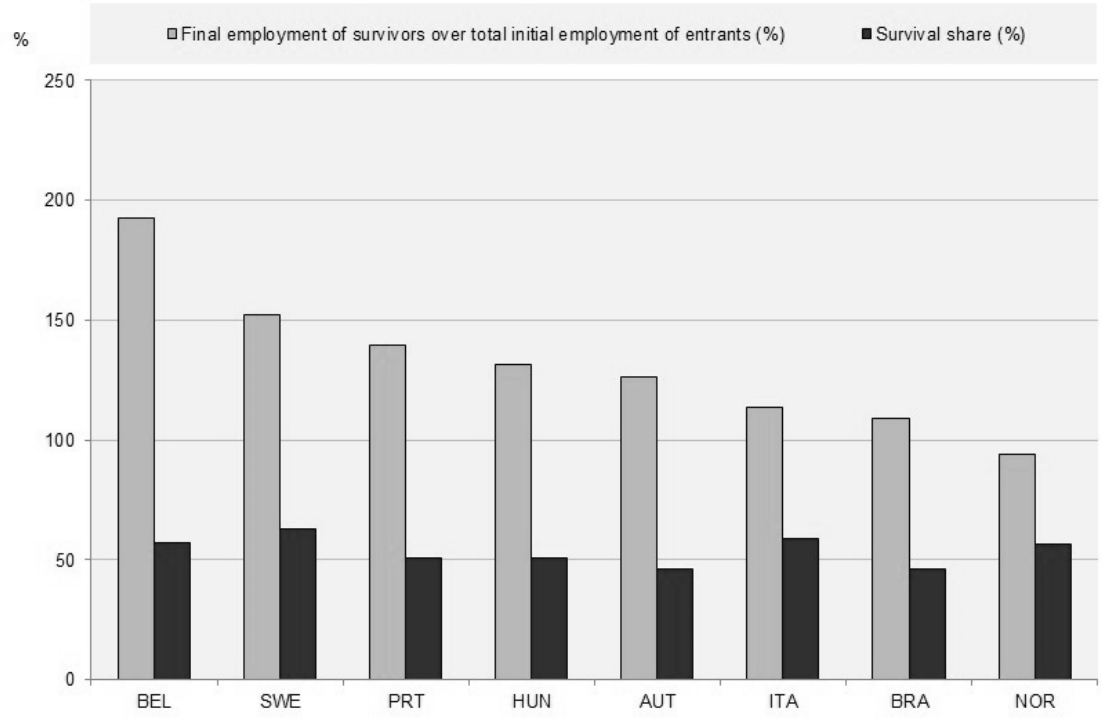
New firms contribute to employment dynamics through three main channels: they create jobs whenever they enter the market with positive employment; they destroy jobs in the event of failure, of which they are much more at risk than older firms; and they create and destroy jobs by hiring and firing workers (the so-called intensive margin), as all other firms do, but at a greater rate in proportional terms given the turbulence in the performance of businesses in their first years of activity. Previous work (Criscuolo et al., 2014) has shown that the net sum of these three components is positive in a sample of 18 countries: young firms aged five or less are on average always – and by a fair amount – net job creators. Figure A1 in the Appendix uses the new DynEmp v.2 data to show that this also consistently applies to all 2-digit sectors of the economy (non-financial business sector).[3]

In almost all countries, macro-sectors, and time periods, young firms are also net job creators at the intensive margin, i.e., when the contribution of entry and exit (the extensive margin) is excluded and only the post-entry net job creation of these firms is taken into account. This is illustrated in Figure 1, which shows the final employment of surviving micro start-ups expressed as the ratio over the total initial employment of all start-ups (thus including also those that exited in the interim) over a time horizon of five years. Across all countries included in the graph (except for Norway) net job creation by surviving micro start-ups is large enough to more than compensate for the job destruction of those micro start-ups that exit – despite the survivors representing only 40 to 60% of the total number of entrants at the beginning of the period.

This study explores and characterizes the job creation process of new and young businesses, by decomposing its main components and by inspecting closely the growth dynamics

[3]Figure A1 illustrates the share of total employment, gross job creation and gross job destruction by small (0-49 employees) young (0-5 years old) units by 2-digit sector, on average, in the countries analyzed. In *all* 2-digit sectors young small units i) are always net job creators, and ii) their relative contribution to gross job creation is always significantly higher than their share in total employment. The share of gross job creation by small young units is on average higher in services, with a number of 2-digit sectors (including "IT and other information services" and "Other business services") in which young-small firms account for more than 40% of total gross job creation in the sector. In some countries, the share of gross job creation by young firms in certain service sectors is above 70%, while the corresponding share of gross job destruction is below 50% (see also Calvino et al., 2015).

Figure 1: Survival share and job creation by micro (0-9) entrants over a five year period



Notes: the graph shows the share of survival and the ratio between final employment of survivors at time $t+5$ over total employment of entrants at time t for micro $(0-9$ employees) entering units. Figures report the average for different time periods $t = 2001, 2004$ and 2007, conditional on their availability. Sectors covered are: manufacturing, construction, and non-financial business services. Those countries for which specific confidentiality rules limited the comprehensiveness of the statistics are excluded from the graph. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

of cohorts of start-ups. The starting point is the number of jobs created by new entrants over a three year interval, i.e., the final employment of start-ups which have survived until their third year of age as a proportion of country employment at the beginning of the period. This synthetic indicator has two main analytical advantages: firstly, it summarizes the contribution of both the intensive and extensive margins, i.e. the entry-exit dynamics and the survivors' net growth. Secondly, as shown in the following, the adopted measure of start-up contribution to employment creation – i.e. the number of jobs created by a cohort of entrants over a three year interval relative to employment at the beginning of the period – can be divided into four different elements: i) average start-up ratio at the beginning of the three year period; ii) entrants' three year survival probability; iii) average size at entry; and iv) three-year post-entry growth. These four elements are examined in detail below.[4]

Before entering into the core of the analysis, it is useful to highlight that the main focus of the paper is on entrants of any size, mainly because of wider data availability for small countries with binding confidentiality requirements. However, small start-ups are generally more likely to be genuinely new firms (*de-novo* entry) as compared to larger entrants, which

[4]For an additional application of this approach to the Japanese manufacturing sector see Calvino et al. (2017).

are more likely to be the result of mergers or acquisitions or legal rather than economic changes in the life of a firm (i.e., *de-alio* entry; see Geurts and Van Biesebroeck, 2014). However, similar analysis presented in the working paper version of this study (Calvino et al., 2015) focused on *small* units only – i.e., below 50 employees, for those countries for which data availability allowed it – confirming that the main conclusions drawn from the analysis based on the full sample of entrants hold.

4.1 The components of start-up contribution to employment creation

Building upon the discussion carried out in the previous sub-section, for every country let us define normalized net job creation ($NNJC$) by surviving entrants between time t and $t+j$ (with $t = 2001, 2004, 2007$ and $j = 3, 5, 7$) as follows:

$$NNJC_a(t, t+j) = \frac{L_a^{surv}(t+j)}{L(t)} \quad , \tag{1}$$

where a indicates age class (entering units).

In this case $L_a^{surv}(t+j)$, identifies employment at time $t+j$ of units entering at time t in every country that survive between time t and $t+j$. The super-script *surv* identifies only units surviving until time $t+j$ and the parentheses indicate that employment is reported at time $t+j$. The denominator represents country total employment at time t. We decompose normalized net job creation by surviving entrants as follows:

$$\frac{L_a^{surv}(t+j)}{L(t)} = \frac{N_a(t)}{L(t)} \times \frac{N_a^{surv}(t)}{N_a(t)} \times \frac{L_a^{surv}(t)}{N_a^{surv}(t)} \times \frac{L_a^{surv}(t+j)}{L_a^{surv}(t)} \quad , \tag{2}$$

where $N_a^{surv}(t)$ identifies the number of entrants in every country at time t surviving until time $t+j$.

The first element of the decomposition identifies the start-up ratio (in terms of employment) in the economy, defined as the total number of entering units over total employment at time t ($N_a(t)/L(t)$). This can be considered a measure of the relative weight of entrepreneurship in each country.[5]

The second element of the decomposition is the survival share of entering units ($N_a^{surv}(t)/N_a(t)$). It indicates the number of entering units surviving until time $t+j$ over the total number of entrants at time t. This measure reflects the extent to which the selection process of entrants is strong in an economy.[6]

The third element of the decomposition identifies instead the average size at entry for surviving start-ups ($L_a^{surv}(t)/N_a^{surv}(t)$). It is the ratio between total employment at time t for entrants surviving until time $t+j$ over the number of entering units surviving until time

[5]Indicators on the number of start-ups are more commonly normalized on the total number of firms, rather than on employment. However, the second option is preferred because it leads to an indicator that is not affected by the average firm size in the economy. To ease visualization, graphs reported throughout the analysis show this measure in terms of start-ups per thousands of employees.

[6]To ease visualization, graphs reported throughout the analysis show this measure in percentage terms.

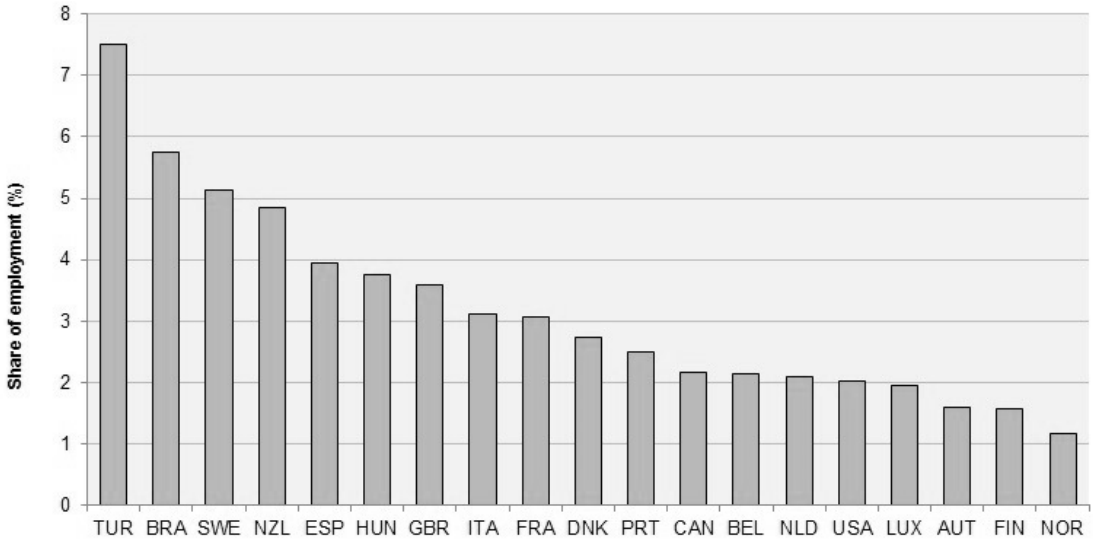
$t + j$. This measure might depend, *inter alia*, on entry barriers, competition, etc.

Finally, the fourth element of the decomposition ($L_a^{surv}(t+j)/L_a^{surv}(t)$) is the the final over initial employment ratio (or the average post-entry growth rate) and we use it as a proxy for post-entry employment growth performance. It identifies employment at time $t+j$ of surviving entrants (between time t and $t+j$) as a proportion of overall employment at time t of the whole cohort of start-ups surviving until $t+j$.

Figure 2 summarizes the dynamics of normalized net job creation by surviving entrants, calculated as the ratio between total employment of entrants at the end of a three year period (on average for three different cohorts, born in 2001, 2004, and 2007, respectively) and overall employment in the country at the beginning of the three year period (see Equation 1).

Country heterogeneity emerges when observing the patterns of normalized net job creation by surviving entrants. A handful of economies – namely Turkey, Brazil, Sweden, New Zealand and, to a lesser extent, Spain and Hungary – are characterized by a higher normalized net job creation. In these countries, net job creation by entrants that survive at least three years represents up to 7% of overall employment; i.e. for every existing 100 jobs in the economy in any given year, the start-ups which are born in that year will add seven new jobs within the following three years.

Figure 2: Net job creation by surviving entrants relative to total employment



Notes: the graph illustrates the ratio between employment at time $t+3$ of surviving entrants and overall country employment at time t. Figures report the average for different time periods $t = 2001, 2004$ and 2007, conditional on their availability. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

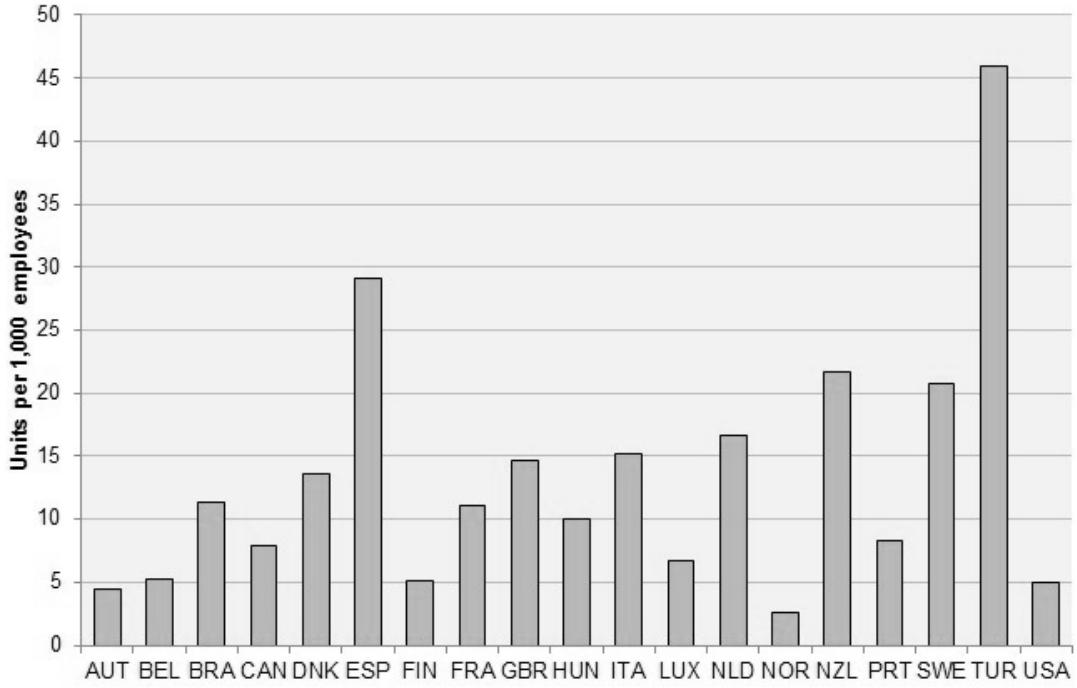
Source: OECD DynEmp v.2 database.

Building upon the framework presented in Equation 2, Figure 3 illustrates each element of the decomposition separately (on average over time for the whole non-financial private business sector). Significant cross-country differences are evident not only for post-entry

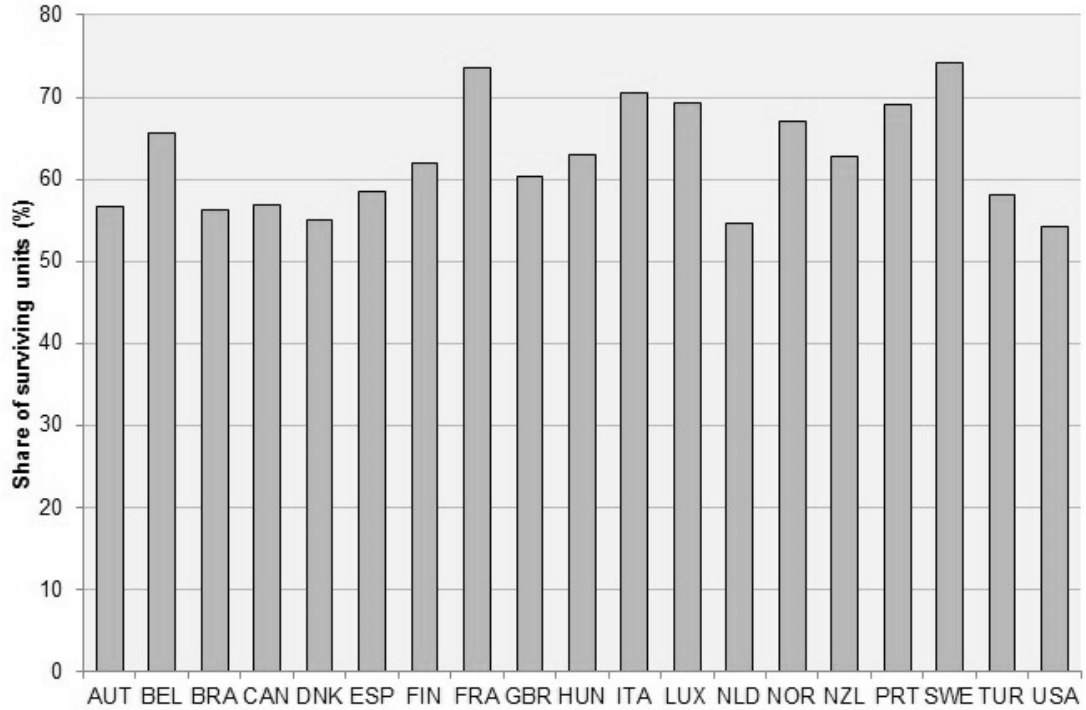
growth performance and survival shares of surviving entrants, but also for start-up ratios. Start-up ratios are particularly high in Turkey, Spain, New Zealand and Sweden (more than 20 start-ups per thousand employees) and substantially lower in Norway, Austria, the United States, Finland and Belgium. Three-year survival rates range between about 55% in the U.S., the Netherlands and Denmark to more than 70% in Sweden, France and Italy. Average size at entry is quite similar across the countries analyzed with some exception for Brazil, the United States, Austria and, to some extent, Norway, where firms start larger. Final-over-initial employment ratios range between about 120% in the U.S. to more than 200% in Canada and Belgium.

Figure 3: Growth decomposition

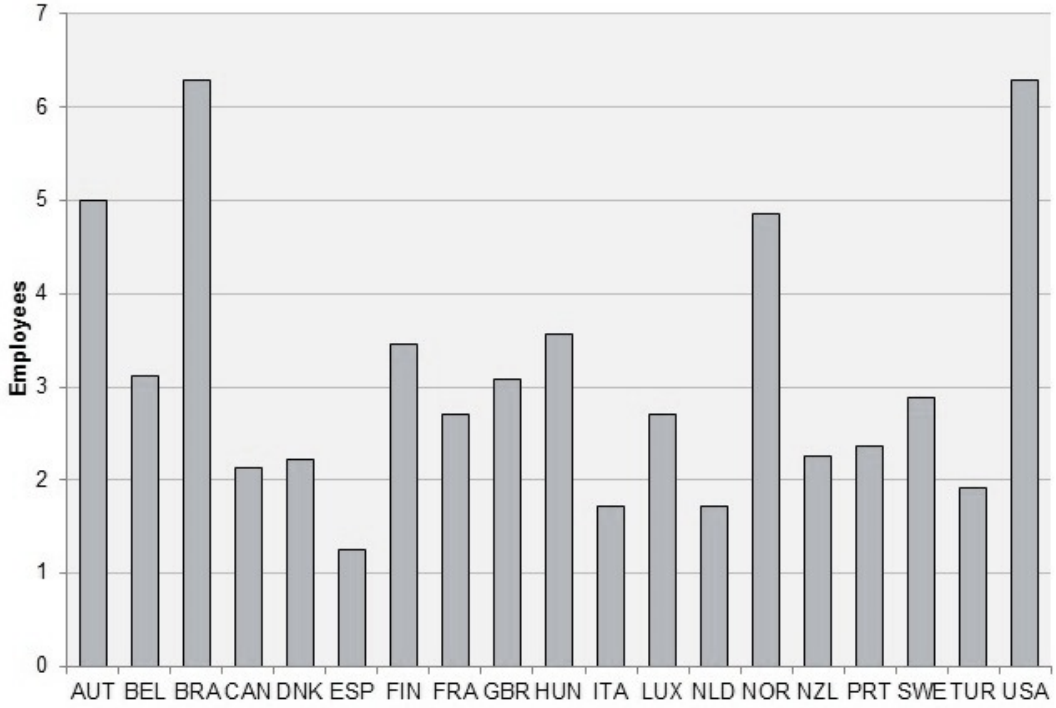
(a) Start-up ratio



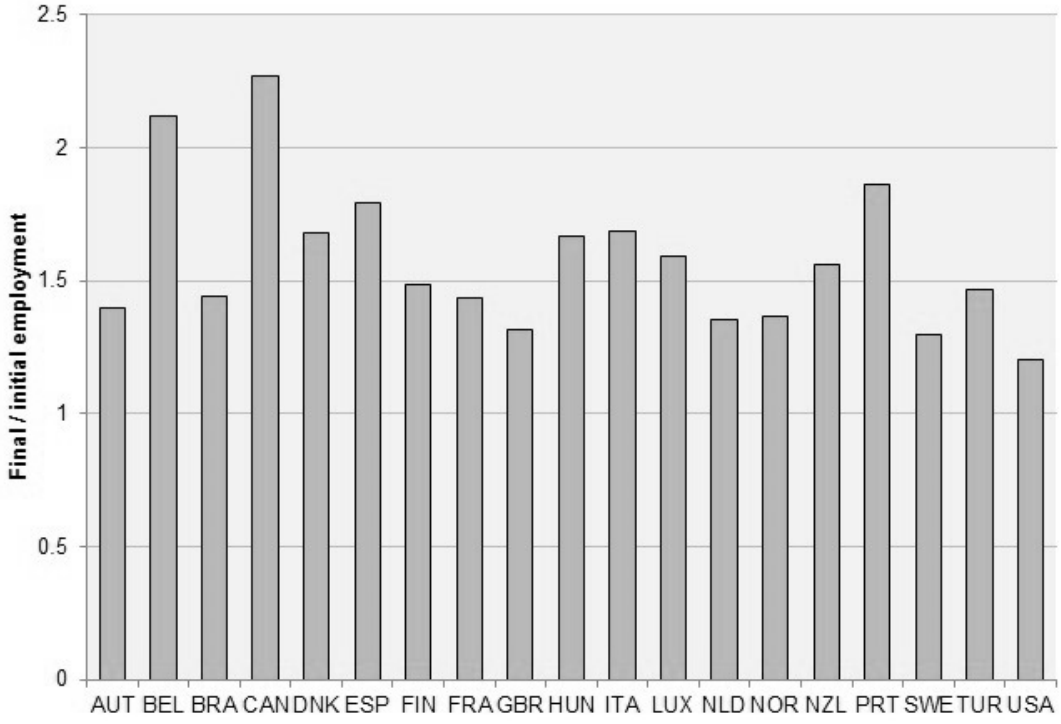
(b) Survival share (after 3 years)



(c) Average size at entry



(d) Average post-entry growth



Notes: the graph illustrates the four components of the growth decomposition. Panel A: start-up ratio, expressed as total number of entering units over total employment (in thousands); Panel B: survival share of entrants, expressed as number of entering units surviving over total number of entrants per cent; Panel C: average size of surviving entrants expressed as total employment of surviving entrants over number of surviving entrants; Panel D: ratio between total employment at $t + 3$ over total employment of surviving entrants. Figures report the average for different time periods $t = 2001, 2004$ and 2007, conditional on their availability. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

The first take-away from Figure 3 is the high degree of heterogeneity across countries – especially in post-entry growth and start-up ratios – and the lack of a *one-size-fits-all* pattern. This is even more evident in the "spider graph" reported in Figure 4, in which each of the four indicators is normalized over the maximum value for that component in the sample of countries analyzed. For instance, Turkey, Brazil, and Sweden, the three countries with the highest normalized net job creation by entrants reported in Figure 2, show a very different combination of the growth decomposition components. Turkey has a very high start-up ratio, but entrants are among the smallest in the sample and their survival share and growth rate are below average. Conversely, Brazil has a rather low start-up rate, but this is counterbalanced by the largest average size at entry in the sample. Sweden has a high start-up ratio and the highest survival share, but this is combined with a low average size at entry and a below average post-entry growth.

In addition, while on average post entry growth in Sweden is not that high, this hides the great heterogeneity which exists in the economy. As discussed in Section 4.1.4, firms at the top of the growth distribution are very dynamic and contribute significantly to high overall normalized net job creation. New Zealand also shows a similarly high normalized job creation by entrants (Figure 2), however as compared to Sweden the average size at entry and – especially – the survival rate are lower, compensated by a higher growth rate. Conversely, Belgium shows a relatively low normalized net job creation by entrants. However, the country is characterized by the second highest average growth ratio amongst survivors, as well as by above average size at entry. This, however, is counterbalanced by a very low start-up ratio, among the lowest in the sample. Finland also has a very low net job creation by entrants; however, with respect to Belgium, the average size at entry is higher, while the survival share and the post-entry growth rates are lower.

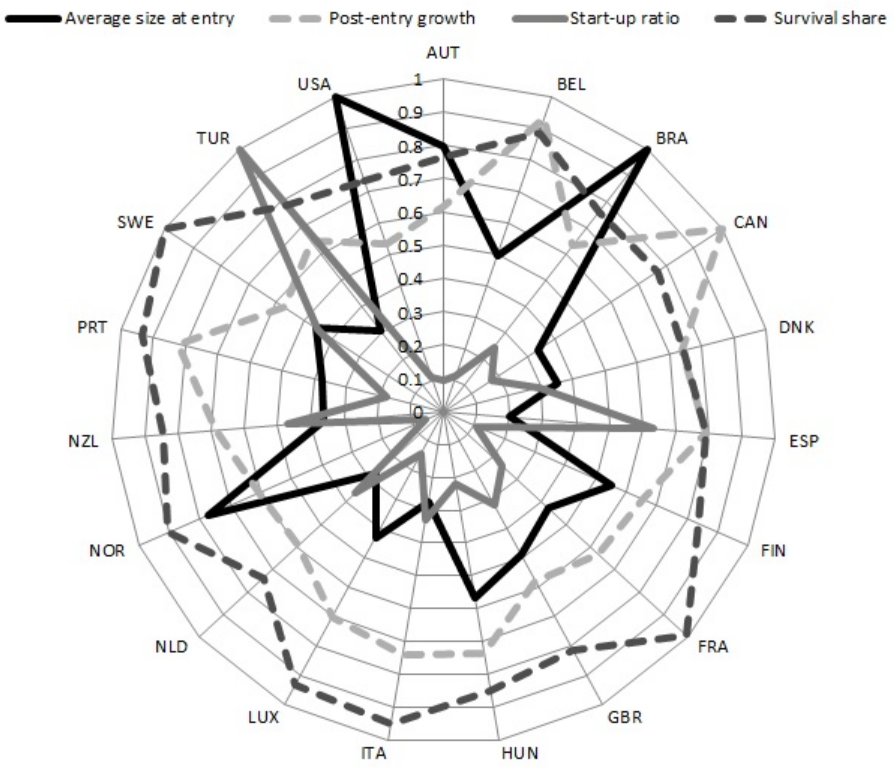
This evidence confirms that entrepreneurship is an extremely complex phenomenon, and that a similar outcome – e.g., high contribution by start-ups to employment creation – might mask very different start-up dynamics across countries. In turn, this emphasizes the importance of improving and widening the scope of the data sources used to analyze business dynamics.

The next subsections separately analyze more in depth each component of the decomposition of normalized net job creation by surviving entrants, further contextualizing them in the relevant literature. The analysis will reveal further heterogeneity, depending on the particular group of entrants considered, their age, sector of activity or on the period under investigation. It will also point to additional differences and empirical regularities, discussed in the following.

4.1.1 Start-up ratio

The first component we focus on is the start-up ratio. It is an indicator of the degree of entrepreneurship in an economy, which is at the core of the "creative destruction" process (Schumpeter, 1942). Recently, there has been growing concern that a "secular decline" in

Figure 4: Growth decomposition: country comparison



Notes: the graph illustrates the four components of the growth decomposition normalized over the maximum value across all countries included in the sample. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

start-up creation is affecting the United States and other advanced economies (Decker et al., 2014; Criscuolo et al., 2014), which in turn could be linked to a slowing-down of reallocation dynamics. More specifically, Haltiwanger et al. (2013) illustrate that in the United States firm entry rates have experienced a substantial decline in the last decades, moving from about 13 percent (as a percentage of all firms) in the 1980s to about 7 percent in recent years. Furthermore, declining start-up rates are particularly evident in the United States local retail markets (see for instance Jarmin et al., 2009 or Davis et al., 2007) due the changing structure of retail trade, which has moved towards more vertical integration. This trend can be particularly worrying, in line with the idea that start-ups are major drivers of the process of creative destruction, and ultimately growth.

Scholars, however, maintain that start-up rates by themselves are not an exhaustive measure of the economic dynamism of an economy, as self-employment is not always "transformational" in nature, but can be rather oriented to the "subsistence" of the entrepreneur. Individuals engaged in the two types of entrepreneurship (transformational and subsistence) seem to respond very differently to policy changes and economic cycles, and transition from subsistence to transformational entrepreneurship is an extremely rare phenomenon (see Schoar, 2010). As emphasized by Decker et al. (2014), the distinction between transformational and subsistence entrepreneurs is very useful not only for developing economies. For instance,

Hurst and Pugsley (2011) argue that many young and small business entrepreneurs in the United States affirm that they do not have any strong aspirations for high growth. More often the reasons to start their companies are instead non-pecuniary, such as time flexibility or personal goals (Astebro, 2015; Raknerud and Praag, 2014). Furthermore, start-up rates can reflect the fact that entrepreneurship may be an alternative to uncertain future career prospects especially in periods of relatively high unemployment (see Santarelli and Vivarelli, 2007 for a discussion on the topic). Finally, start-up rates may partly include a number of "entry mistakes" linked to potential entrepreneurs' overconfidence (Dosi and Lovallo, 1997).

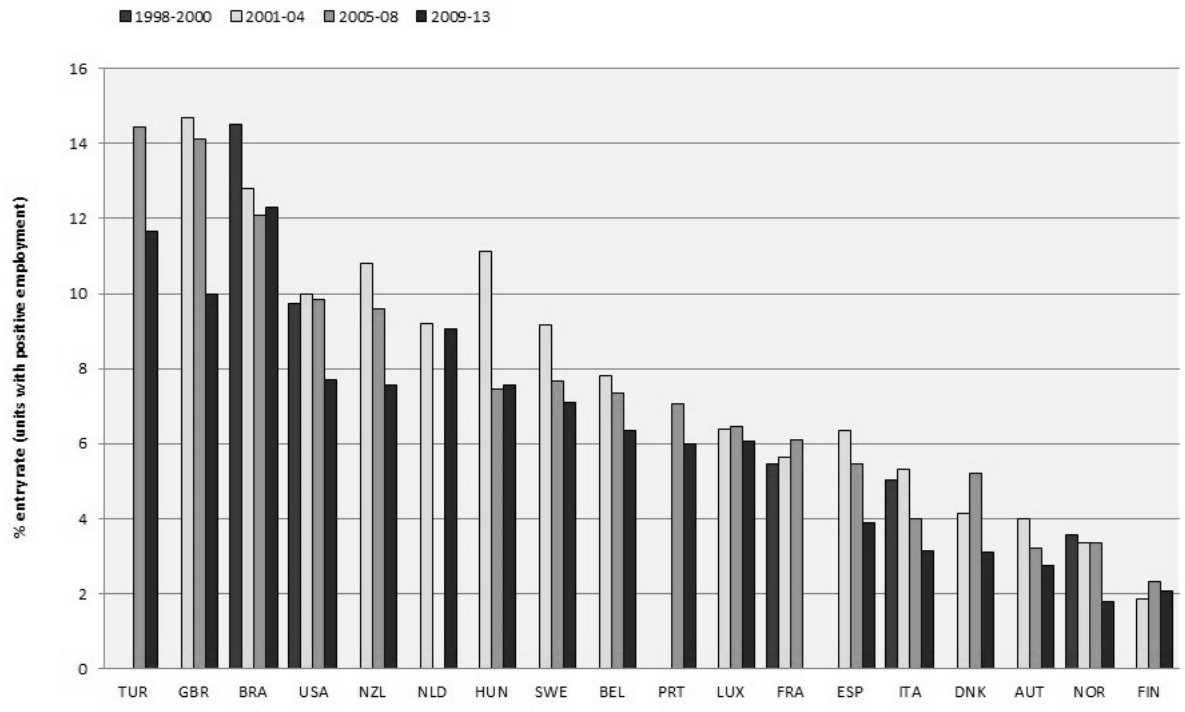
Figure 5 provides comparative evidence of the evolution of start-up rates over time in the countries analyzed. Differently from the decomposition framework, the graph reports the role of start-ups in terms of the number of entrants with positive employment over total number units with positive employment, on average in four different time windows. Declining start-up rates are more evident for some countries, such as Austria, Belgium, New Zealand, Portugal, Spain, Sweden, Turkey and the United Kingdom. In others economies, such as for instance Denmark and Finland, entry rates exhibit more ambiguous patterns. France exhibits instead different dynamics: the start-up rate is steadily increasing over the period. While this can reflect the shorter time period considered (until 2007) that does not include the recession, it is consistent with more general evidence of an increase in entrepreneurship in France over the 2000's (Blanchenay et al., 2017).

Some of the cross-country differences in start-up rates observed at the aggregate level can be due to a different sectoral composition of the economy. In fact, as shown in the Annex of Calvino et al. (2015) and as outlined in existing evidence for the United States, start-up rates and their evolution over time can be extremely different across sectors. However, even when imposing the same sectoral composition across countries, start-up rates differ significantly. Table 1 compares the country level start-up rates, calculated keeping the industry composition constant at the average level across countries, with the averages observed in the same sample. As illustrated in the table, there are some differences in the relative values, but those are overall small. Therefore, the different sectoral composition does not explain much of the observed cross-country differences in start-up rates.

4.1.2 Size at entry

In a dynamic economy, characterized by low entry barriers and opportunities for new firms to experiment, the average size at entry is expected to be small. Furthermore, there is a long-standing debate and large body of empirical work concerning the relationship between firm growth and initial size. This strand of literature discusses the validity of the *law of proportionate effect*, or so called Gibrat's law, that postulates the independence of firm growth from initial size (see Gibrat, 1931 and Sutton, 1997). Gibrat's law seems to hold not only as a theoretical benchmark, but also as a good first-order approximation of the empirical relationship between firm size and growth. A number of deviations from this law, however, seem to be in place especially for small (young) firms, which tend to grow faster (see

Figure 5: The role of start-ups by country over time



Notes: the graph illustrates entry rates (calculated as number of entrants with positive employment over total number of units with positive employment). Figures report averages for the periods $1998-2000, 2001-2004, 2005-2008$ and $2009-2013$, conditional on availability. Sectors covered are: manufacturing, construction, and non-financial business services. The period between 2005 and 2008 has been excluded for the Netherlands due to a redesign of the business register in 2006. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

for instance Coad, 2009 or Lotti et al., 2009 for extensive discussions on the topic). On the other hand, a number of contributions suggest that low average size is negatively correlated with survival probability (see among others, Geroski, 1995; Audretsch and Mahmood, 1995; and Mata et al., 1995). Agarwal and Audretsch (2001) try to reconcile the two views (size-growth independence versus size-survival correlation), arguing that each outlook tends to be specific to the phase of the industry life cycle considered and to the degree of technological intensity of the sector analyzed.

In our database, the average size of entrants is remarkably low. Figure 6 illustrates average size at entry for all start-ups that survive over a five year period for those four 2-digit industries showing the widest cross-country variation in entry size. The box-plot graph provides a comprehensive picture of the cross-country distribution of average size at entry within the selected 2-digit sectors. A more skewed cross-country distribution of average size at entry, with higher cross-country mean, is evident for the basic pharmaceutical products and the transport equipment sectors.

While Figure 6 shows that there is substantial variation across countries in average size at entry within some sectors, Table 2 visually inspects whether the average cross-country

Table 1: Start-up rates by countries keeping constant the industry structure

country	Original	Fixed	Difference
AUT	3.22	3.49	0.27
BEL	6.53	8.26	1.74
BRA	9.96	11.85	1.88
DNK	15.22	17.50	2.29
ESP	27.96	28.38	0.42
FIN	6.17	6.67	0.50
FRA	11.77	13.08	1.30
GBR	14.41	13.44	-0.97
HUN	8.58	10.41	1.84
ITA	13.05	13.59	0.54
LUX	7.07	7.60	0.53
NLD	20.36	20.45	0.09
NOR	2.65	2.78	0.13
NZL	20.38	18.90	-1.48
PRT	8.23	9.91	1.68
SWE	21.17	21.71	0.54
TUR	46.01	50.89	4.88
USA	4.84	4.90	0.06

Notes: country averages keeping the industry composition fixed are calculated as $y_i = \sum_j a_{i,j} \times w_j$, where i indexes countries, and j sectors; a_{ik} are the indicators calculated at the industry-country level, and w_j are the relative industry shares in total employment on average across all countries. Year 2007 (except France and Norway, for which 2004 is used). Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

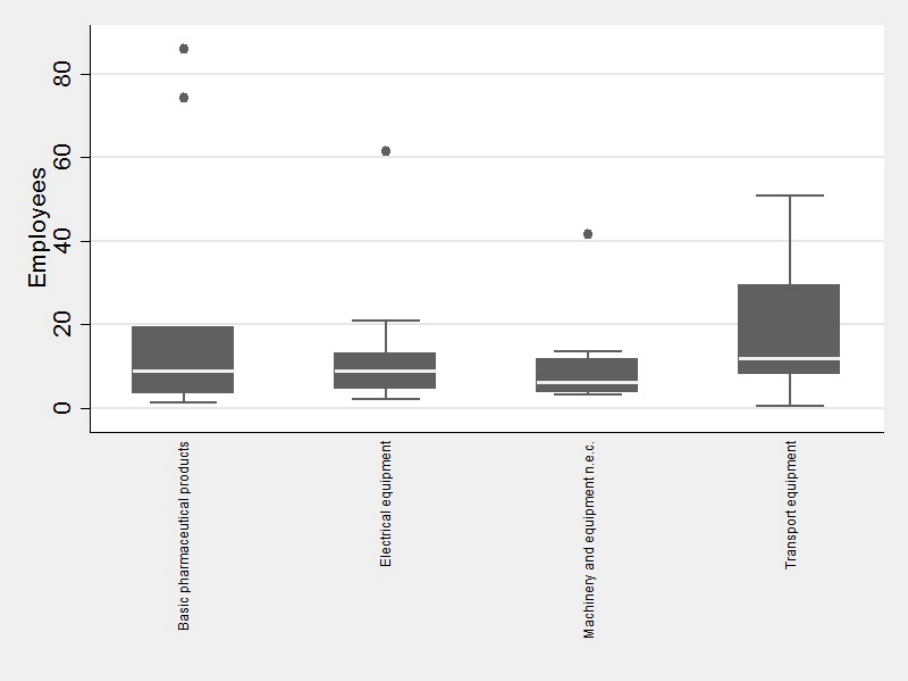
Source: OECD DynEmp v.2 database.

values of this variable are still affected by the sectoral composition. The table shows that, in most countries, values obtained keeping the sectoral composition constant across countries are comparable to the simple averages, suggesting that sectoral composition plays only a limited role in explaining cross-country differences. However, it is interesting to note that in the four countries in which the size at entry is higher than the average – Austria, Brazil, Norway and the U.S. – the aggregate average size at entry would be even higher if their industrial structure mirrored that of the average country. Therefore, if anything, sectoral specialization seems to compress, rather than amplify, cross-country heterogeneity in entry size (i.e., countries with higher-than-average size at entry are specialized in sectors with lower-than-average size at entry).

4.1.3 Survival share and likelihood of exit

Taken in isolation, the share of start-ups that survive over the first years of activity is a multifaceted indicator. A *high* survival rate can be interpreted as an indicator of a supportive environment for start-ups, e.g. in terms of access to finance; while a *low* survival rate could signal that many start-ups are free to enter the market and experiment with risky business strategies. A fraction of those succeed and grow fast, while those that are unsuccessful can leave the market smoothly without trapping resources into low-productivity activities. This

Figure 6: Surviving entrants: differences in average size at entry by 2-digit sector



Notes: the graph reports the cross-country distribution of average size at entry for all entering units surviving to $t + 5$ by 2-digit sector. Average size at entry is expressed as the ratio between total employment of surviving entrants over number of surviving entrants. Figures report the average for different time periods $t = 2001, 2004$ and 2007, conditional on their availability. The box identifies the lower adjacent value (low bar/ whisker below the box), the 25th percentile (lower end of the box), the median (bar inside the box) the 75th percentile (upper end of the box), and the upper adjacent value (bar/ whisker above the box) of countries average-size-at-entry distribution. Points represent outside value. For further information and definitions of adjacent and outside values see Cox (2009). Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

process reflects an "up-or-out" dynamics that is the lifeblood of a Schumpeterian creative destruction process.

Previous contributions to the literature emphasize that the probability of survival tends to increase with firm size[7] (Evans, 1987 and Dunne et al., 1988) and that market selection significantly affects the survival dynamics of entrants over time (Bartelsman et al., 2005). Furthermore, survival rates of entrants tend to be affected by technology-specific components (Agarwal and Audretsch, 2001) and by the pre-entry characteristics of entrepreneurs (Fontana and Malerba, 2010; Dahl and Reichstein, 2007).

In the database under scrutiny, variation in survival rate is also evident. Figure 3 shows that the survival shares over the first three years of life span from about 55% in Netherlands to around 74% in Sweden. Extending the focus to other time spans, Table 3 shows that the survival rate is on average equal to just above 60% after three years from entry, to about 50% after five years, and to just over 40% after seven years. The relatively small standard deviation confirms that the survival share is the most homogeneous component of the decomposition across countries.

[7]Note that – conditional on survival – the proportional growth rate of firms does not seem to exhibit the same pattern.

Table 2: Size at entry by countries with keeping industry structure constant

country	Original	Fixed	Difference
AUT	4.60	6.64	2.05
BEL	3.02	5.06	2.04
BRA	6.57	9.88	3.30
DNK	1.91	2.45	0.54
ESP	1.23	2.08	0.85
FIN	2.27	3.49	1.22
FRA	2.01	3.01	1.00
GBR	3.13	4.75	1.63
HUN	3.58	4.25	0.67
ITA	1.87	3.03	1.16
LUX	2.58	2.87	0.29
NLD	2.10	2.50	0.40
NOR	4.57	5.61	1.04
NZL	2.18	2.39	0.21
PRT	2.37	4.22	1.85
SWE	1.50	2.98	1.48
TUR	1.91	2.50	0.58
USA	6.40	7.24	0.83

Notes: country averages keeping the industry composition fixed are calculated as $y_i = \sum_j a_{i,j} \times w_j$, where i indexes countries, and j sectors; a_{ik} are the indicators calculated at the industry-country level, and w_j are the relative industry shares in total employment on average across all countries. Year 2007 (except France and Norway, for which 2004 is used). Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

Figure 7 and figure A2 in the Appendix focus on the dynamics of the likelihood of exit conditional on age, first on average (Figure 7) and then by country (Figure A2) over the great recession. More specifically, the graphs illustrate the dynamics of the exit probability conditional on age (reported on the horizontal axis) and size, and its country-specific variation over the global financial crisis in the 2008-9 biennium. The graphs are extracted from the outcomes of two of the "distributed regressions" which are run within the DynEmp v.2 routine on the source micro-data for each country. The regressions are estimated with a Linear Probability Model where the dependent variable is the exit dummy, and the right-hand side variables are age dummies (interacted or not with a crisis dummy), size class dummies, year dummies and 3-digit sector dummies. The omitted (baseline) age category is the residual class "10 year old or more".

The output dataset contains only the coefficients on the age and size class dummies, the number of observations, and statistics on the quality of the fit (see Criscuolo et al., 2015 for further details). All the coefficients reported in the graphs are statistically significant, which means that the probability of exit before the age of 10 is always statistically different than at the age of 10.

Figure 7 shows that firms are most likely to exit between their second and third year of activity. This holds true for most countries, where the average probability of exiting

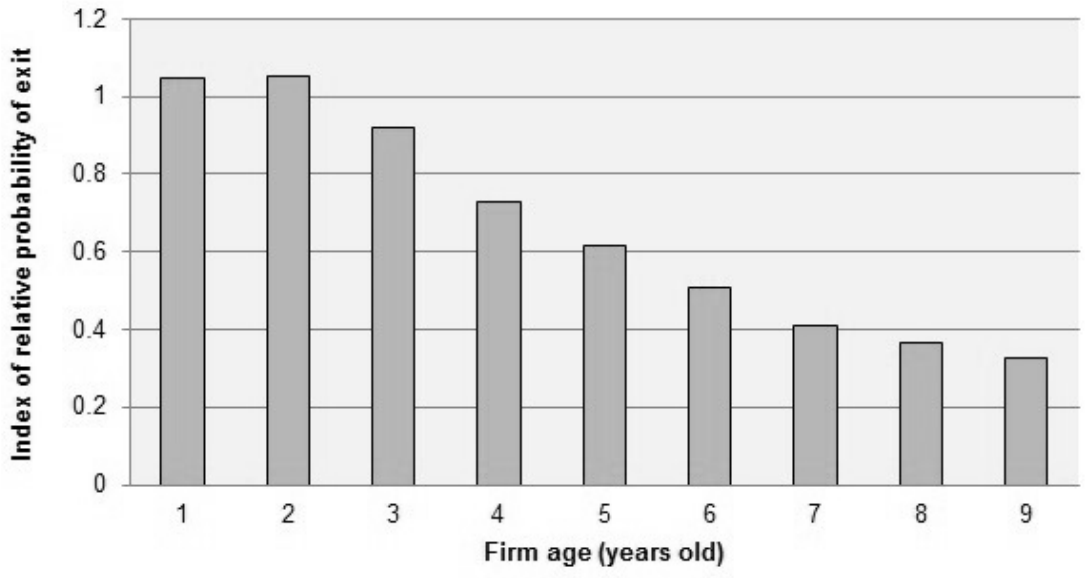
Table 3: Survival share of entrants after 3, 5, and 7 years

	$j = 3$	$j = 5$	$j = 7$
average	62.2	49.8	41.5
st. dev.	7.4	7.4	7.3
median	61.2	47.8	40.8

Notes: the table reports average, sample standard deviation and median of the survival share of entrants surviving until time $t + j$, where $t = 2001$, 2004 and 2007 and $j = 3$, 5 and 7. The statistics are computed pooling together available countries and years, conditional on data availability. Data are in percentage points. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

Figure 7: Relative probability of exit at different ages



Notes: the graph reports the age coefficients of the exit "distributed regression" (which has as response variable an exit dummy and as explanatory variables age, size, three-digit sector and year dummies). Regression coefficients are normalised by country (subtracting the country minimum value and dividing by the country maximum value) and then averaged out across available countries. Norway has been excluded due to ongoing checks on unusual dynamics in the underlying data. Exit regressions are not available for the United Kingdom. Firm age is reported on the horizontal axis (1 to 9 years old). Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

(controlling for units' size class, 3-digit sector and year) peaks when units are between two or three years old.[8] Furthermore, the general effect of the global financial crisis in the countries analyzed is to increase the probability of exit across all age categories considered. Interestingly, in some countries the increase is not equally distributed, with some age intervals seeing a much higher increase in exit probability than others (like e.g., Finland for age $6-7$; Denmark for age $3-4$; Austria for age 5).

[8]Unreported tests also confirm that in most cases the coefficients of the age 2 dummies are statistically different from the coefficients of the age 1 and age 3 dummies.

4.1.4 Post-entry Growth

Previous work has already highlighted that the average growth rate of start-ups – although always positive on average – entails a substantial degree of heterogeneity within cohorts of otherwise similar entrants, with the large majority of small start-ups growing very slowly, and a tiny proportion of them experiencing very fast growth (Criscuolo et al., 2014; Anyadike-Danes et al., 2015; Criscuolo et al., 2017). It is therefore important to further explore this firm-level heterogeneity in the growth performance of start-ups in order to draw useful policy implications.

Extending the analysis presented by Criscuolo et al. (2017), which focuses on a three-year window using a previous wave of data collection (DynEmp Express), Figure 8 analyses the post-entry dynamics of micro-entrants (entrants with 0-9 employees) in the whole non-financial business sector, classifying them according to their size class five years later (or in the "exit" group if they did not survive). From Panel A, which presents the figures in terms of number of units, it is evident that most micro start-ups either remain stable (i.e., at the end of the period they are in the same size class in which they were at the beginning of the period) or exit the market. In every country, the number of micro start-ups moving to a higher size class at the end of the period is extremely small – on average around 3% and never more than 6%. The graph also shows that, in most economies, the number of surviving micro start-ups is higher than the number of exiting units.

The pattern is however completely different if, rather than looking at firms, one looks at jobs. Panel B in Figure 8 illustrates post-entry dynamics of micro entrants in terms of their net job creation (the difference between employment at the beginning and at the end of the five year period, respectively). The very few micro-entrants whose size is bigger than 20 employees at the end of the horizon are responsible for most job creation of micro start-ups in all countries – on average 37% with a maximum of 53% in France. Furthermore, in most countries gross job creation by surviving micro start-ups more than compensates gross job destruction by exiting units.[9]

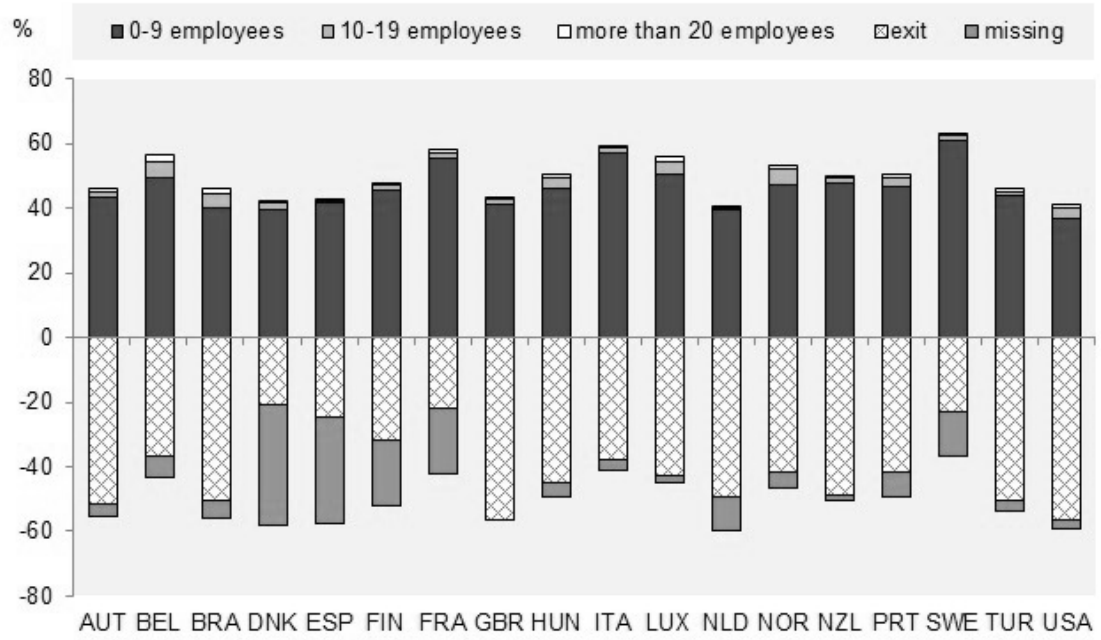
Given the relevance of this point, we further analyse the relative role played by countries, macro sectors, and time in explaining the differences in the share of growing micro entrants. In particular, we focus on the share of entrants with 0-9 employees at time t that move to the 10-19 or 20 or more size class at time $t+5$, with $t = 2001, 2004, 2007$, pooling together data for manufacturing, construction, and non-financial business services.[10] We regress these shares against country, time and macro sector dummies. Results reported in Table 4 show that the main sources of variation are related to country-specific factors, where the adjusted R-squared of the regression equals about 23%, rather than time or macro sectoral specificities.

[9] A caveat is however necessary for this analysis. Due to the specificity of their confidentiality rules and the relatively small size of their economy, the confidentiality blanking of the output datasets for Denmark, Finland, France, Luxembourg, New Zealand, the Netherlands, Spain, the United Kingdom and the United States may lead to underestimating the share of micro start-ups moving to a higher size class, as well as their contribution to net job creation.

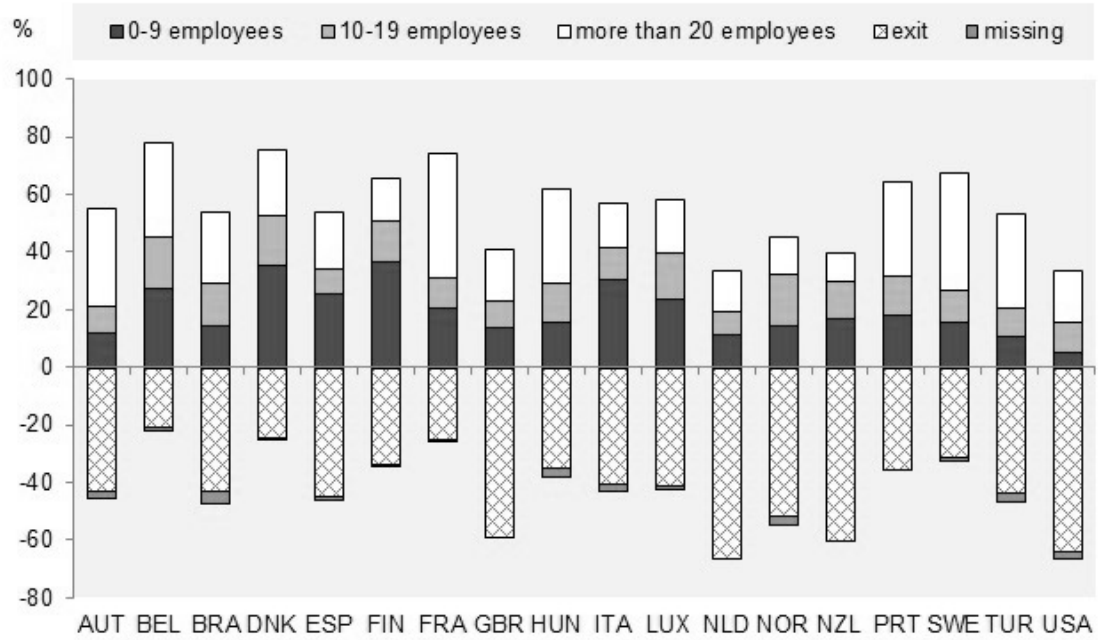
[10] Related econometric analysis discussed in Criscuolo et al. (2017) correlates the share of micro-firms moving to a bigger size class after three years to the age of the firm. Their main result is that young firms are systematically more likely to move to a bigger size class.

Figure 8: Focus on micro-entrants: stable vs. growing vs. exiting

(a) Share of units in all micro entrants



(b) Contribution to total net job creation



Notes: Panel A represent the share (in terms of number of units) of micro ($0-9$ employees) entrants by size class at time $t+5$. Panel B represents the contribution to net job creation (defined as net job creation by the group over total job creation/destruction of micro entrants) for micro ($0-9$ employees) entrants by size class at time $t+5$. Size classes are aggregated as follows: $0-9$ (stable), $10-19$ and 20 plus (growing), exit (shrinking) and units for which the size class at time $t+5$ is missing. Figures report the average for different time periods $t = 2001, 2004$ and 2007, conditional on their availability. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

Overall, country, time, and macro sector dummies account for about 31% of the variation in the database. Qualitatively similar dynamics emerge once focusing on the determinants of differences in the contributions to net job creation of the same group of firms. Further exploring the sources of these differences represents an interesting avenue for further research (see Calvino et al., 2016 for a first policy-oriented analysis in this direction).

Similarly to the evidence on the probability of exit presented above, average employment growth is much higher and volatile in the first two to three years of a firm's life. Figure 9 focuses on entering units surviving over a period of three years, classified by their age class at time t (entrants; units one or two years old; and units three to five years old). The figure compares average employment growth (in Panel A) and average employment growth volatility (in Panel B) in the whole non-financial business sector. Employment growth volatility is calculated as the standard deviation of the yearly employment growth index at firm level over time, and it is then averaged over the group of firms considered (see Criscuolo et al., 2015 for details).

The upper graph clearly shows that surviving entrants grow on average substantially more than their older counterparts. On the other hand, surviving start-ups' growth appears to be also more volatile (in terms of their employment growth rates) in most countries (bottom graph). Belgium, Denmark, Portugal and Spain present the largest differences in growth rates between surviving entrants and older units. This pattern, again, points to the critical importance of the first couple of years of life for the new entrants. Restricting the sample to micro ($0-9$ employees) firms only produces very similar patterns (see Calvino et al., 2015). The figures show clearly a significant gap between the growth just after entry and growth of firms later in the life cycle. However, the extent to which this gap exists is very different across countries.

Confirming significant heterogeneity in the growth performance of cohorts, Figure 10 shows that although for all countries most of the growth of new entrants happens in the first 2 to 3 years of activity, there are significant differences across countries in the extent to which start-ups continue to grow in the following years. The graph shows the final/initial employment ratio for cohorts of surviving start-ups. In countries like Belgium, Luxembourg and Sweden start-ups continue to grow also after 5 and 7 years after entry, while in other countries – like Canada and Italy – the trend is much flatter or slightly reverses after the third year.

5 Discussion and conclusions

This paper has explored in depth the characteristics and growth dynamics of entrants across a number of OECD countries and has implemented a novel analytical decomposition of the contribution of new firms to the creation of new jobs. In particular, the decomposition has highlighted the importance of disentangling the role of different margins: start-up ratio, size at entry, post-entry growth performance and survival rates.

Two characteristics make this analysis particularly informative. First, compared to pre-

Table 4: Micro entrants growth - Focus on the sources of variation

	(1)	(2)	(3)	(4)
BEL	0.0230***			0.0223***
	(0.00721)			(0.00693)
BRA	0.0185***			0.0185***
	(0.00645)			(0.00612)
DNK	-0.00280			-0.00280
	(0.00645)			(0.00612)
ESP	-0.0131*			-0.0123*
	(0.00721)			(0.00690)
FIN	-0.00743			-0.00808
	(0.00721)			(0.00693)
FRA	-0.00389			-0.00545
	(0.00912)			(0.00885)
GBR	-0.00793			-0.00767
	(0.00912)			(0.00883)
HUN	0.0131*			0.0125*
	(0.00721)			(0.00693)
ITA	-0.00511			-0.00576
	(0.00721)			(0.00693)
LUX	0.0187***			0.0192***
	(0.00655)			(0.00621)
NLD	-0.0135**			-0.0135**
	(0.00645)			(0.00612)
NOR	0.0203***			0.0197***
	(0.00721)			(0.00693)
NZL	-0.00637			-0.00702
	(0.00721)			(0.00693)
PRT	0.00671			0.00826
	(0.00978)			(0.00954)
SWE	-0.00435			-0.00435
	(0.00645)			(0.00612)
TUR	-0.00189			-0.000591
	(0.00912)			(0.00892)
USA	0.00435			0.00435
	(0.00645)			(0.00612)
2004		-0.00276		-0.00183
		(0.00336)		(0.00292)
2007		-0.00459		-0.00286
		(0.00376)		(0.00368)
Services			-0.0151***	-0.0153***
			(0.00341)	(0.00295)
Construction			-0.00558	-0.00576*
			(0.00342)	(0.00296)
Observations	232	232	232	232
Adj. R-squared	0.230	-0.002	0.072	0.308

Notes: Dependent variable: shares of growing micro entrants (10-19 and 20 plus size class at time $t + 5$). Baseline categories: Austria for country dummies; 2001 for year dummies; Manufacturing for macro sector dummies. The constant is omitted from the table. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: OECD DynEmp v.2 database.

vious cross-country analysis, we rely on much more disaggregated information – e.g. by classifying firms by age dimension and distinguishing between entrants and incumbents – based on highly representative underlying micro-data sources (primarily business registers, aimed at including the universe of firms). Second, cross-comparability is ensured by the use of a common statistical routine run on highly representative underlying sources.

This paper has uncovered both empirical regularities that appear to hold consistently across countries and cross-country differences in entrants' net job creation. The existence of these significant cross-country differences points to the potential role of institutional settings and policy environments and suggest avenues for extensions of this work in a policy-oriented perspective.

The decomposition has evidenced stronger cross-country differences along two margins: start-up ratios and post-entry growth. This suggests that policies might play a significant role in determining both of these channels for the net job creation by young firms. Our decompositions could therefore be used as a diagnostic tool by policy makers to benchmark their performance in both of these areas and could focus their policies either to improve their start-up rates, their scale-up success or both depending on the picture drawn by the decomposition. For example in some countries, the number of entry might be rather low, but once in the market start-ups perform rather well, and thus policies might need to focus on barriers to entry; lack of entrepreneurial capacity; lack of seed capital. In addition thanks to the richness of our data, policy makers can further investigate whether particular sectors are disproportionally affected. In others, it might be the case that even though entry rates are high, scaling-up is the real bottle neck, in this case attention should be rather given to factors that might hinder expansion of businesses, such as access to finance; contract enforcement; access to market; labour market policies, etc. Finally, in some countries both margins might require attention.

Previous studies have shown that policies can have an influential role to play in shaping the environment in which successful start-ups can enter the market, experiment, innovate, and grow (Andrews and Criscuolo, 2013; Andrews et al., 2014 and Bravo-Biosca et al., 2016). A first analysis in this direction is carried out by Calvino et al. (2016). By exploiting the richness of the underlying DynEmp database,[11] and the multidimensional analysis offered by the decomposition described in this paper, Calvino et al. (2016) investigates the differential impact of policies in the fields of access to finance, bankruptcy regulation and contract enforcement on start-up rates, (post-entry) employment growth performance of entrants versus incumbents and survival rates. Calvino et al. (2016) show that start-ups' post-entry growth performance is systematically more linked than incumbents' to the policy environment and national framework conditions. Secondly, contract enforcement and quality of civil justice seem to matter significantly more for scale-ups than start-ups. These results are particularly insightful for policy makers given that across countries young firms contribute disproportionally to aggregate net job creation and the first two years of a firm's activity seem to be

[11] That contains statistics at the country-industry-year level differentiated across start-ups and incumbents.

crucial in determining its fate.

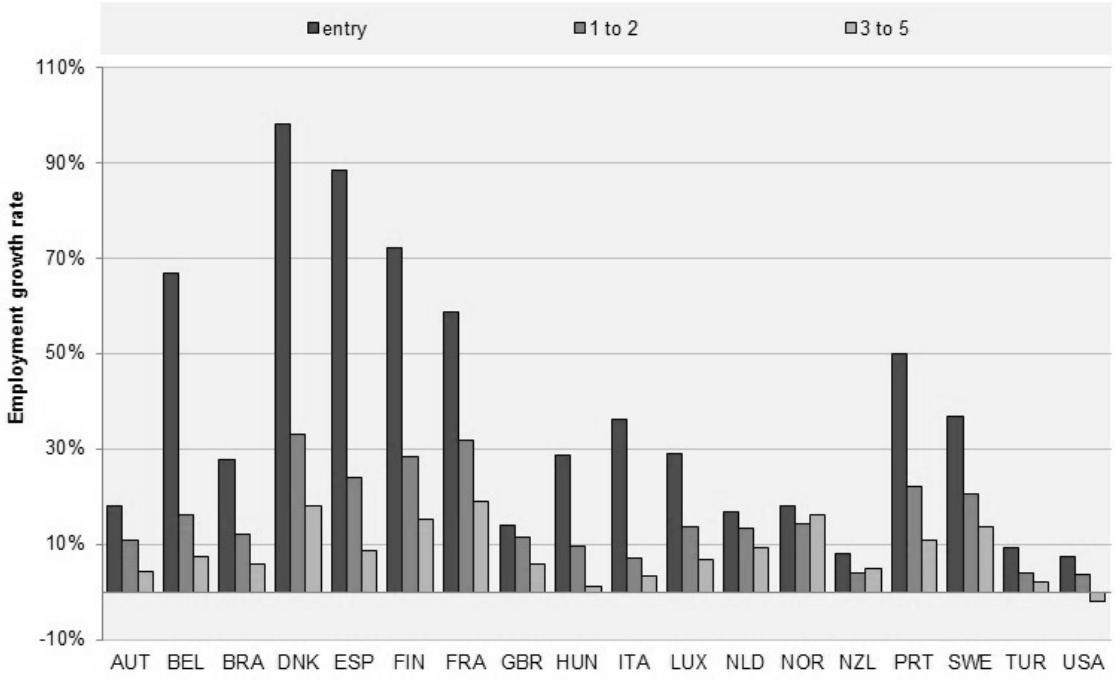
In addition, while a full characterization of the *high-growth* start-ups, i.e., of the tiny proportion of successful start-ups which disproportionately contribute to job creation, is beyond the scope of this paper, with the available data it is possible to investigate their relative contribution to aggregate job creation by country, time period, and industry. As shown in the paper, while these firms generally account for a very small share of the total number of start-ups they account for the largest contribution to total net job creation – and thus understanding whether the policy factors that affect their prevalence and their performance is particularly relevant.

Moreover, since the dataset covers around 10 years for most countries, starting from the early 2000*s* until 2011 or 2012, the effect of the Great Recession can also be investigated more in depth. In particular, the economic literature has discussed whether during recessions a "scarring" or a "cleansing" effect prevails for start-ups. Recessions may spur a cleansing process in the economy, as unproductive firms exit the market and free up resources which could be employed by more productive firms. On the other hand, recessions may also have a "scarring" effect on the economy, impeding the developments of potentially successful new firms and hampering the process of reallocation, e.g. because of frictions in the financial market. The disproportionate exit rate among start-ups which is often found during recessions may have long-lasting detrimental effects on growth also in the medium to long run. Evidence from the United States suggests that during the last recession, contrary to previous recessionary episodes, the intensity of reallocation fell rather than rose; furthermore, the reallocation that did occur was less productivity enhancing than in prior recessions (Foster et al., 2014). The DynEmp database combined with productivity data can help shed light on whether this was the case in other economies.

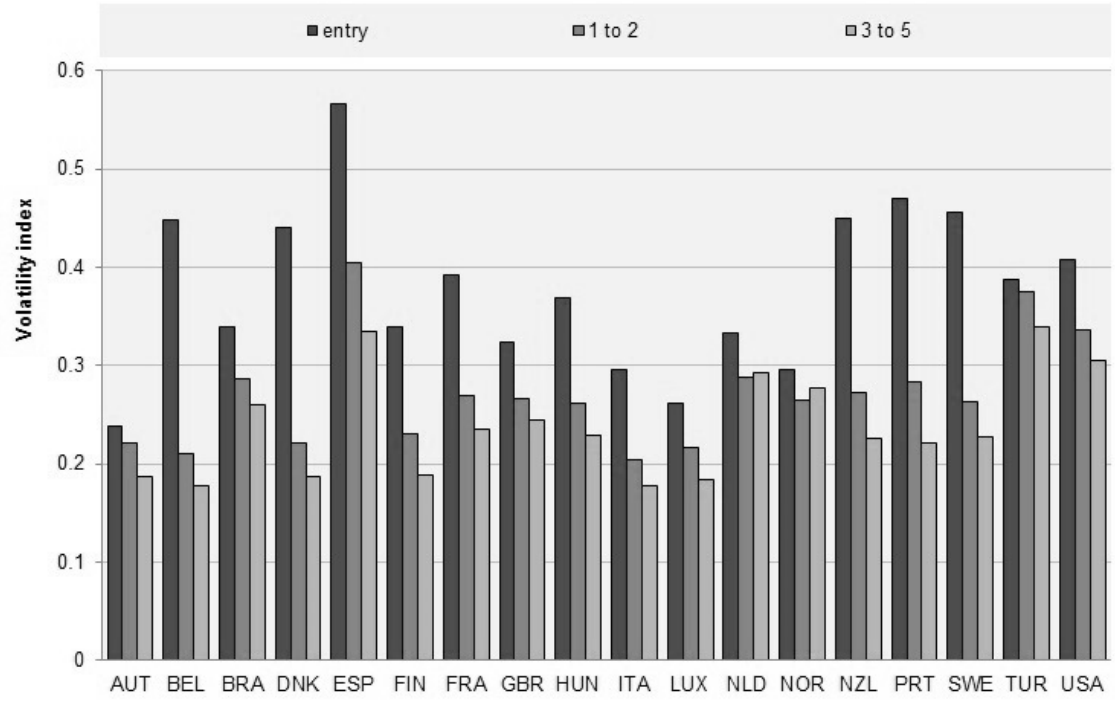
Finally, the current analysis could be extended to investigate the determinants of the decline in entry rates across countries. This would be relevant in light of recent research that has focused on the impacts of a missing generation of firms, mainly from the perspective of a single country (see OECD, 2017, Gourio et al., 2016).

Figure 9: Surviving units by age class: growth and volatility

(a) Average employment growth index



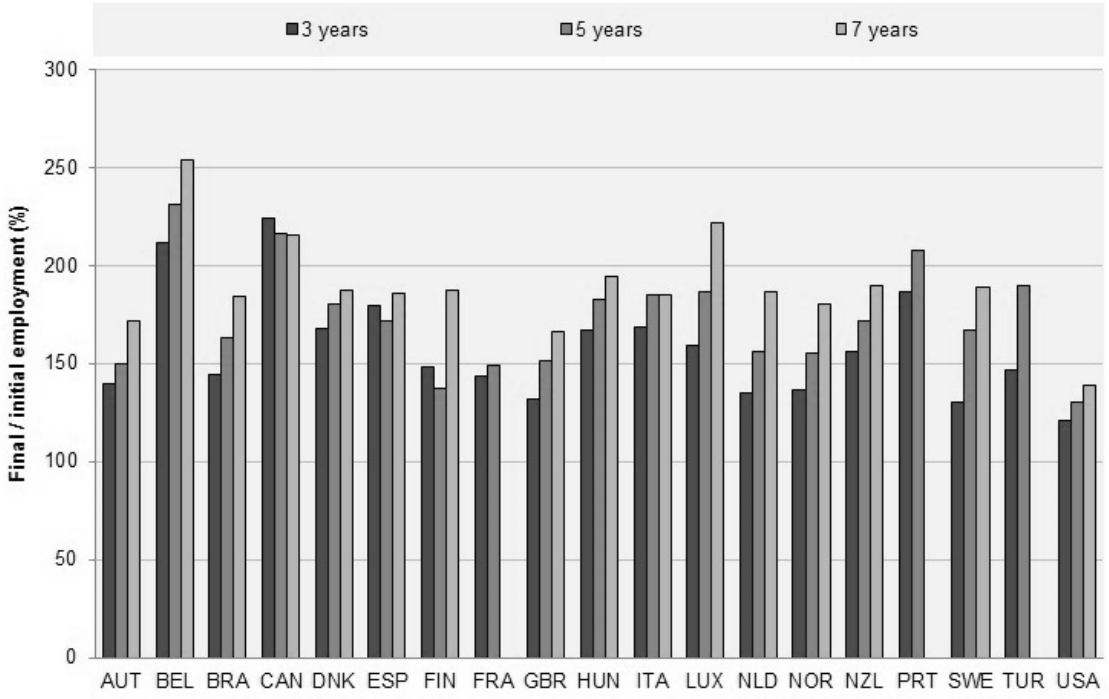
(b) Average employment growth volatility



Notes: Panel A illustrates the average employment growth index for all units surviving at time $t+3$ by age class at time t (entry, $1-2$ and $3-5$ years old). Panel B represents the average employment growth volatility for all units surviving at time $t+3$ by age class at time t (entry, $1-2$ and $3-5$ years old). Employment growth volatility is calculated as the standard deviation of the yearly employment growth index at firm level from t to $t+3$, and it is then averaged over the group of firms considered. Figures report the average for different time periods $t = 2001, 2004$ and 2007, conditional on their availability. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

Figure 10: Final over initial employment after 3, 5, and 7 years (surviving entrants)



Notes: the graph shows the ratio between employment at time $t + j$ and employment at time t of surviving entrants. Figures report the average for different time periods $t = 2001$ and 2004, conditional on their availability. Sectors covered are: manufacturing, construction, and non-financial business services. Each of the time lags $j = 3, 5, 7$ is reported separately. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

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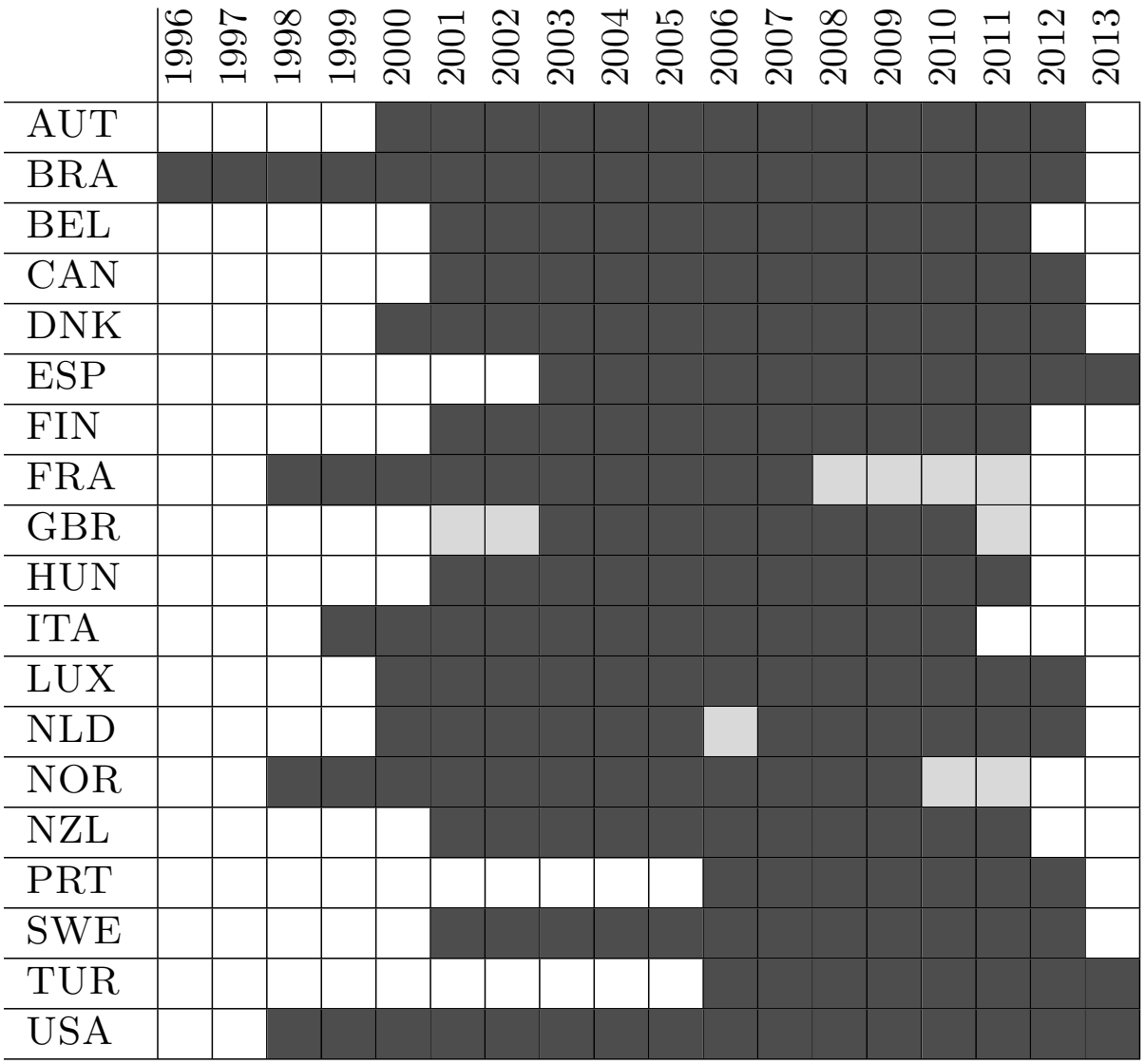
Appendix

Table A1: Contributors to the DynEmp v.2 data collection

Country	**National representative**	**Institution**
Austria	Werner Hoelzl	WIFO Institute (Austrian Institute of Economic Research)
Belgium	Michel Dumont, Chantal Kegels, Hilde Spinnewyn	Federal Planning Bureau
Brazil	Carlos Henrique Leite Corseuil, Gabriel Lopes de Ulyssea	IPEA - Instituto de Pesquisa Econômica Aplicada
Canada	Pierre Therrien, Jay Dixon, Anne-Marie Rollin, John Baldwin	Industry Canada Statistics Canada
Denmark	Dorte Hoeg Koch, Morten Skov Poulsen	Ministry for Business and Growth
Finland	Mika Maliranta	The Research Institute of the Finnish Economy (ETLA) and Statistics Finland
France	DynEmp and MultiProd team	OECD
Hungary	Adrienn Szep Szollosine, Erzsebet Eperjesi Lindnerne, Gabor Katay, Peter Harasztosi	Central Bank of Hungary, Hungarian Central Statistical Office
Italy	Stefano Costa	Italian National Institute of Statistics (ISTAT)
Luxembourg	Leila Peltier - Ben Aoun, Chiara Peroni, Umut Kilinc	STATEC
Netherlands	Michael Polder	Statistics Netherlands (Centraal Bureau voor de Statistiek)
New Zealand	Lynda Sanderson, Richard Fabling	New Zealand Treasury, Motu Economic and Public Policy Research and Statistics New Zealand
Norway	Arvid Raknerud, Diana-Cristina Iancu	Statistics Norway and Ministry of Trade and Industry
Portugal	Jorge Portugal	Presidencia da Republica
Spain	Valentin Llorente Garcia	Spanish Statistical Office
Sweden	Eva Hagsten	Statistics Sweden
Turkey	Faik Yücel Günaydin	Ministry of Science, Industry, and Technology
United Kingdom	Michael Anyadike-Danes	Aston Business School
United States	Javier Miranda	Center for Economic Studies, US Census Bureau

Notes: Countries included in the dataset used for this paper

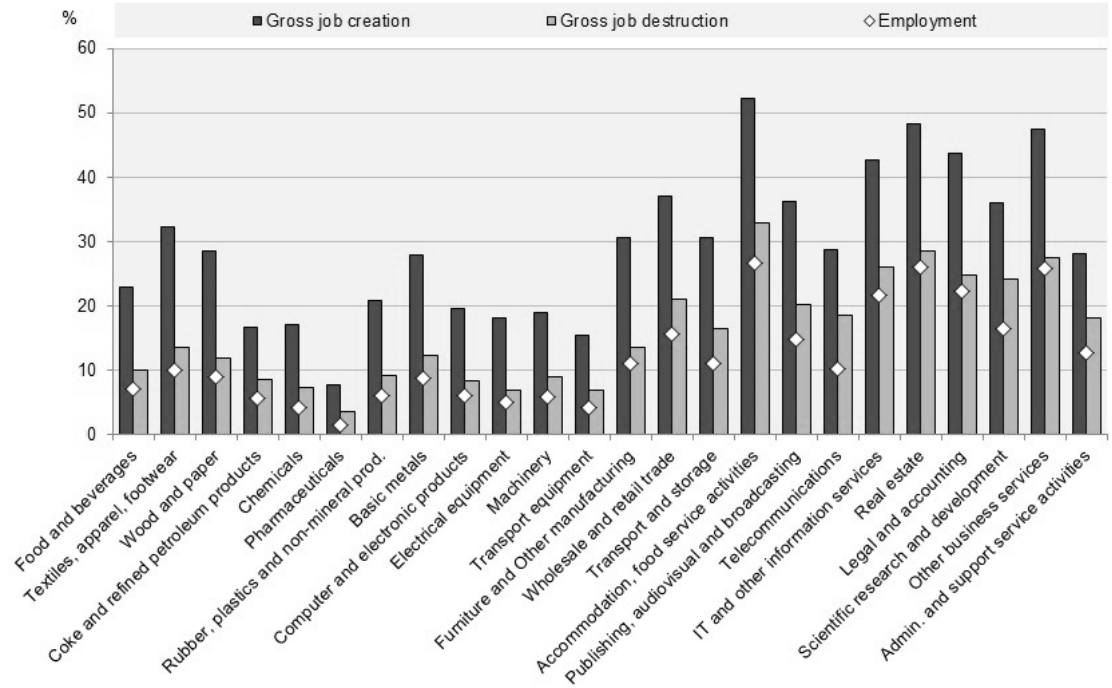
Table A2: Temporal coverage DynEmp v.2 over time by country



Notes: temporal coverage by country of the database used for the analysis. Years for which annual flow data are available are colored. Analysis based on flow data excludes the first available year, since most job flows statistics require two consecutive periods to be computed. Only a limited number of statistics is available for Canada. Gray boxes correspond to years that have been excluded from the analysis due to data issues. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

Figure A1: Share of total employment, GJC and GJD of small young units by 2-digit sector



Notes: the graph reports the share of total employment (total employment of small young units over total employment), the share of gross job creation (gross job creation of small young units over total gross job creation) and the share of gross job destruction (gross job destruction by small young units over total gross job destruction) of small ($0-49$ employees) young ($0-5$ years old) units by 2-digit sector (in manufacturing, construction and non-financial business services). Figures report cross-country averages over the available years, conditional on data availability. Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.

Figure A2: Relative probability of exit at different ages – recession vs. no recession

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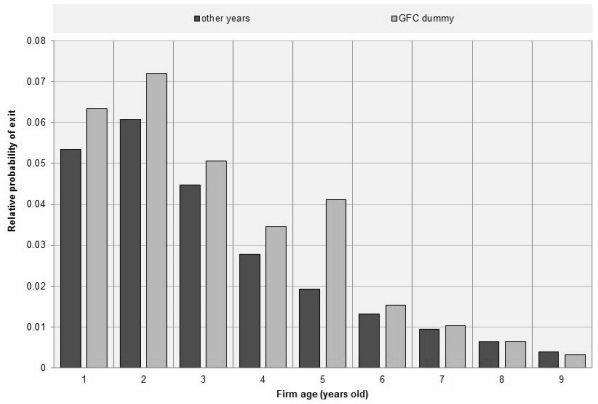

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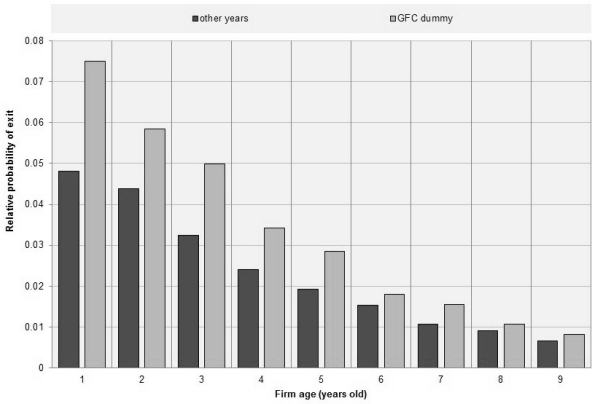

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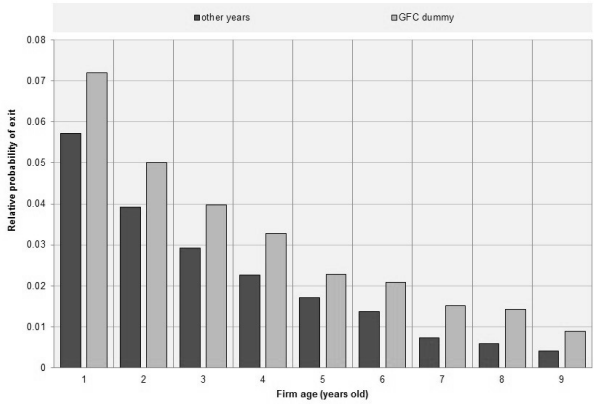

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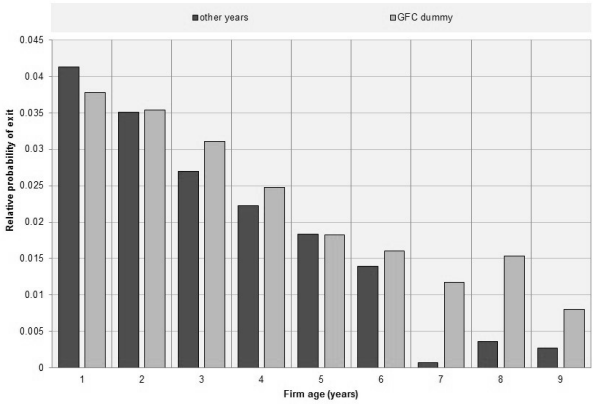

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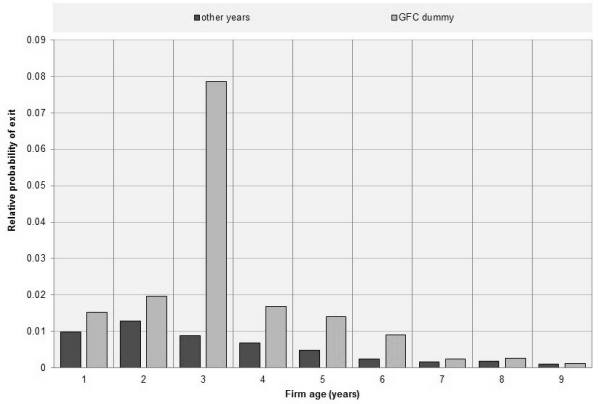

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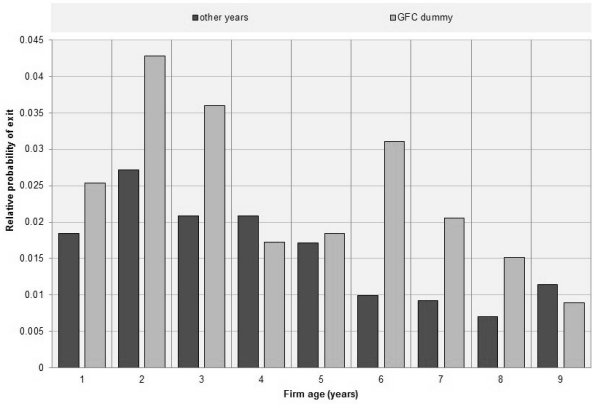

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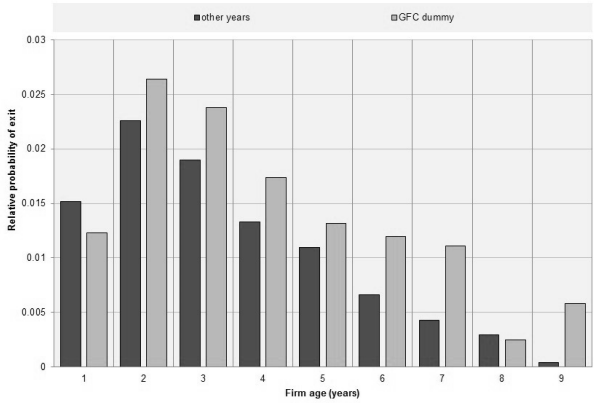

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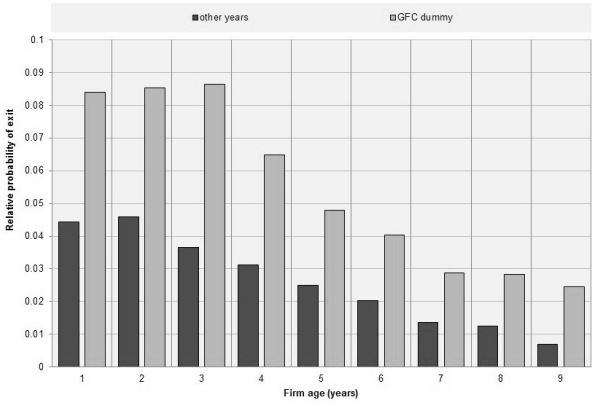

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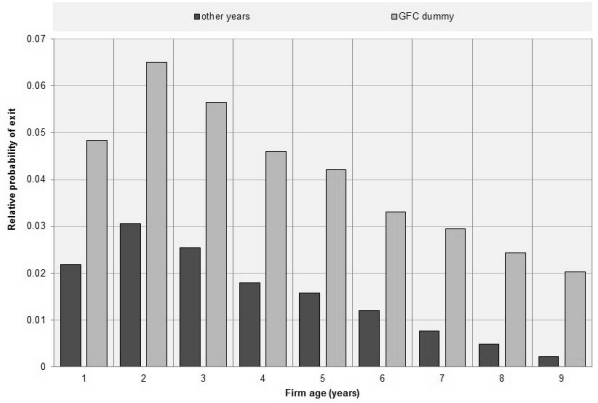

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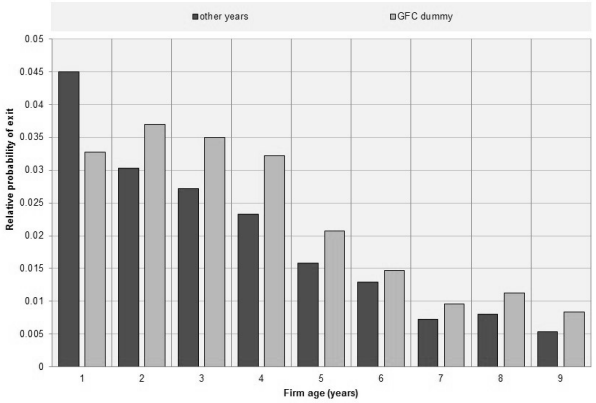

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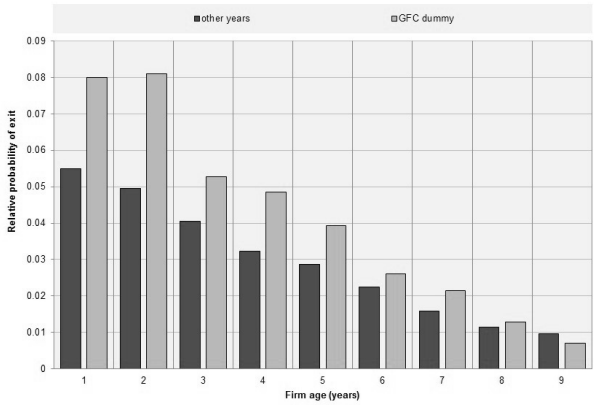

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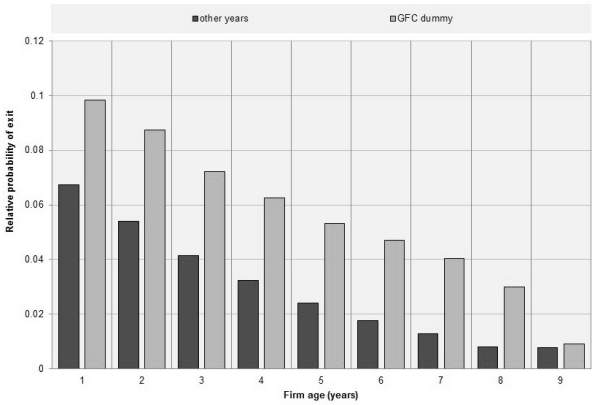

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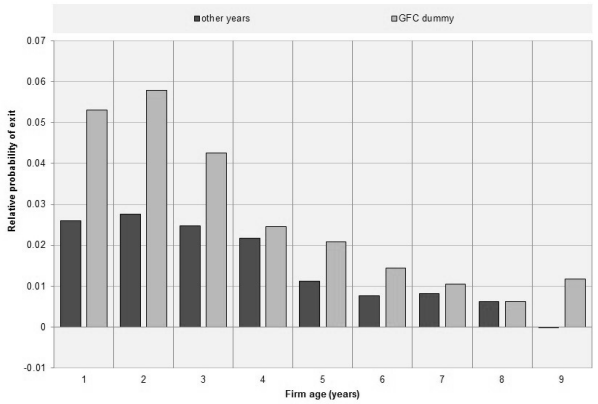

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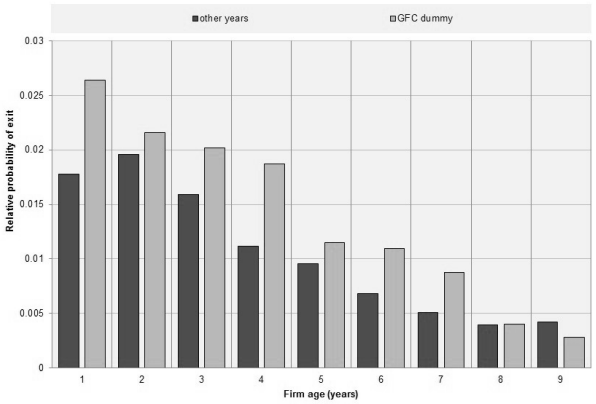

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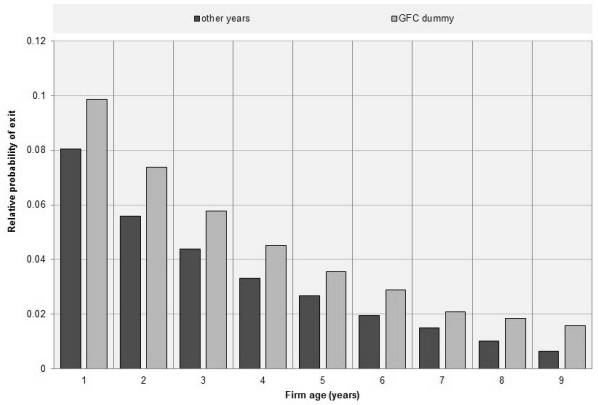
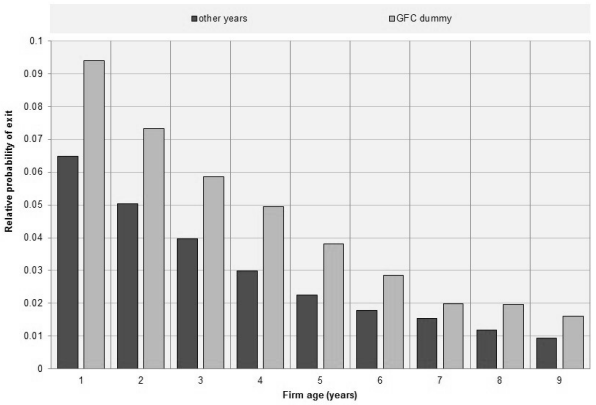


USA



Notes: the graphs report the age coefficients of the exit "distributed regression" (which has as response variable an exit dummy and as explanatory variables age, size, 3-digit sector and year dummies) interacted with a recession dummy (equal to one in the years 2008 and 2009, and equal to zero otherwise). The label *GFC dummy* indicates the value of the coefficient when the Global Financial Crisis dummy equals 1, while *other years* when this dummy equals 0. Each country in the database is analyzed separately. France has been excluded due to a redesign of the statistical system of data collection in 2008 (FICUS to FARE). Norway has been excluded due to ongoing checks on unusual dynamics in the underlying data. Firm age is reported on the horizontal axis (1 to 9 years old). Owing to methodological differences, figures may deviate from officially published national statistics. Data for some countries are still preliminary.

Source: OECD DynEmp v.2 database.