OECD publishing

Please cite this paper as:

Criscuolo, C., P. Gal and C. Menon (2014-05-21), "The Dynamics of Employment Growth: New Evidence from 18 Countries", *OECD Science, Technology and Industry Policy Papers*, No. 14, OECD Publishing, Paris.
http://dx.doi.org/10.1787/5jz417hj6hg6-en

OECD Science, Technology and Industry Policy Papers No. 14

The Dynamics of Employment Growth

NEW EVIDENCE FROM 18 COUNTRIES

Chiara Criscuolo,

Peter N. Gal,

Carlo Menon

FOREWORD

This paper was approved by the OECD Committee for Industry, Innovation and Entrepreneurship (CIIE) in March 2014.

Note to Delegations:
This document is also available on OLIS under reference code
DSTI/EAS/IND/WPIA(2013)1/FINAL

© OECD/OCDE, 2014

Applications for permission to reproduce or translate all or part of this material should be made to:
OECD Publications, 2 rue André-Pascal, 75775 Paris, Cedex 16, France; e-mail: rights@oecd.org

TABLE OF CONTENTS

ACKNOWLEDGMENTS 4

EXECUTIVE SUMMARY 6

INTRODUCTION 8

1. THEORY AND EXISTING EVIDENCE 12

1.1. Theoretical background 12
1.2. Existing empirical evidence 13
Cross-country results 14

2. DATA AND METHODOLOGY 17

2.1. Challenges with measuring firm entry and age 22
2.2. Addressing some limitations 23

3. DESCRIPTIVE ANALYSIS 26

3.1. The importance of small firms across countries and sectors over time 26
3.2. The joint role of firm age and size 29
3.3. The importance of start-ups, young and old firms over time and across sectors 30
3.4. Sources of job creation and job destruction and employment dynamics: The role of entry, exit and firm age and size 37
3.5. The impact of the international financial crisis 45

4. ECONOMETRIC ANALYSIS 54

4.1 The role of age and size in explaining gross job flow rates and net growth 54
4.2 The impact of the crisis 55

5. CONCLUSION AND NEXT STEPS 61

ANNEX A: THE *DYNEMP EXPRESS* DATABASE 62

The *DynEmp Express* routine 62
Source data characteristics 62
Data harmonisation 68
Output databases 68

ANNEX B. ADDITIONAL GRAPHS 69

Size distributions 69
Age and size distributions 76
The role of entry, exit and the intensive margin 83
The role of the financial crisis 86

NOTES 89

REFERENCES 91

THE DYNAMICS OF EMPLOYMENT GROWTH: NEW EVIDENCE FROM 18 COUNTRIES

by Chiara Criscuolo, Peter N. Gal and Carlo Menon

ACKNOWLEDGMENTS

The *DynEmp* (*Dyn*amics of *Emp*loyment) project would not have progressed this far without the contribution of Javier Miranda and Mariagrazia Squicciarini – who have provided invaluable comments and have been instrumental in the creation of the *DynEmp* network and the co-ordination of the Working Party of Industry Analysis (WPIA) of the OECD – and without the active participation of national delegates from WPIA and other members of the DynEmp network. Their support has been essential for allowing access to national business registers and for improving the process and the methodology of the data collection through comments, suggestions, and technical advice. The OECD Secretariat would like to sincerely thank all the contributors listed in Table 1 for making the *DynEmp* project possible, while retaining all responsibilities for errors and omissions in this document. The authors are also extremely grateful to Nadim Ahmad; Eric Bartelsman; Giuseppe Berlingieri; Alessandra Colecchia; Nick Johnstone; Dirk Pilat; Stefano Scarpetta; Paul Schreyer; Colin Webb; and Andrew Wyckoff for useful discussions, and to Pekka Honkanen for excellent research assistance. The financial contribution of NESTA is gratefully acknowledged.

Table 1. Participants in the *DynEmp* project

Country	Representative(s)	Institution(s)
	Mariagrazia Squicciarini	OECD
Austria	Werner Hölzl	WIFO Institute (Austrian Institute of Economic Research)
Belgium	Hilde Spinnewyn, Chantal Kegels, Michel Dumont	Federal Planning Bureau
Brazil	Gabriel Lopes de Ulyssea, Carlos Henrique Leite Corseuil, Fernanda de Negri	Instituto de Pesquisa Econômica Aplicada
Canada	Pierre Therrien, Jay Dixon, Anne-Marie Rollin, John Baldwin	Industry Canada, Statistics Canada
Finland	Mika Maliranta	The Research Institute of the Finnish Economy (ETLA) and Statistics Finland
France	Lionel Nesta, Flora Bellone	GREDEG, CNRS and OFCE, Sciences Po.
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)
Japan	Kyoji Fukao, Kenta Ikeuchi	Hitotsubashi University and National Institute of Science and Technology Policy
Luxembourg	Leila Peltier – Ben Aoun, Anne Dubrocard, Michael Prombo	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, Eivind Lorentzen	Statistics Norway and Ministry of Trade and Industry,
Portugal	Jorge Portugal	Presidencia da Republica
Spain	Valentin Llorente Garcia, Luis Esteban Barbado Miguel, Jose Manuel Almendros Ulibarri, Javier Agustin Munoz Carabias	Spanish Statistical Office and Ministry of Industry, Energy and Tourism,
Sweden	Eva Hagsten and Jan Selen	Statistics Sweden
United Kingdom	Chiara Rosazza-Bondibene, Catherine Robinson, Albert Bravo-Biosca, Steve Bond and James Stainer	National Institute of Economic and Social Research (NIESR); NESTA UK and Office for National Statistics (ONS)
United States	Javier Miranda	Center for Economic Studies, US Census Bureau

EXECUTIVE SUMMARY

The OECD has embarked on a distributed microdata project, called *DynEmp*, with the aim of providing a cross-country evidence base for the design of well-grounded policies for employment and growth. The project has produced a new database of micro-aggregated firm-level data on employment dynamics for different groups of firms classified by size, age and sectors across 18 countries and over a ten year period.

This report discusses preliminary cross-country evidence from this rich and unique database originating from the first wave of the project (*DynEmp Express*). A number of findings provide useful information to help understand the persistently high unemployment levels and disappointing growth performance in many advanced economies. The evidence has to be treated as experimental and comparisons across countries should be viewed with caution, since despite careful efforts at harmonising the underlying cross-country data, differences might still remain on how well different business registers identify firm events (e.g. births and deaths), as well as the time consistency of the data. An encouraging sign however is that the main results and within-country patterns hold across countries that use different methodologies to identify entry or exit.

The aim of this first phase of the project is to describe the dynamism of different economies, focusing on the process of creative destruction, the role of young businesses for job creation, their growth dynamics and potential. Furthermore, the impact of the "Great Recession" on both creative destruction and young businesses is investigated, focusing on how the financial crisis has impacted jobs and firms in different countries and which firms have been hit hardest by the recession.

Preliminary evidence from the DynEmp database shows that great differences exist in the weight that small firms have in terms of employment levels and job creation. The disproportionate weight of small firms and the low presence of large businesses might reflect two very different phenomena: a significant presence of start-ups that are often very small - or a large share of more mature businesses that have not grown. More broadly, disaggregating the *age* profile of businesses within different size classes provides complementary insights to an analysis based solely on the *size* dimension when assessing the dynamism and the efficiency of resource allocation of an economy. The DynEmp data show significant cross-country differences in the age profile of small firms, with small firms being systematically older in some countries.

The relevance of the age profile of small businesses takes on particular importance when analysing the role of small businesses as net job creators. Results from the DynEmp database suggest that not all small businesses are net job creators, showing that only young businesses – predominantly small – create a disproportionate number of jobs, confirming recent evidence for the United States. When disentangling the role of entry from the role of expansion of incumbent young firms, the data clearly shows that entry explains most of the contribution to job creation, followed by start-ups (i.e., firms that are less than three year old). While this remains true even during the recent great recession, the data shows a sharp decline in the contribution of entry and young firms to aggregate employment growth during the recession. More generally, the findings point to a decline in start-up rates over the past decade across all countries considered, which gives cause for concern, given their strong contribution to job creation. Going beyond cross-country averages, the data shows great heterogeneity across countries in the extent to which young firms contribute to aggregate employment growth.

The disproportionate contribution of young firms to gross job creation, however, has to be considered in conjunction with the "up-or-out" dynamics typical of young firms, where high average rates of post-entry growth for incumbent young firms co-exist with low survival rates for firms in this age group. Differences in these dynamics likely reflect the extent to which young firms are willing to experiment and are able to shed jobs. This can vary significantly across countries and sectors and over time, depending on the nature of the activity of the firms, the uncertainty of demand and the business environment, and on features of the policy framework, such as regulatory barriers, employment protection legislation and bankruptcy legislation. The report presents evidence on the extent to which the dynamics of young firms differ from older businesses, and how these differences have changed over time and varied across countries and macro-sectors.

An efficient process of reallocation, where young firms can experiment and thrive if successful, is crucial to ensure employment as well as productivity growth. However, existing cross-country evidence suggests that sizeable differences exist in the extent to which younger firms are able to upscale and create jobs in different economies. The report provides direct evidence on the extent to which firms grow over a three-year horizon, while it provides indirect evidence on the potential size that young firms are likely to achieve as they mature. Again, there are large cross-country differences in the growth potential of young firms.

Finally, the report investigates how the financial crisis has affected jobs and firms in different countries and which firms, job flows (job creation *vs.* job destruction) and margins (entry/exit vs. up scaling/downsizing) of the employment growth dynamics have been hit hardest by the recession. The descriptive and regression analysis shows that the Great Recession has affected disproportionally more young firms, both in their job creation and job destruction rates. Notwithstanding this, the contribution to net employment growth of start-ups and young firms remains positive during the crisis, confirming their importance for job creation throughout the business cycle.

INTRODUCTION

Firm employment dynamics is at the core of the creative destruction process, resource reallocation and productivity growth. Although comparable data on business dynamics are limited, available evidence points to significant cross-country differences in employment growth dynamics, even after taking into account differences in the sectoral composition of economies. Given the persistently high unemployment levels and disappointing growth performance in many advanced economies, there is an increasingly strong focus on job creation amongst policy makers. International organisations, such as the Organisation for Economic Co-operation (OECD), The International Monetary Fund (IMF) and the European Union Commission (EU), stress the close link between policies aimed at improving the functioning of labour markets and growth-enhancing policies, recognising that these issues are closely related and suggest that a strong evidence base is required for efficient policy design.

In particular, it is important to have a clear picture not only of aggregate changes in employment, but also of the gross flows (gross job creation and gross job destruction), as these provide a much richer picture of the dynamics underlying aggregate net job creation figures and of the margins of adjustments in the economy (e.g., whether lower employment is due to lower creation or higher destruction). This additional information is crucial when designing policies to tackle low employment rates.

Similarly, it is important to know which groups of firms (young *vs*. old, small *vs*. large, incumbents *vs*. entrants *vs*. closing businesses, etc.) are creating or destroying jobs, and at which stages of the business cycle. In addition, for long run growth it is important to understand the extent to which different types of firms are able to grow and upscale in an economy and the extent to which the process of creative destruction and reallocation of resources (e.g. labour) is efficient and how it evolves during the business cycle. This is especially true in light of recent developments in labour-substituting technologies (automation, intelligent robotics, 3d-printing, etc.) which may lead to downsizing in some traditional activities. New types of economic activities, typically introduced by young businesses and entrepreneurs, may thus become relatively more important as creators of jobs.

Most of the existing cross-country evidence focuses on differences across countries in the importance of small firms or of entrepreneurial firms (often measured as self-employment) at a specific point in time. The role of firm age, and its relationship with firm size is less well-addressed in the literature. In order to fill this gap, the OECD secretariat – under the aegis of government experts who form the Working Party of Industry Analysis – has embarked on a distributed microdata project, called *DynEmp*. The objective of the project is to present a picture of firms and employment across different size, age, and size-age classes, and describe how these have evolved over time.

The project collects new harmonised micro-aggregated firm-level data from confidential national business registers on employment dynamics (gross job creation and gross job destruction) for different groups of firms classified along the size, age and sectoral dimensions, across countries and over time. The evidence described in this report is based on such data collected in the first round of *DynEmp* – called *DynEmp Express* – for 18 countries and the 2001-2011 period. In addition to the weight of different firm groups in terms of number of firms and share of employment, the data has information on gross job creation and gross job destruction of different age-size groups, entrants and closing businesses. Furthermore, the data can disentangle the extent to which entry of new businesses and young incumbent

businesses contribute to gross and net job creation and examine how start-up rates have evolved during the last decade.

This report should be seen as a first exploration of this source of cross-country information on job flows for providing a new evidence base for policy making, and not yet as an exhaustive analysis that fully exploits the potential of the *DynEmp Express* database given also some limitations in the extent to which the data is fully comparable across countries despite careful efforts at harmonizing the underlying cross-country data. Some differences might still remain on how well different business registers can identify firm events (e.g. births and deaths), as well as the time consistency of this information. Thus, comparisons across countries should only be done with caution. However, the data does provide evidence of within-countries empirical regularities that hold over a ten year period, over three different macro-sectors and across the 18 countries, and which is in line with theory and existing empirical evidence.

The common thread in this report is the importance of the process of creative destruction, the role of young businesses for job creation, their growth dynamics and potential. Furthermore, the impact of the Great Recession on both creative destruction and young businesses is investigated, focusing on **how the financial crisis has impacted jobs and firms** in different countries and which firms and margins of the employment growth dynamics have been hit hardest by the recession.

Evidence from previous cross-country studies of employment dynamics suggests that **the process of creative destruction** provides an important contribution to aggregate employment and productivity growth (Bartelsman et al., 2005); with market selection leading to the exit of less productive firms and the success and growth of the more productive ones. In line with the Schumpeterian idea that start-ups are major drivers of the process of creative destruction, and ultimately growth, recent evidence from the United States challenges the common belief that all small businesses are net job creators, showing that only young businesses – predominantly small – create a disproportionate number of jobs (Haltiwanger et al., 2013). Furthermore, most of the job creation by young firms is accounted for by the entry of new start-ups. At the same time, additional research shows a secular decline in the rate of start-ups in the United States, which remains at least partly unexplained. Given the role that entry and start-up firms play for job and productivity growth this decline appears rather worrying.

To investigate the extent of dynamism in different economies, this report provides **comparative evidence on size and age distributions** of firms and employment across countries over a ten year period for manufacturing, construction and non-financial services in 18 countries. For instance, the *DynEmp* data provide information on the extent to which the population of businesses and the distribution of employment differ across countries not only in terms of size but also – within size classes – in terms of age. Interestingly, significant differences emerge when comparing the age profile of small firms across countries: in some countries small firms are systematically older.

This evidence might provide very useful insights when assessing the dynamism and the efficiency of economies in allocating resources to the most efficient firms. For example, the same share of small firms might result from high dynamism, if most of those small firms are young startups; but it might also reflect the lack of opportunities for young firms to grow and an inefficient reallocation of resources, if a large share of small businesses is mature. This in turn might be driven by distinctive features of the industrial and ownership structure (e.g. family ownership; sectoral specialisation in sectors where minimum efficient scale is smaller) in different economies, as well as market size or the policy framework (e.g. competition; openness; employment protection legislation; availability of finance etc.). Furthermore, this information might be used when estimating the impact and cost of policy measures targeted at particular firm size and age categories across countries and over time.

Preliminary results show that – on average across the 18 countries and over the ten year period considered – the group of young firms, i.e. firms five years old or younger, contributes positively to aggregate job creation. When disentangling the role of entry from the role of expansion of incumbent young firms, the data clearly shows that entry explains most of the contribution to job creation; followed by the expansion of young incumbent firms that are less than three years old. Looking behind time averages, the cross-country averages show a sharp decline in the contribution of entry and young firms to aggregate employment growth during the crisis, although their contribution remains positive. The data show great heterogeneity across countries in the extent to which young incumbent firms contribute to aggregate employment growth and how this evolved over time.

The disproportionate contribution of start-ups to employment creation has to be considered together with their distinctive "up-or-out" dynamics, where high average rates of growth co-exist with low survival rates. This happens to a much larger extent for young firms than for older incumbents (for evidence from the United States see Haltiwanger et al., 2013). These dynamics seem to confirm the selection process suggested in theoretical models of passive learning of Jovanovic (1982) or of active learning of Ericson and Pakes (1995). In these models, in the period following entry, managers of start-ups still need to learn how to maximise productivity and to experiment with new and risky technologies.

The extent to which firms are willing to experiment and are able to shed jobs can differ significantly across countries and across sectors, depending both on the nature of the activity of the firms and on the policy framework features of a country such as regulatory barriers, employment protection legislation and bankruptcy legislation. "*DynEmp Express*" provides new evidence relevant for this debate by comparing the extent to which young firms differ from older businesses in their employment growth dynamics and how this difference varies across countries. The results suggest that across all countries young firms are more likely to exit, but – conditional on survival – they grow more than older businesses. The extent to which young and old businesses differ in their growth dynamics varies significantly across countries.

An efficient process of reallocation, where young firms can experiment and thrive if successful, is crucial to ensure productivity growth (Andrews and Criscuolo, 2013). However, existing cross-country evidence suggests that sizeable differences exist in **the extent to which younger firms are able to upscale** in different economies, suggesting that the rapid expansion of successful young firms is more of a feature of the United States than of other OECD economies (Bartelsman et al. 2005; Arnold et al, 2011; Andrews et al., 2014). The *DynEmp Express* database provides direct evidence on the extent to which firms grow over a three-year horizon, while it provides indirect evidence on the potential size that young firms are likely to achieve as they mature. The cross-country differences that emerge from the data are striking. These differences might depend on the industrial structure and country size, but are likely to be also affected by institutional and policy settings. Although this report does not go so far as to investigate the role of countries' policies or specific features of the institutional setting – such as the presence of size-contingent policies – it does present evidence of significant cross-country differences in the extent to which young firms can potentially grow.

The process of creative destruction and reallocation can be significantly affected by the economic cycle and in particular by downturns. The theoretical literature provides different prediction on how crises, and in particular financial crises, might affect these processes. On the one hand, the "liquidationist" view would suggest the existence of a silver lining to recessions because they can be a solid breeding ground for productivity enhancing reallocation, providing a way out of the economic crisis, and because they provide firms with an opportunity to restructure at low cost (Hall, 1993; Davis and Haltiwanger, 1990; Cooper and Haltiwanger, 1993; and Caballero and Hammour, 1994). On the other hand, according to the "reverse-liquidationist" view it might be the case that a surge in job destruction is not matched by a surge in employment creation if – as it has been the case in the recent recession – the crisis reduces the availability

of finance for entrepreneurs (Caballero and Hammour, 2005) and thus the scope for experimentation (Ziebarth, 2012; Buera and Moll, 2012).

Most of the contributions to this literature are theoretical, while the quantitative evidence on how job creation and destruction of different firms have been affected by the crisis – and how that differed across countries – is still scarce. Recent evidence from the United States (Fort et al., 2012 and Foster *et al*, 2013) suggests that job creation by young firms has been affected the most, while job destruction of young businesses remained virtually unchanged. Similarly, recent evidence from the United Kingdom (Butchner and Bursnall, 2013) shows that the crisis was a period of sustained lower job creation, especially for small and medium sized firms.

In both cases, the results suggest that lack of credit – either because of credit rationing or lower values of offices and structures as collateral – coupled with elevated levels of uncertainty and the lack of confidence hit young and small businesses particularly hard. These patterns, however, are not common to all countries (see for example Lawless 2012) for a description of the Irish case). This report investigates which group of firms (small or large; young or old), flows (gross creation or destruction) and margins of adjustment (extensive in terms of entry/exit or intensive in terms of expansion/contraction) were most affected by the crisis.

The results of this report confirm that the Great Recession has affected young firms disproportionally more, but – contrary to recent evidence from the United States – it finds that both job creation and job destruction contribute to this result. In particular, during the recession, job destruction has gone up for this group of firms more than for older incumbents and job creation has gone down. All of this notwithstanding, the contribution to net employment growth of young firms remains positive during the crisis, confirming their importance for job creation throughout the business cycle.

The structure of the report is as follows. Section 1 discusses the theory and the existing evidence on business dynamics. Section 2 describes the methodology and the data used highlighting also its limitations. Section 3 presents the descriptive analysis on the role of firm size and age and explores the sources of job creation, including a focus on the impact of the financial crisis. Section 4 reports econometric estimates of the differentials in gross job flows and net job growth of firms of different age and size as well as the differential impact of the financial crisis on these firms. The final section concludes and presents the next steps of the research agenda of the secretariat.

1. THEORY AND EXISTING EVIDENCE

1.1. Theoretical background

One of the earliest approaches to explaining firm growth relates to Gibrat's Law, stating that firm size and growth should be independent (see Sutton, 1997, for a survey). The growing exploitation of rich firm-level datasets (see more on this below), and the wide heterogeneity found in them, however, invited researchers to consider more complex theories for firm-growth.

Several models have been proposed to explain the rich and heterogeneous micro-level dynamics found in firm-level datasets regarding entry, exit and growth. One of the most common elements in these models is the role of experimentation in shaping these diverse patterns. Jovanovic (1982) and Hopenhayn (1992) were among the first to discuss formally how learning is shaping entry, exit and firm growth. The theoretical literature also focused on assessing the consequences of such heterogeneity in business dynamics. An early contribution was made by Caballero and Hammour (1994) who explain the cyclical behaviour of job creation and destruction and in particular the stronger sensitivity of job destruction by a vintage model predicting creative destruction during downturns, i.e. the replacement of the old technology and firms with the most recent ones.[1]

Two of the early theoretical studies linking policies with heterogeneous firm dynamics and welfare consequences were undertaken by Bentolila and Bertola (1990) and Hopenhayn and Rogerson (1993). They show that policies which raise the costs of firing interfere with the process of reallocation and can lead to sizeable employment and productivity losses. Along these lines, Cabrales and Hopenhayn (1997) build and calibrate a model to explain the implications of relaxing the rules for temporary employment in Spain.

More generally, high barriers to entry and subsidies to incumbents or policy measures that might delay the exit of less productive firms might stifle competition and slow down the reallocation process relative to an economy without barriers. As a consequence, productivity of entrants will be higher and productivity of incumbents and exiting firms lower. This mechanism has been formalised in relation to trade barriers in the seminal paper by Melitz (2003) and extended in Melitz and Ottaviano (2008).

Specific size contingent policies, can also affect the reallocation process significantly by distorting the firm size distribution. Both theoretical models (e.g., Guner et al., 2008) and empirical evidence (Garicano et al., 2013) suggest that the impact of these policies on aggregate productivity measures, the equilibrium number of establishments and their size distribution might be non-negligible.

Focusing more directly on the productivity and income effects, recent studies by Alfaro et al. (2008), Hsieh and Klenow (2009), Bartelsman et al (2013) and Restuccia and Rogerson (2013) have developed models of resource allocation across firms with heterogeneous productivity levels. They find that the misallocation of resources, possibly driven by the presence of distortions, can explain a significant part of aggregate productivity differences across countries. Bartelsman et al. (2013) allow for these distortions to play a role not only in the allocation of resources amongst incumbent firms, but also in the selection of firms in and out of the market.

Exogenous shocks, such as the recent financial crisis, might have a quantitatively significant impact on aggregate productivity through firm dynamics. Earlier macro models (Hall, 1993; Caballero and Hammour, 1994; Gomes et al., 2001) suggested that the acceleration of the Schumpeterian creative destruction process that might take place during downturns might constitute a silver lining to recessions, thanks to the exit of less productive firms, the entry of more productive ones, and to the lower opportunity cost of restructuring incumbents firms when demand is low.

As highlighted in more recent theoretical and empirical contributions, recessions might not be cleansing processes but they might rather produce long-term scarring effects, especially in the presence of distortions (Barlevy, 2002 and Ouyang, 2009; Caballero and Hammour, 2005). In particular, the presence of tight financial market conditions, typical of the great recession, might hinder the productivity enhancing restructuring process. Firms' reduced access to finance may lead to low levels of creation and restructuring in the recovery phase.[2]

1.2. Existing empirical evidence

The literature exploiting the richness of administrative business-level data on employment dynamics and the role of gross job flows (job creation and job destruction) was initiated by seminal publications in the 1990s, focusing mainly on the United States (Dunne et al, 1989; Davis and Haltiwanger, 1990; Davis et al, 1998; Davis and Haltiwanger, 1999).[3] They demonstrated that job creation and job destruction occur simultaneously, and far exceed net job variation. Furthermore, they found that job reallocation (the sum of the absolute values of job creation and job destruction) shows systematic patterns over the business cycle. Finally, they presented evidence of significant heterogeneity across different types of firms, implying that the assumption of a "representative firm" is problematic when analysing questions related to employment and productivity.

Other research followed suit, examining the role of firm characteristics in job creation. Lotti et al (2003) and Neumark et al. (2008) find that there is a negative relationship between firm size and growth, violating the "Gibrat's Law" which states that firm size and growth should be independent. The results by Hijzen et al (2010) lead to similar conclusions for the United Kingdom.

However, Haltiwanger et al. (2013) challenge these results and show that when controlling for firm age, the relationship between size and growth is not significant. Their findings also highlight that firm births contribute substantially to both gross and net job creation. Since new firms tend to be small, this explains previous findings of a negative relationship between firm size and growth. Conditional on survival and size, young firms grow faster on average than incumbents. At the same time, job destruction among small firms is also relatively high due to their disproportionately high exit rates. These results reflect the greater dispersion and turbulence of younger business and their "up-or-out" dynamic, with high rates of both gross job creation and destruction.

Another strand of literature focuses on the cyclicality of employment by different types of firms. Gertler and Gilchrist (1994) and Sharpe (1994) found that small firms respond more to financial and monetary policy shocks. On the other hand, Moscarini and Postel-Vinay (2012) show that employment in large firms is more closely linked to changes in the unemployment rate than those of small ones. Recent work by Fort et al. (2012) enriches this analysis by investigating the role of age as well as size by using data from the US Census Bureau's Business Dynamics Statistics from 1981 to 2010. In cyclical downturns, the difference in net job creation rates between small young firms and large mature firms declines. In particular, the authors find that young small firms respond disproportionately to cyclical shocks in the economy as compared to older (small and large) firms. They find evidence suggesting that this might be at least partly explained by the greater importance of shocks in house prices for small young businesses that are more likely to use home equity financing.

Lazear and Spletzer (2012) go beyond firms and look at workers, emphasising that increased mobility of employees across jobs increases labour productivity.[4] The authors show, alarmingly, that the Great Recession has yielded a strong decline in "churn", that is, the sum of hirings and separations, and a large part of this was due to a drop in hirings. It is also worthwhile to highlight a recent interesting finding about the role of young firms with respect to the types of jobs they create. Coad et al (2014) presents evidence for Sweden which indicate that young and fast-growing enterprises are more likely to hire workers with a long unemployment spell than other businesses.

Perhaps driven by the recent financial crisis and the sluggish employment pick-up in its aftermath, statistical agencies and policy institutions have exhibited an increased interest in better understanding employment dynamics. Vert and Geurst (2011) decompose aggregate employment dynamics by job creation and job destruction margins, separately for incumbents, entrants and exits for Belgium. Butcher and Bursnall (2013) also use worker-level data to disentangle real job openings (hires) and separations (fires or exits) for the United Kingdom. They emphasise that the crisis hit new workplace creations particularly strongly, especially among small and medium sized firms. They attribute this to the heightened role of credit constraints. Finally, Ibsen and Westergaard-Nielsen (2011) confirm that the role of firm age (i.e. young firms) is also more important in Denmark than size (small firms) in driving job creation.

Cross-country results

Due to the inherent difficulties in accessing business-level data simultaneously in several countries, the first rigorous cross-country analysis of heterogeneous firm dynamics was only undertaken in the 2000s. A seminal contribution to this line of research was made by Bartelsman et al. (2005). The paper studies firm demographics and survival across ten OECD countries, by collecting micro-aggregated data from national business registries based on a common data protocol. The authors find that despite average firm sizes being different – firms generally being smaller in Europe than in the United States – firm "churning" is similar across countries, with about 20% of firms entering and exiting every year, and with about 20-40% of all entrants exiting within the first two years. Moreover, post-entry growth of successful entrants in the United States is considerably higher than in Europe, potentially indicating barriers to growth in the latter.

Instead of using national administrative sources, an earlier study by Scarpetta et al (2002) relied on Amadeus, a commercial database.[5] The paper studies the role of policy and institutional settings in both product and labour market productivity and dynamics using a firm-level data set from ten OECD countries as well as industry-level data set for a broader set of economies. The authors find that aggregate productivity patterns are largely the result of within-firm performance, but the contribution of firm dynamic processes should not be overlooked. This holds particularly in high-technology industries, where new firms tend to play an important role. Moreover, burdensome regulations on entrepreneurial activity, in addition to high costs of adjusting the workforce, seem to negatively affect the entry of small firms.

Using the same dataset and a different methodology (Rajan and Zingales, 1998), Klapper et al (2006) finds that the sectors which are usually characterised by high entry rates are more negatively affected in such countries where entry regulations are strong. Further, they show that in those instances, entrants are generally larger and incumbents grow more slowly, indicating that entry barriers have more widespread consequences on firm dynamics.

Aghion et al. (2007) analyse the linkages between financial development and business dynamics, using a harmonised firm-level data set for 16 industrialised and emerging countries. The authors find that access to finance matters most for the entry of small firms and in sectors that are more dependent on external finance. Access to finance also helps new firms expand if successful. Financial developments, on the other hand, have no or negative impact on the entry of large firms.

From a sample of 16 developed and emerging economies, Haltiwanger et al. (2010) show that job flows vary significantly by firm size in each country, but even after controlling for the different size and industry compositions, there are also country-specific differences in the pace of job creation and destruction. They also find that stringent firing and hiring regulations tend to reduce job flows.

Bravo-Biosca (2011) also studies firm dynamics across 11 developed countries, collecting data in a similar fashion to Bartelsman et al. (2005). The author shows that there are significant differences in growth distributions across countries: successful firms are found to grow much faster in the United States than in Europe, and unsuccessful firms are also found to shrink much faster. Europe also has a much higher share of stable firms where the level of employment does not vary much. Finally, the author documents a positive relation between the dispersion in firm growth rates and productivity growth.

Moscarini and Postel-Vinay (2012) thoroughly document that the employment changes of large firms are more pro-cyclical than those of small firms, not only in the United States but also in Canada, Denmark, France and the United Kingdom. They explain their findings by the better ability of large firms to pay higher wages and "poach" workers from small ones during times of economic expansion.

Gal et al. (2013) use a cross-country firm-level database (ORBIS) for 20 OECD countries to assess the role of heterogeneity across countries in the size and industry distributions of firms for explaining the diverse labour market responses at the onset of the financial crisis. They find that cross-country differences in the employment responsiveness to output shocks (output-elasticities) and the different sizes of the output shocks were the most important drivers of employment growth, and differences in the size and industry composition played a less prominent role.

Anyadike-Danes et al. (2013) relate to newly born firms in six European countries in 1998. They found them to be typically very small, with more than three-quarters having less than five employees and that relatively few of the cohort of firms studies survive ten years. However, the firms that do survive grow much faster. In addition, a tiny proportion of the very smallest firms in the cohort account for a disproportionately large share of total job growth, while the rest of the surviving firms hardly grow at all.

Recent OECD work (Bravo-Biosca et al, 2013) has found that financial development, stronger competition in the banking sector and better contract enforcement are associated with a more dynamic growth distribution, a lower share of stable firms and higher shares of growing and shrinking firms, and a more rapid expansion and contraction at the extremes of the growth distribution. Stringent employment protection legislation, as well as generous R&D fiscal incentives, are associated with a less dynamic firm growth distribution, with more stable and fewer growing and shrinking firms.

Finally, a few contributions have examined the role of high growth firms (HGFs).[6] Using data from five OECD countries and Quebec, Schreyer (2000) finds that high-growth firms account for a disproportionately large share of gross jobs gained, and that small firms have higher net job creation rates than large firms, although significant flows of gross job gains co-exist with large flows of gross job losses, particularly among small firms. Moreover, fast-growing firms tend to be more concentrated in some sectors as opposed to growing firms, but the concentration is not necessarily in the same sectors. Large firms are, in absolute terms, also significant job-creators in the high-growth group of firms. However, this effect often reflects mergers and acquisitions rather than organic growth. In addition, growing firms tend to be younger than firms on average. Audretsch (2012) provides an extensive review of the current state of research on what determines high-growth firms as well as their contribution to job creation and employment growth. Despite high-growth firms constituting only a small proportion of all firms, they account for a large share of employment creation. However, recent evidence suggests that high employment growth firms are not necessarily newly founded entrepreneurial start-ups, but larger and more mature firms.

Bassanini et al. (2010) use a harmonised dataset on hirings and separations at the industry-level in OECD countries to analyse how labour-market institutions affect gross job and worker flows. The results suggests that cross-country differences in job protection for open-ended contracts and unemployment benefits can explain a large share of cross-country variation in gross worker flows, although the effect of the former is largely limited to job-to-job flows, as opposed to job-to-jobless or jobless-to-job transitions.

2. DATA AND METHODOLOGY

The data presented in this document are a result of the first output of the *DynEmp* project, called *DynEmp Express*, which is led by the OECD with the support of national delegates and national experts in member and non-member economies. The primary source of firm or establishment level data is generally national business registers.[7] Business registers (BRs) collect information on firms' entry, exit, employment and/or turnover from social security records, tax records, censuses and/or other administrative sources. These data provide the most comprehensive coverage of economic activity in any country, aiming to cover the universe of businesses. Their original use is mainly cross-sectional to provide information on economic activity underlying National Accounts, but many Statistical Institutes and researchers have built panel data from snapshots of BRs adjusting the data for problems (e.g. coding errors) and inconsistencies (e.g. changes in the data collection procedures) to make them longitudinal thus producing a unique source to analyse firm dynamics. However, due to the confidential nature of the information contained, access to this rich data source is often restricted. Furthermore, national sources are generally not directly comparable; therefore, homogenisation of the key concepts is still required.

These limitations are tackled by developing a statistical routine that is shared with national representatives taking part in the project (See Table 1 in Acknowledgements). Representatives from participating countries (e.g., researchers from statistical agencies, ministries, independent research institutes or academic institutions) ran the routine on the confidential micro data to which they had access; went through the disclosure procedures specific to their country to ensure that confidentiality was respected and sent the non-disclosed data back to the *DynEmp* team. Finally, the output of the routine was entered into a unique harmonised micro-aggregated database containing comparable non-confidential statistics across all participating countries.

The dataset used for this report covers the following countries: Austria, Belgium, Brazil, Canada, Finland, Italy, France, Hungary, Luxembourg, Japan, Netherland, Norway, New Zealand, Portugal, Spain, Sweden, the United Kingdom and the United States. The period covered is generally 2001-2011, with exceptions. For details on the coverage, see Table 2. Annex A provides further detailed description of the various data characteristics of each national source, the data collection process and the resulting dataset.

The statistics are collected at the enterprise level with the exception of Japan, where information is only available at the plant level.

It should be stressed that the *DynEmp Express* programme allows the analysis to be conducted at different levels of aggregation (e.g. lower: establishment; or higher: enterprise groups). Looking at a different level of analysis would provide different and complementary pictures of the level of job creation and destruction within countries. Although this is beyond the scope of this report, the flexibility of the *DynEmp* approach would allow the analysis of the establishment level dynamism happening within enterprises as well as the role of enterprise groups for internalising enterprise level employment adjustments, if information on employment at the different level of analysis and the linkages across the different unit were available at the country level.

Table 2. Data coverage

Country	Period covered	Note
Austria	2001-2010	Companies have the choice of reporting either at the enterprise or at the establishment level (see Stiglbauer, 2003).
Belgium	2001-2011	
Brazil	2002-2010	
Canada	2001-2011	Only a subset of statistics has been produced and therefore the country could not be included in all graphs; see graph notes for further detail.
Finland	2001-2011	
France	2002-2007	
Hungary	2001-2011	
Italy	2001-2010	
Japan	2001-2009	Sectoral coverage is limited to manufacturing in the case of yearly job flow data for most years in the sample. Data are at establishment level.
Luxembourg	2001-2010	
Netherlands	2001-2011	Results are preliminary and data might be affected by breaks in the longitudinal structure of the business register.
Norway	2001-2010	
New Zealand	2001-2009	
Portugal	2006-2011	
Spain	2003-2009	
Sweden	2001-2010	
United Kingdom	2001-2011	
United States	2001-2011	

Note: Data coverage as included in the current analysis. See Annex A for further detail.

The advantages of using harmonised micro-aggregated panel data from business registers for understanding employment dynamics are manifold. Firstly, the margins of employment adjustment can be distinguished between gross job creation and job destruction, and also between the extensive margin of firm entry and exit and the intensive margin of continuing units (incumbents). Secondly, the role of firm age and size can be investigated. Finally, the importance of these factors can be compared across countries, industries and over time.[8] The age and size class breakdowns are presented in Table 3.

Table 3. Size and age classes used in *DynEmp* Express

Size classes	Age classes
1-9 (Micro)	0 (Entrants)
10-49 (Small)	1-2 (Start-ups: 0-2)
50-99	3-5 (Young: 0-5)
100-249 (Medium: 50-249)	*6-10 (Mature)*
250-499	11 and above
500 and above	

Note: these two dimensions are combined, i.e. within each size class, all age classes are looked at. Size class definitions are based on average employment over year *t* and *t*+1 for incumbents, on employment at year *t*+1 for entrants and year *t* for exits, respectively. Age class definition is based on the number of years present in the data at year *t*+1. Throughout the text, the labels in parentheses are used for certain breakdowns if not indicated otherwise.

In terms of sectoral coverage, three broad groups of activities, manufacturing and non-financial business services are singled out, as well as construction, due to its importance during the financial crisis in some countries.

Units[9] are assigned to one of the three statuses: entrants, exits and incumbents. For each interval (*t*, *t*+1), incumbents, entrants and exits are defined as follows:

- a unit is an entrant if it is not present in the micro data in year *t* but is present in *t*+1 with positive employment;
- a unit is an exit if it is not present in *t*+1 and is there in *t* with positive employment;
- an incumbent unit is present both in *t* and in *t+1* with positive employment.

The measures defined and collected at the level of *status* × *size* × *age* × *industry* × *year* × *country* breakdowns, or *cells*, by the *DynEmp Express* routine are presented Table 4.

Table 4. Definitions of collected variables by the *DynEmp* Express routine using business-level data

Name	Definition
Number of units (*I*)	The number of active units in a cell *c*.
Employment (*E*)	The sum of employment across all units in a cell *c*: $E_{ct} = \Sigma_{i=1}^{I} E_{it}$, where *i* denotes a unit belonging to cell *c*.
Gross job creation (*JC*)	Sum of all positive unit-level job variations ($\Delta E_{i,t+1}^{+}$) from year *t* to *t*+1 within a cell: $JC_{ct} = \Sigma_{i=1}^{I} \Delta E_{i,t+1}^{+}$
Gross job destruction (*JD*)	Absolute value of the sum of all negative unit-level job variations ($\Delta E_{i,t+1}^{-}$) from year *t* to *t*+1 within a cell: $JD_{ct} = \lvert \Sigma_{i=1}^{I} \Delta E_{i,t+1}^{-} \rvert$

From the resulting micro-aggregated data various further measures are constructed at the cell level, summarised in Table 5. They capture several aspects of employment dynamics:

- net job creation (NJC);
- gross and net job creation (JC) and destruction (JD) rates at the cell level, reflecting the dynamics of the group of firms in the cell (e.g. young and small firms, see Type A measures in Table 5);
- JC and JD at the cell level compared to aggregate employment, reflecting both the dynamics and the importance (i.e. weight) of those cells in the aggregate (e.g. contribution of young and small firms to total employment growth, see Type B measures in Table 5);
- JC and JD in the cell compared to JC and JD at the aggregate level, also reflecting both dynamics and the importance of those cells in gross employment changes (e.g. contribution of young and small firms to overall gross job creation, see Type C measures in Table 5).

Note that, following the literature on business-level employment dynamics, the average employment over the two periods (as opposed to the base or current year employment) is used in the denominator of all three types of measures. This approach has the advantage that growth rates based on this normalisation are not biased by mean-reversion dynamics, are bounded between –2 and +2,[10] and approximate log-differences up to second order (see Haltiwanger et al. 2013).

DynEmp Express also collects information on transition dynamics at three different points in time (2001, 2004 and 2007) over a three year horizon. The transition analysis contains information on the share of firms in different size and age groups that change size class and the jobs associated with those changes, during the three-year period considered. The size classes considered are 0-9, 10-49, 50-99, 100-249, 250-499, 500 or more. In addition, it considers the share of firms that become inactive; i.e. those businesses that are permanent exits or are temporarily inactive. These firms have zero or missing employment at the end of the period, but might start operating again after some time. The age classes considered are entrants; start-ups less than three years old; three to five; six to ten; eleven years or more. Age is measured at the beginning of the transition period.

Table 5. Definitions of constructed variables using the collected micro-aggregated data

Name	Definition
Net job creation (NJC)	Difference between gross job creation (JC_{ct}) and gross job destruction (JD_{ct}): $NJC_{ct} = JC_{ct} - JD_{ct} = E_{c,t+1} - E_{ct}$, where *c* denotes cell (e.g. small and young firms in manufacturing) and *t* denotes year.
Type A measures – job variation rates reflecting cell-level dynamics ***Reference group in denominator is cell level aggregate employment***	
Gross job creation rate (JCR)	Ratio of gross job creation over average employment in the 2-year period: $Rate\_JC_{ct} = \frac{JC_{ct}}{0.5 * (E_{c,t+1} + E_{ct})}$
Gross job destruction rate (JDR)	Ratio of gross job destruction over average employment in the 2-year period: $Rate\_JD_{ct} = \frac{JD_{ct}}{0.5 * (E_{c,t+1} + E_{ct})}$
Net job creation rate (NJCR)	Ratio of net job creation over average employment in the 2-year period (and can also be calculated as the difference between gross job creation and destruction rates): $Rate\_NJC_{ct} = \frac{E_{c,t+1} - E_{ct}}{0.5 * (E_{c,t+1} + E_{ct})} = Rate\_JC_{ct} - Rate\_JD_{ct}$
Type B measures – contributions by cell to aggregate employment ***Reference in denominator is total aggregate employment***	
Contribution from gross job creation in cell c to aggregate employment change	Ratio of gross job creation in cell *c* (JC_{ct}) over total average employment (E_t) in the 2-year period : $Contrib\_JC_{ct} = \frac{JC_{ct}}{0.5 * (E_{t+1} + E_t)}$ where $E_t = \Sigma_{c=1}^{C} E_{ct}$ is total employment, and *C* is the number of cells in a given country and in year *t*.
Contribution from gross job destruction in cell c to aggregate employment change	Ratio of gross job destruction in cell *c* (JD_{ct}) over total average employment (E_t) in the 2-year period : $Contrib\_JD_{ct} = \frac{JD_{ct}}{0.5 * (E_{t+1} + E_t)}$
Contribution from net job creation in cell c to aggregate employment change	Ratio of net job creation in cell *c* (NJC_{ct}) over total average employment (E_t) in the 2-year period : $Contrib\_NJC_{ct} = \frac{NJC_{ct}}{0.5 * (E_{t+1} + E_t)}$

Table 6. Definitions of constructed variables using the collected micro-aggregated data (Continued)

Name	Definition
Type C measures – share by cell in aggregate gross changes and employment ***Reference in denominator is total job creation, destruction or employment***	
Share of cell c in total gross job creation	Ratio of gross job creation in cell *c* (JC_{ct}) over total job creation ($\Sigma_{c=1}^{C} JC_{ct}$): $Share\_JC_{ct} = \frac{JC_{ct}}{\Sigma_{c=1}^{C} JC_{ct}}$
Share of cell c in total gross job destruction	Ratio of gross job destruction in cell *c* (JC_{ct}) over total job destruction ($\Sigma_{c=1}^{C} JD_{ct}$): $Share\_JD_{ct} = \frac{JD_{ct}}{\Sigma_{c=1}^{C} JD_{ct}}$
Share of cell c in total employment	Ratio of total average employment in cell *c* over total average employment: $Share\_E_{ct} = \frac{E_{c,t+1}+E_{ct}}{E_{t+1}+E_{t}}$

Note: instead of using base or current year employment in the denominator, the average employment over the two periods is used.

Note that the net job creation rate (*NJCR*) measure, defined at the level of a cell, is essentially an employment weighted average of unit-level growth rates if only surviving units are considered (i.e. the role of entry and exit are not accounted for).[11] As such, it can be used to assess the overall net employment growth of firms with certain age, size and industrial activity characteristics.

2.1. Challenges with measuring firm entry and age

Substantial efforts were made at harmonising the key concepts related to firm dynamics. Nevertheless, the exact definitions of firm birth and death may still need to be further investigated and refined. Bearing this potential caveat in mind, the precise role of various firm age groups should be interpreted with caution. Accordingly, the main focus below is on highlighting broad qualitative patterns, robustly present in the majority of countries, rather than exact rankings of countries.

Firms that enter, i.e. that appear for the first time in the business registers, may or may not indicate genuine births of new businesses, in the traditional sense of being created by entrepreneurial managers and employees who did not work together before. They may reflect spurious births due to problems of coding errors in the BRs or breaks in the Business Register data (e.g. due to the introduction of electronic Business Registers), but they may also reflect the birth of new legal entities such as spinoffs from a larger company, a creation of a new firm as part of an enterprise group (e.g. a greenfield investment); the merger of more companies; the restructuring of an existing firm or the renaming of a company under a different name. Similar issues apply for the definition of exit. Refining these definitions with the involvement of national statistical agencies is an avenue of future data development.

Different methodologies have been used by different Statistical Offices to address the identification of a real economic birth and they are presented below. However, a more fundamental question relates to what should be considered the "right" concept of "entry/birth" of an enterprise relative to that of an enterprise group or an establishment and to how far business registers and administrative information can go into identifying these different events. For example, should a spin-off from an existing company be considered a new entry or not? Should the creation of an enterprise by a domestic group be treated differently than the greenfield investment of a multinational?

Some of these issues relate to the choice of the level of analysis, which in this report is the enterprise, but – more importantly – there is no "right" answer to these questions since different definitions of entry/birth might be "right" for different policy questions and the identification of the "right" entry will in turn depend on the availability of information in the data at hand. If the interest is on firms as employers then administrative changes should not be considered as births or deaths, but spinoffs or new affiliates of an enterprise group or a multinational might be considered as new enterprises (if the level of the analysis is the enterprise and not the enterprise group), even though they might benefit from the experience and the financing of the mother company. In future research, the *DynEmp* project could investigate the distinctive role of independent enterprises *vs.* affiliates of existing groups, but this is beyond the scope of the current analysis.

In order to distinguish economic "births" of enterprises from pure legal and administrative changes and to identify mergers and acquisitions, Statistics Canada has developed the LEAP dataset that relies on a labour-tracking methodology to identify "spurious births" due to restructuring or mergers and acquisitions. The idea underlying this data construction exercise is to exploit payroll data to track workers across different firm identifiers; if a high percentage of workers in an exiting business at time *t* is found to be recorded under a new firm at time t+1, then the two observations are considered to be from the same business. Similar techniques have been used in other countries, also to identify outsourcing and insourcing patterns: in the United States as described in Benedetto et al. (2007), in Belgium (see Geurts and Van Biesebroeck, 2013), in Denmark (Ibsen and Westergaard-Nielsen, 2011) and in Germany (at the establishment level: Hethey-Maier and Schmieder, 2013).[12]

The US Census uses a different approach to compute establishment and firm age from the data in the Longitudinal Business Database (LBD) (see Becker et al., 2006; and Davis et al., 2007). Birth year is defined as the year an establishment first reports positive employment in the LBD. Establishment age is computed by taking the difference between the current year of operation and the birth year. Given that the LBD series starts in 1976, observed age is by construction left censored at 1975. Firm age is computed for all firms in the LBD from the age of the establishments belonging to that particular firm. A firm is assigned an initial age by determining the age of the oldest establishment that belongs to the firm at time of birth. Firm age accumulates with every additional year after that. Note that mergers and acquisitions and divestitures could lead to abrupt changes in firm age purely from establishment composition issues if firm age were defined in each year using age of the oldest establishment owned in that year (see https://www.census.gov/ces/dataproducts/bds/overview.html and references therein).

2.2. Addressing some limitations

The results presented in this report are preliminary, as the harmonisations of key concepts and calculations methods may still require some further refinement. Some of the issues that may affect cross-country comparability are as follows:

- The data – with the exception of data for Canada and the United States – do not account for mergers and acquisitions in the determination of firm age, entry and exit as not all countries keep track of these business events in the same manner.
- Related to this, the classification of an event as exit also differs slightly across countries. Most Statistical Offices allow for periods of inactivity of businesses before considering them inactive, but the length differs across offices. Others adjust age for the period of inactivity. To harmonize this, *DynEmp* includes years of inactivity in the calculation of the age variable. There are some differences with respect to the minimum threshold above which a unit is present in the underlying national micro data in cases when the business register builds on tax records and filing the report is compulsory only for those firms above a certain level of turnover of employment (or a

combination of the two). The inclusion and treatment of sole proprietors in the business registers may also show differences across countries.

- For most countries (see Annex A for details), measures for employment are based on headcounts rather than on full-time equivalents. To the extent that firms in certain countries rely more on temporary or part-time employment in certain years, this may result in increased employment dynamics.
- For Japan, sectoral coverage is limited to manufacturing in the case of job flow data (job creation and job destruction). On the other hand, the age and size distributions are available for all three macro-sectors (manufacturing, non-financial business services and construction), but only for certain years (see Annex A).
- The definition of a business unit varies somewhat across countries: Japan reports data at the establishment level, and other countries at the firm level. The case of Austria is ambiguous, as companies have the choice of reporting either at the enterprise or at the establishment level, but as firms have a reduced administrative burden by reporting only at the enterprise level, that is the level most likely to be used (see Stiglbauer, 2003).
- Finally, changes in data collection or recording procedures of national sources may introduce breaks in the series which may be particularly relevant for measuring firm age.

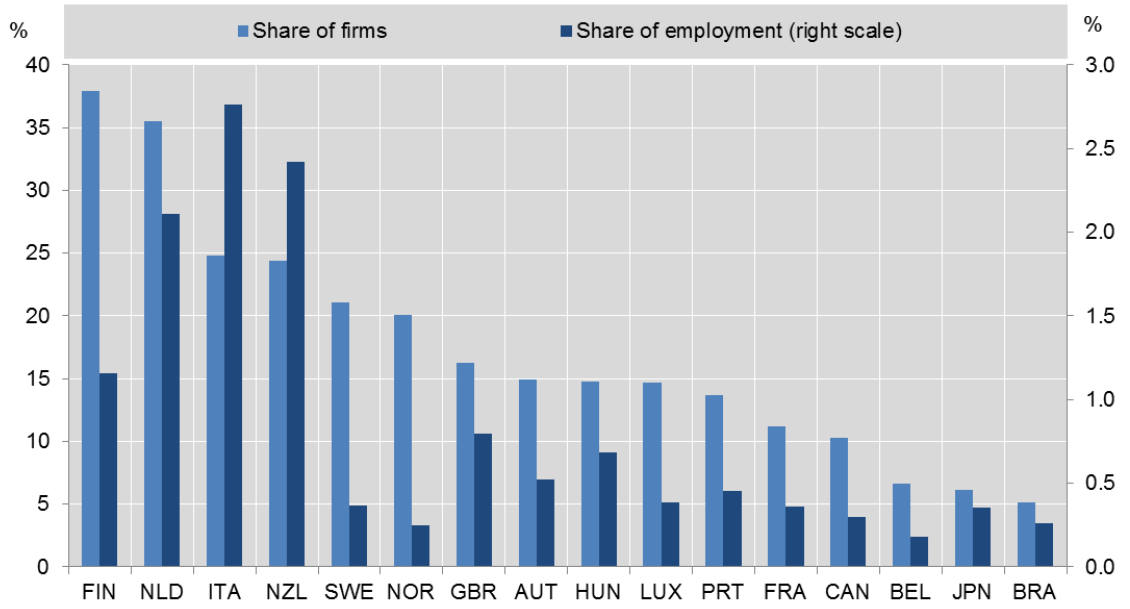
To address these shortcomings and to achieve better harmonisation related to entry, exit and firm age, the *DynEmp Express* routine adopts the following definitions:

- Entry year (exit) is the first (last) year when the unit appears in the data with positive employment.
- To minimise the problems of entry of affiliates of larger groups, the statistics are reported by age and age-size classes, focusing on the young-small group (and thus separating enterprises that are included in the young categories because of errors in coding or recoding due to "legal" changes or restructuring).
- To minimise the potential for measurement error coming from differences in dealing with short-lived units, units that enter and exit in the same year are excluded from the main analysis and some of their characteristics are recorded only in separate output files.
- To mitigate the potential problem of the inclusion/exclusion of sole proprietors, units which never grow above one employee are also relegated from the main analysis into separate output data. To highlight the importance of these units by countries and industries, Figure 1 shows their share in total units and employment.[13] In manufacturing, firms never growing over one employee can account for more than one quarter of the total number of firms in countries like Finland, the Netherlands and Italy, although their share in total employment is below 3%. In non-financial business services the share of single-employee firms is even higher, but again their weight in terms of employment is extremely limited, with the significant exception of Italy, where 16% of non-business services employment is accounted for by one-employee firms.

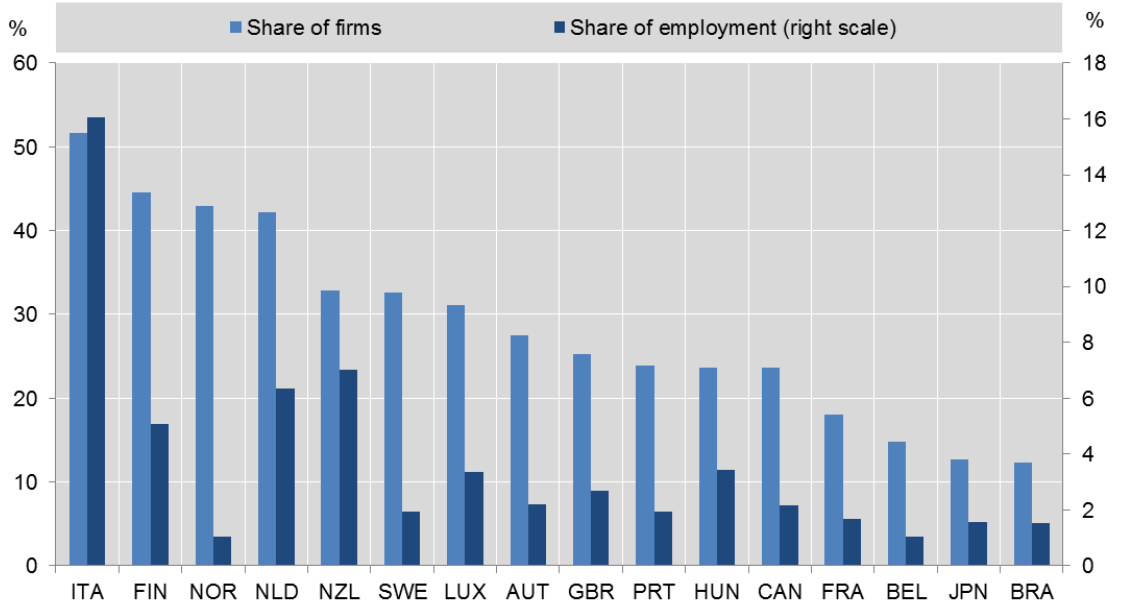
These adjustments allow for improved cross-country harmonisation, but they may introduce methodological differences in the DynEmp project relative to those used by National Statistical Offices and thus results from the DynEmp project may deviate from officially published national statistics.

Figure 1. Share of employment in firms never growing above one employee

Panel A. Manufacturing



Panel B. Services



Note: The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. The figures present the share in terms of number of units and employment of units never growing over one employee. The share of employment is calculated based on the assumption that those units have exactly one employee, irrespectively whether in the original source the recorded employment was lower than one. Data for Canada abstract from merger and acquisition activity.

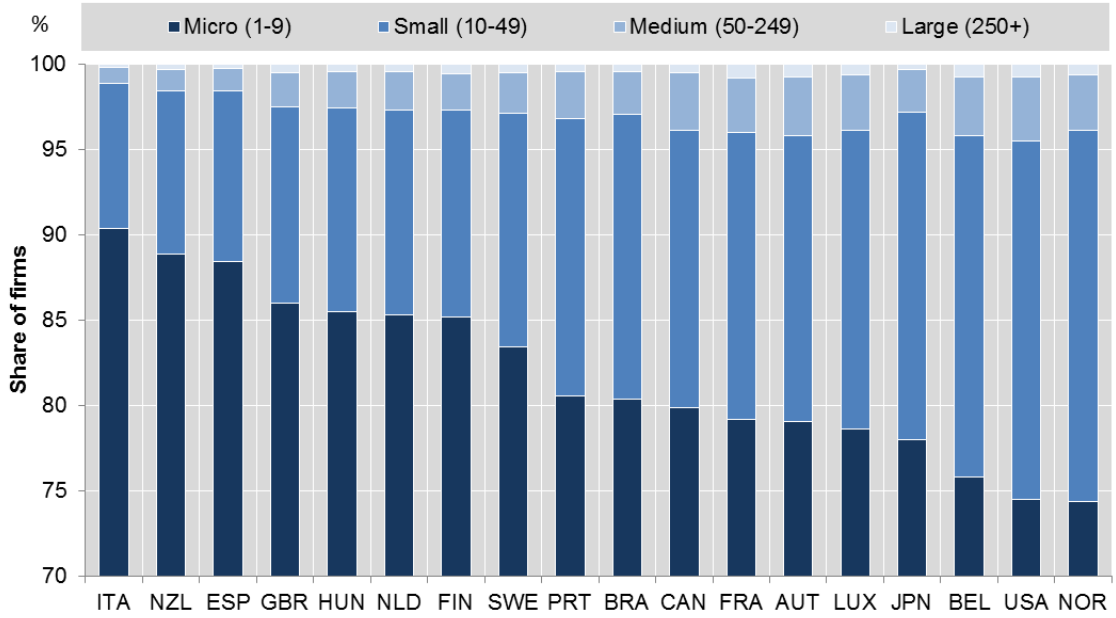
3. DESCRIPTIVE ANALYSIS

3.1. The importance of small firms across countries and sectors over time

Figure 2 presents evidence of the importance of small firms in terms of share of firms in the economy. As expected, in all economies, small firms – defined as firms with less than 50 employees – represent more than 95% of all firms, and in some countries such as Italy, New Zealand, Spain, Hungary, Finland and the Netherlands, 80% of all firms are micro firms, i.e. employ less than 10 employees. On the other hand, firms with more than 250 employees represent only 1% of the firm population. The share of micro and small firms is even larger when focusing on services: on average across 17 countries[14] in the sample, 85% of firms employ less than 10 workers (see Figure B2 in Annex B). In manufacturing, however, the share of larger firms is slightly greater, as firms above 50 employees account for around 8% of the total, on average (Figure B1 of Annex B).

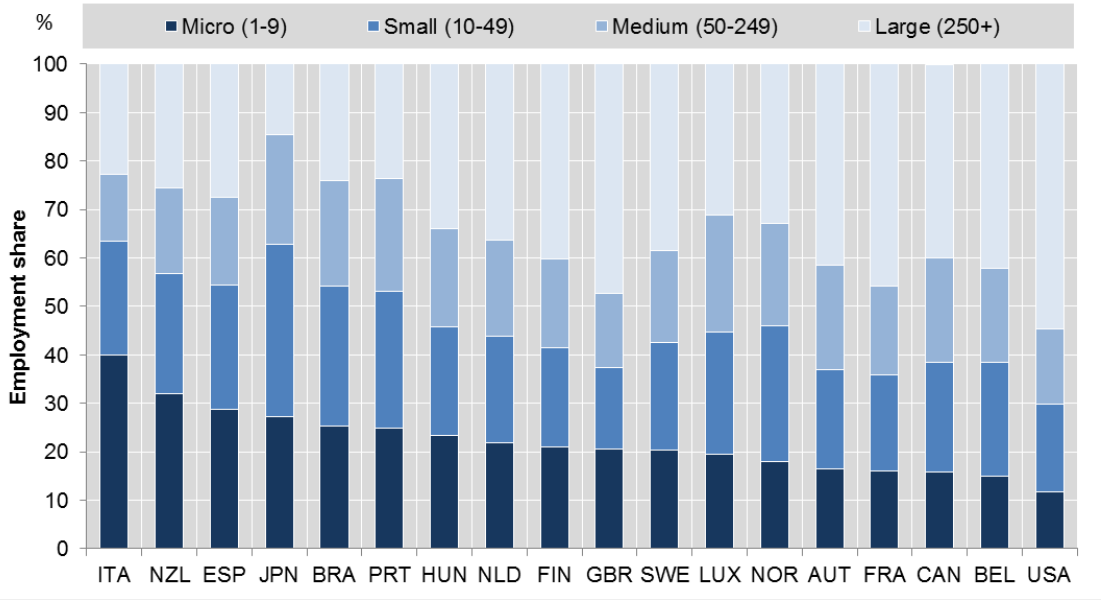
The picture changes considerably and shows more significant differences across countries when considering the weight that these firms have in terms of employment. As shown in Figure 3, micro firms that account on average across countries for 80% of firms only account for 20% of total employment. Small and medium sized firms together account for between 34% and 59% of the total (Figure 3). The figure also shows large differences in the weight that large firms have in the economy. In countries such as the United States, France, Belgium and Austria, more than 40% of employment is in firms with 250 employees or more, while in countries such as Italy, Brazil, and New Zealand, this share is barely above 20%.

Figure 2. Share of firms of different size by country



Note: The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Average across all available years.

Figure 3. Share of employment by different firm size and by country

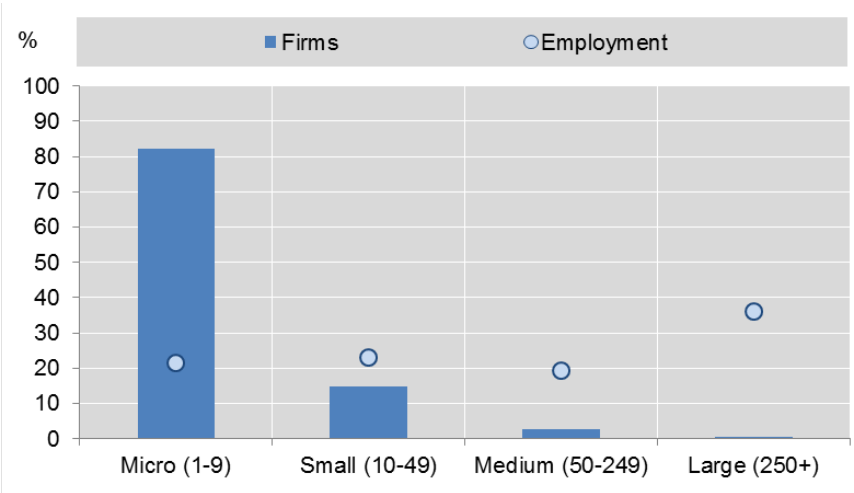


Note: The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Average across all available years.

Significant differences along the whole firm size distribution and differences in the average size of large businesses help explain the cross-country differences in the weights of micro and small firms. Figure 5 describes this point comparing two polar cases: Italy and the United States.

Figure 4. Most firms are small but most employees work for medium and large firms

Firm size and employment distribution, average across countries and years



Note: The figure presents the employment and firm size share accounted for firms (or units) of different size classes, averaged over countries and years. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure 5. Differences in firm and employment distributions: Two examples

Firm size and employment distribution in Italy and the United States

Note: The figure presents the average employment and firm size share accounted for firms (or units) of different size classes over the period covered 2001-2011 for the United States and 2001-2010 for Italy. The small box which zooms in on medium and large firms, has a y-axis scale from 0 to 1%. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics.

Results from existing empirical evidence suggest that observed differences in the relative weight of small and large firms across countries might reflect differences in industrial composition, since the size of the typical business and entry costs in some industries might be systematically lower, if for example the average capital intensity in a particular industry is lower. Market size (Desmet and Parente, 2010); multi-national status (e.g. Criscuolo and Martin, 2009); family ownership (e.g. Sraer and Thesmar, 2007); and international openness of the economy (Eaton et al; 2004) have also been found to be related to firm size. Finally, differences in structural conditions and the presence of size-contingent policies may explain difference in the shape of the observed firm size distributions (Garicano et al, 2013; Guner et al., 2008; Bertrand and Kramarz, 2002).

Whatever the reason, these differences in size distribution seem to be persistent over time, as shown in a series of figures in Annex B (Figures B6 to B14) with no clear pattern across countries on the direction of the change.

Cross-country comparable information on the firm size distribution weight of small firms in the employment distribution is a crucial input in all analysis of differences in wage structures across countries (as large firms typically pay higher wages, see Brown and Medoff, 1988 for seminal work on this issue); working conditions and wage inequality, as well as innovation rates; physical and intangible investment levels and productivity. Small firms are found to have lower average levels of investment in human; physical and intangible capital than larger companies and are on average less innovative (see for example recent evidence for Italy from Bugamelli et al., 2012).

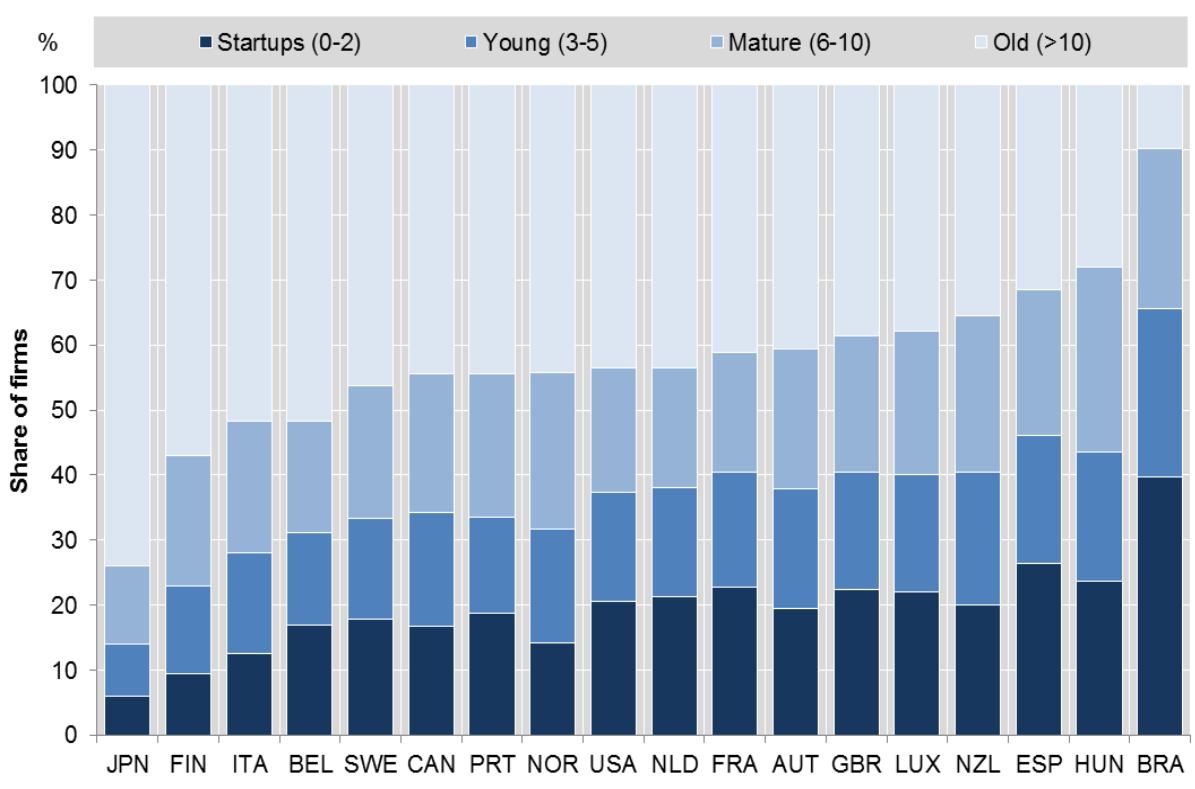
3.2. The joint role of firm age and size

Recent literature on misallocation (e.g. Restuccia and Rogerson, 2013; Hsieh and Klenow, 2009; Bartelsman et al., 2013), suggests that a large employment share in small businesses, which tend to be less productive than larger businesses, might reflect an inefficient allocation of resources. As such the greater the percentage of resources allocated to small businesses is likely to result in lower aggregate productivity.

However, most of these studies that look at firm size distribution, at the characteristics of firms in different size classes, or at the impact that this might have on aggregate outcomes, normally ignore systematic differences in the age profile across firms of different sizes, and in age profiles within size classes across sectors and across economies. These differences might be significant: as shown in Figure 6, the age profile of small businesses is very different across economies. In Brazil – the only emerging economy in the sample – more than 50% of micro firms are less than five years old while in Finland, Japan, Norway and Italy, they are less than 30%. Part of this may be due to sectoral composition, i.e. micro businesses in manufacturing are on average older than in services. However, even within these sectors, there are significant cross-country differences (see Figure B15, Figure B16, and Figure B17 of Annex B).

Figure 6. Age composition of small businesses

Average over time, firms below 50 employees



Note: The graph shows the share of firms by different age groups in the total number of micro and small firms (below 50 employees) in each economy on average over the available years. The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada abstract from merger and acquisition activity.

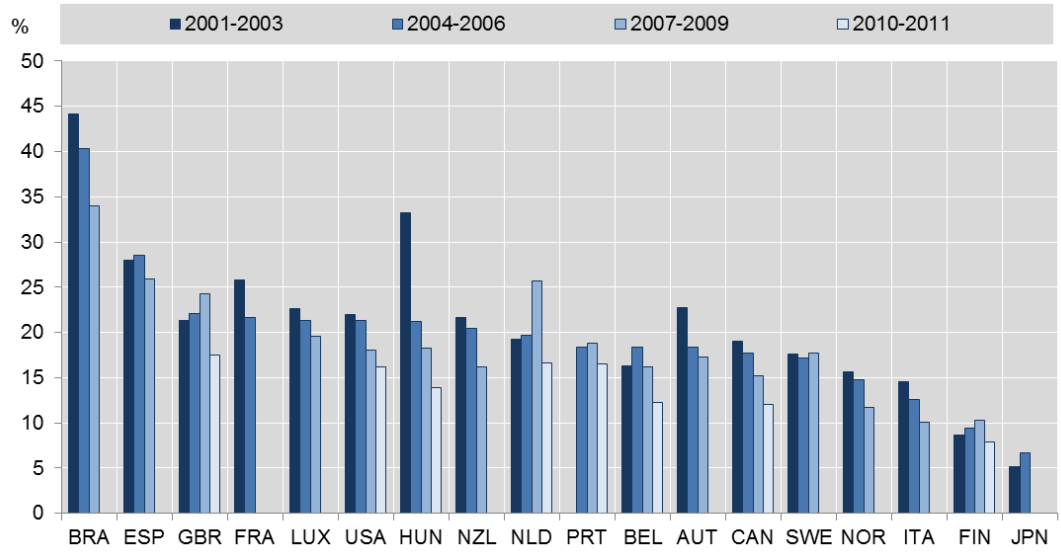
The age profile of small businesses might help qualify the link between the presence of small businesses and lower average productivity found in the recent misallocation literature: a higher employment share in small businesses might reflect the large presence of mature businesses that did not grow and did not exit, as suggested by much of the misallocation literature. Alternatively, it might also reflect dynamism in an economy with the presence of many new firms that are, almost by definition, going to be smaller on average (e.g., Foster et al, 2012; Dunne et al., 1989; Caves 1998; Cabral and Mata, 2003).[15] In all countries in the *DynEmp* database more than 95% of businesses that are five years old or younger also have less than 50 employees.

In turn, the differences in the share of young firms amongst the smallest businesses might reflect three different phenomena. First, they can be driven by differences in the entry margin. While persistent differences might exist in the entry process across countries, these might have been exacerbated towards the end of the period under analysis due to the Great Recession, the importance of which may have differed across countries. Second, it might reflect differences in the size of entrants and the extent to which young firms grow and become larger. Finally, it might depend on the extent to which young firms manage to survive. The analysis of the *DynEmp* dataset attempts to provide evidence on these three different margins in the following subsection below.

3.3. The importance of start-ups, young and old firms over time and across sectors

The share of start-ups (firms less than 3 years old) over time is reported in Figure 7. Across all countries, the share of start-ups has been steadily decreasing even before the crisis. However, the Great Recession had an additional negative impact on start-up rates. These results align with recent evidence from the United States that found a significant decline in business dynamism in the United States over the last 30 years, where the main reasons behind these declining rates of start-ups and the potential role of faltering entrepreneurship therein largely remain an empirical puzzle (Decker et al., 2013).

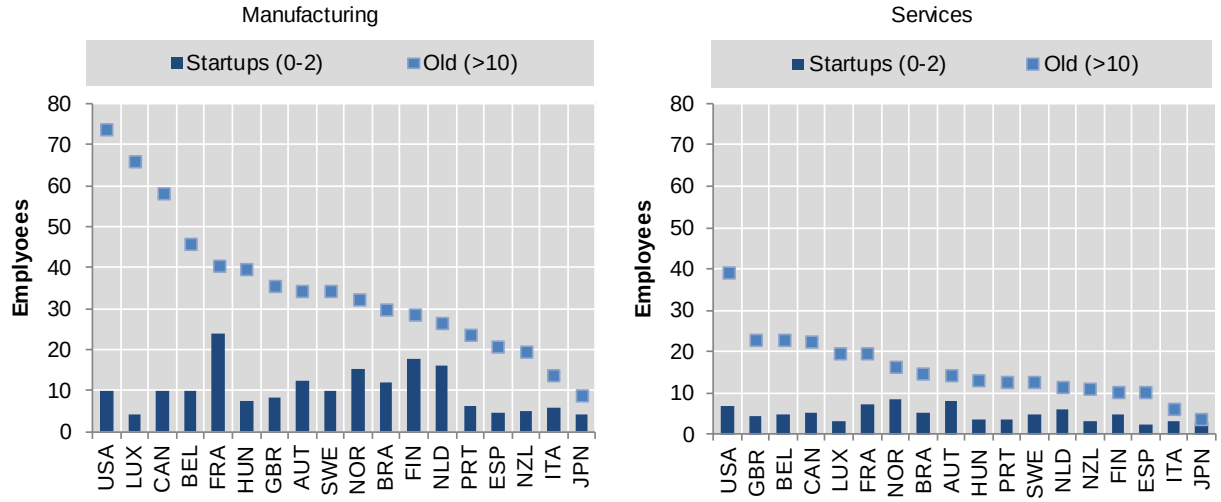
Figure 7. Declining start-up rates in most countries



Note: The graph reports start-up rates (defined as the fraction of start-ups among all firms) by countries, averaged across the indicated three-year periods. Start-up firms are those firms which are from 0 to 2 years old. The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Norway, Spain and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

Differences in the extent to which young firms grow and become larger are shown in Figure 8. Unfortunately, at this stage of the project, it is not possible to follow a cohort of firms beyond a 3-year horizon.[16] Instead, the analysis tries to infer the potential growth that young firms could achieve from indirect evidence obtained by comparing the average (and median) size of start-ups and of old businesses (eleven years old or more). As indicated in the figure, differences in the size of start-ups at entry exist but are not striking, with France, Finland, and the Netherlands having the largest infant firms in the sample. It is also worth noting that these differences might also be partly influenced by the intensity of mergers and acquisition activity across countries and whether the new businesses that result from M&A deals appear as "entrants" in a country's business register. Looking from a different angle at differences across sectors, Figure 9 highlights that manufacturing firms generally start at a larger size but startup activity is much weaker than in services.

Figure 8. Average size of start-up and old firms across industries and across countries

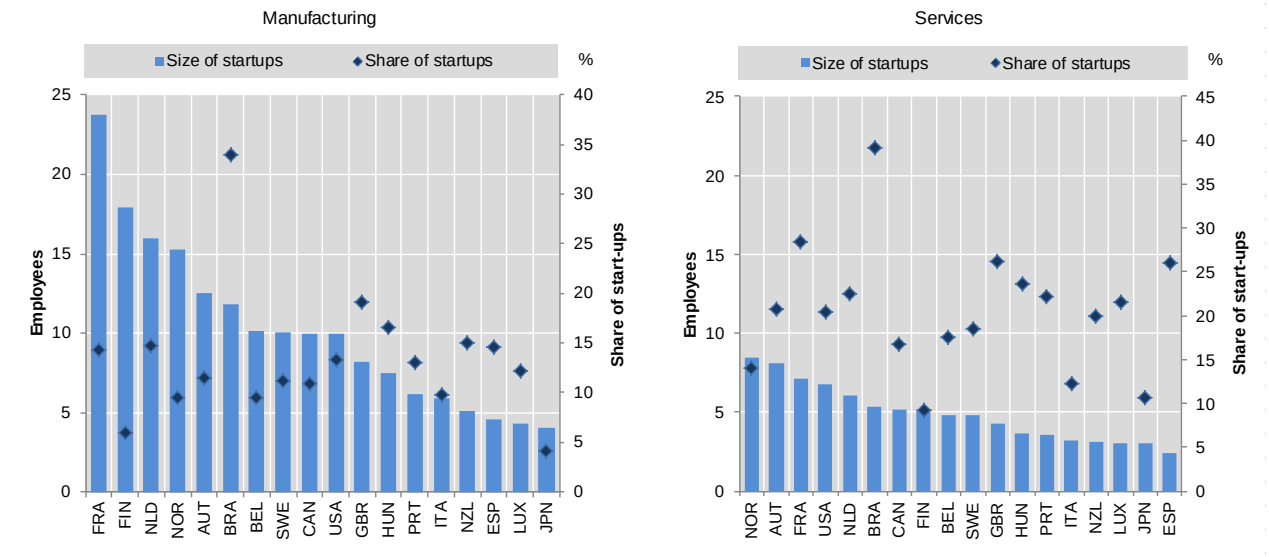


Note: The graph reports the average size of start-up firms (from 0 to 2 years old) and firms more than 10 years old, as the average over the available years. The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

The picture becomes much more heterogeneous when looking at the size of older businesses. The average size of old firms in the United States – around 80 employees in manufacturing and 40 in services – is by far the largest in the sample. These statistics are even more striking since in some other economies, the average start-ups tend to be larger than in the United States, for example the average size of start-ups in the French manufacturing sector is more than double the average size of United States start-ups, while the situation reverses when considering older businesses: on average the size for an old manufacturing business in France is half the size than in the United States. This evidence confirms previous results of Bartelsman et al. (2005) on employment growth amongst surviving firms in the manufacturing sector of six European countries (France, Finland, West Germany, Portugal, Italy and the United Kingdom) and the United States showing that at the age of seven, US firms are on average 60% larger than their size at entry, while in European countries the figure ranges between 5% and 35%. This suggests that in some countries there are lower entry barriers for new firms; as a consequence, entrants can start off at a smaller size as they have more room for experimentation. This, in turn, might contribute to unleashing the growth prospects of very productive and successful businesses. Also it indicates that in some countries barriers to

growth (access to market; burdensome regulation on starting businesses; lack of competition; etc.) might hinder the growth potential of young businesses.

Figure 9. Larger start-ups in manufacturing but more of them in services

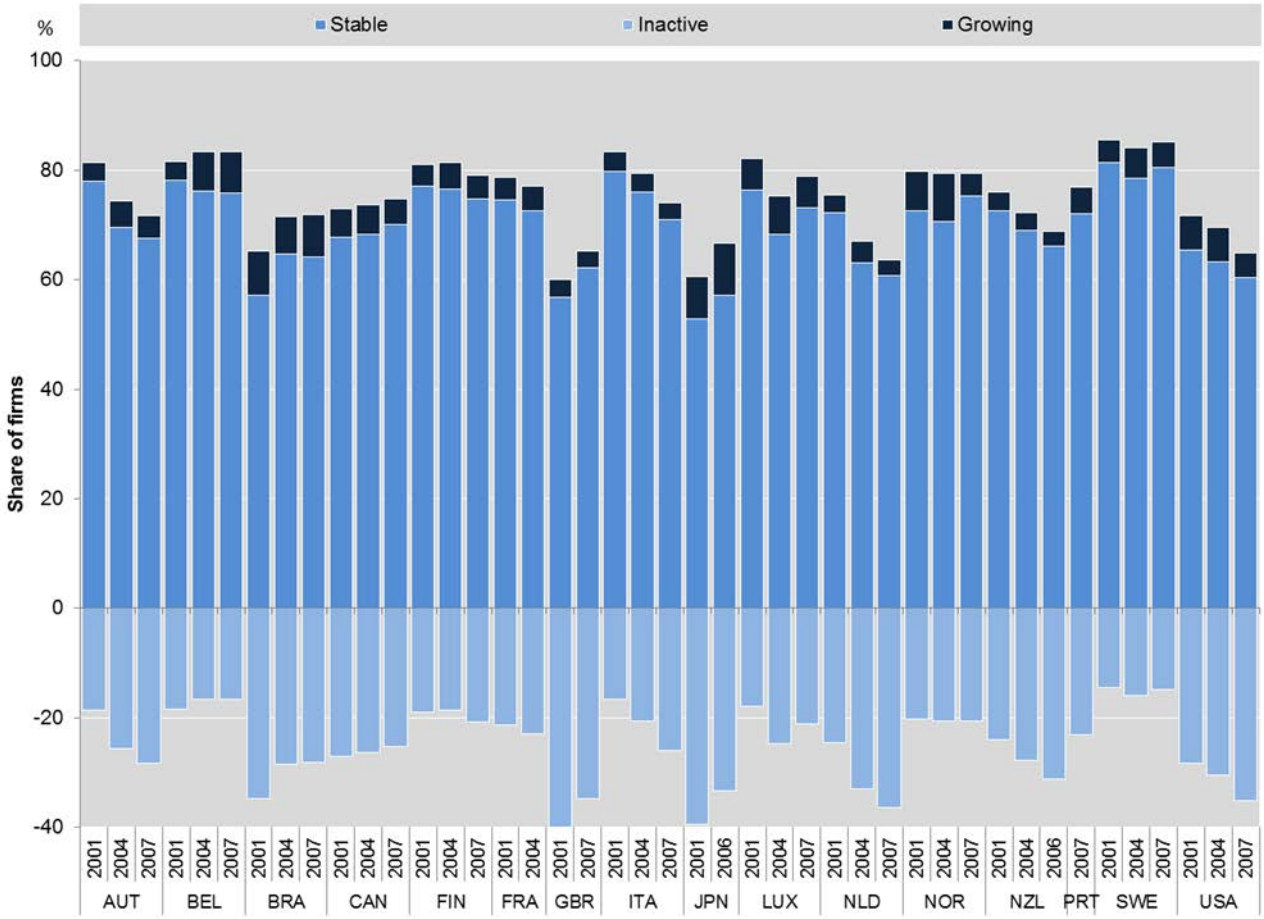


Note: The graph reports the average size of start-up firms (from 0 to 2 years old) and the share of start-up firms in the total number of firms by sector. The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Services exclude the financial business sector. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

To overcome some of the limitations of the statistics presented in Figure 8 *DynEmp Express* uses transition matrices to follow three different cohorts of start-ups (of different size) over three-year periods starting in 2001, 2004 and 2007. The *DynEmp* dataset contains information on the transition dynamics of firms of different age and size, and reports the number of units that, over a three-year period, grow to larger size classes, those which remain in the same size class, and those which become inactive.[17] It also reports the number of jobs associated with each transition. Figure 10, Figure 11, and Figure 12 report evidence from the analysis for micro start-ups for the three cohorts and across countries. Three main features are worth noting: firstly, very few micro start-ups – about 2% to 9% – grow above 10 employees, but their contribution to employment change ranges from 19% to 54%; secondly, stable firms still create a reasonable amount of jobs, but their contribution is less than proportional to their weight in terms of number of firms, and for some cohorts and countries they actually contribute negatively to net job creation; and, thirdly, the extent to which micro start-ups survive is very different across countries and over time. This "up or out" dynamic has been recently documented for young firms in the US, but the three figures show that the importance of this phenomenon differs greatly across countries both in terms of number of firms and jobs involved.

Figure 10. Three-year survival and growth performance of micro start-ups, 2001, 2004, 2007

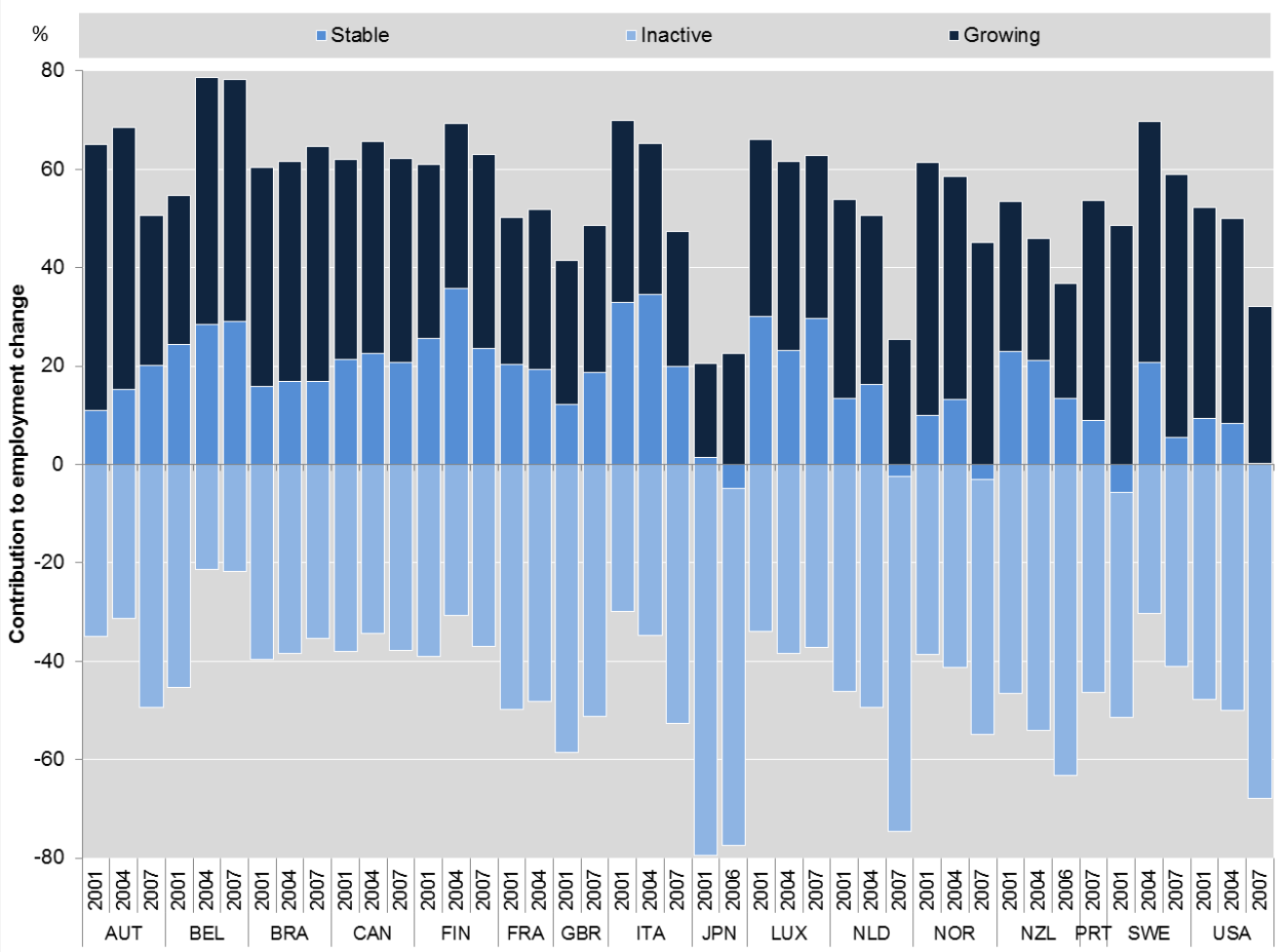
Share of firms by status 3 years later



Notes: stable firms belong to the same size category (0-9) at the end of the three year period; growing firms belong to a higher size category at the end of the three year period; inactive firms do not report information on employment at the end of the three year period, either because they are temporarily inactive or because they have permanently exited. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure 11. Three-year survival and growth performance of micro start-ups, 2001, 2004, 2007

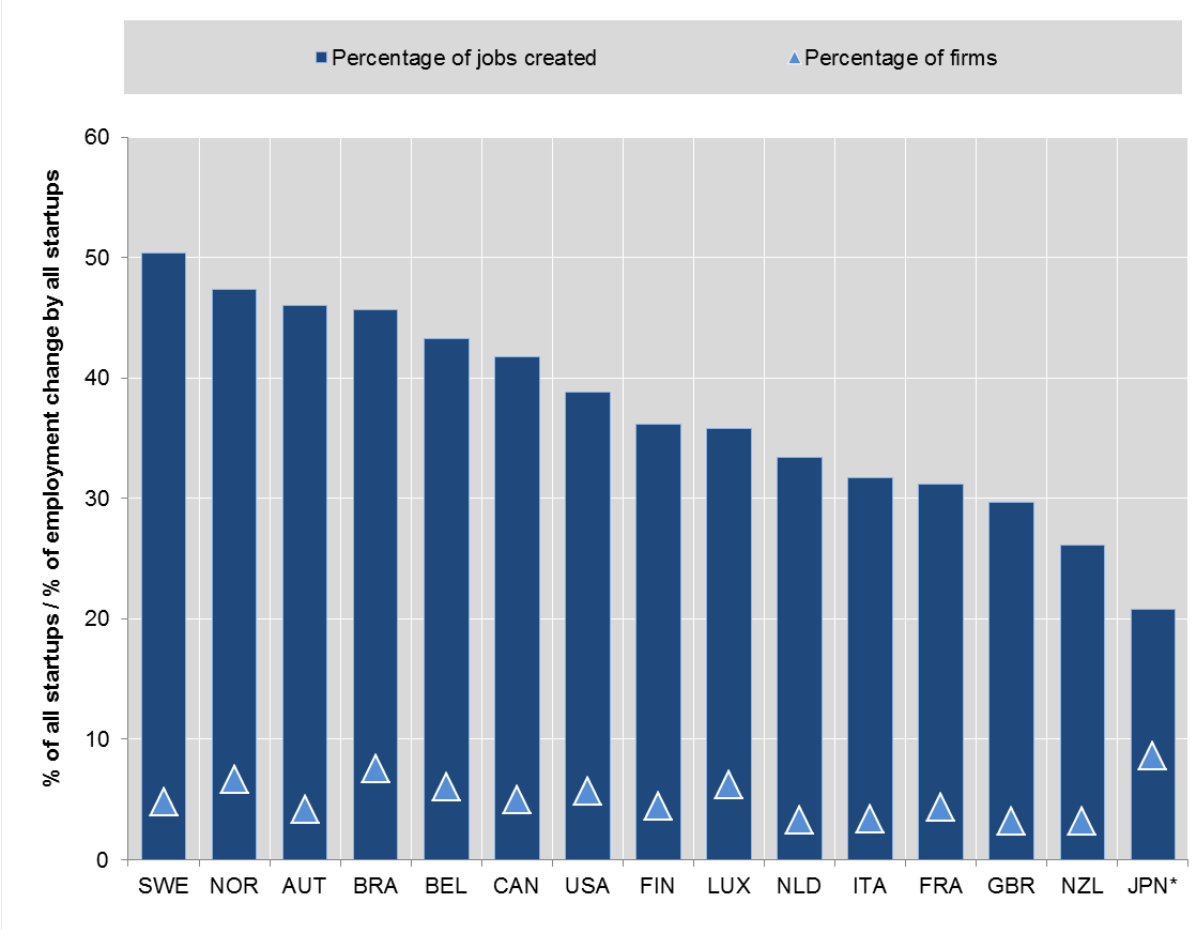
Contribution to employment change by firm status 3 years later



Notes: stable firms belong to the same size category (0-9) at the end of the three year period; growing firms belong to a higher size category at the end of the three year period; inactive firms do not report information on employment at the end of the three year period, either because they are temporarily inactive or because they have permanently exited. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

Figure 12. Growing start-ups

Percentage of all start-ups and contribution to start-up net job variation, 2001-2010



Note: growing start-ups are firms with less than 10 employees at the age 0 to 2 with grow over 10 employees over a 3-year interval. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

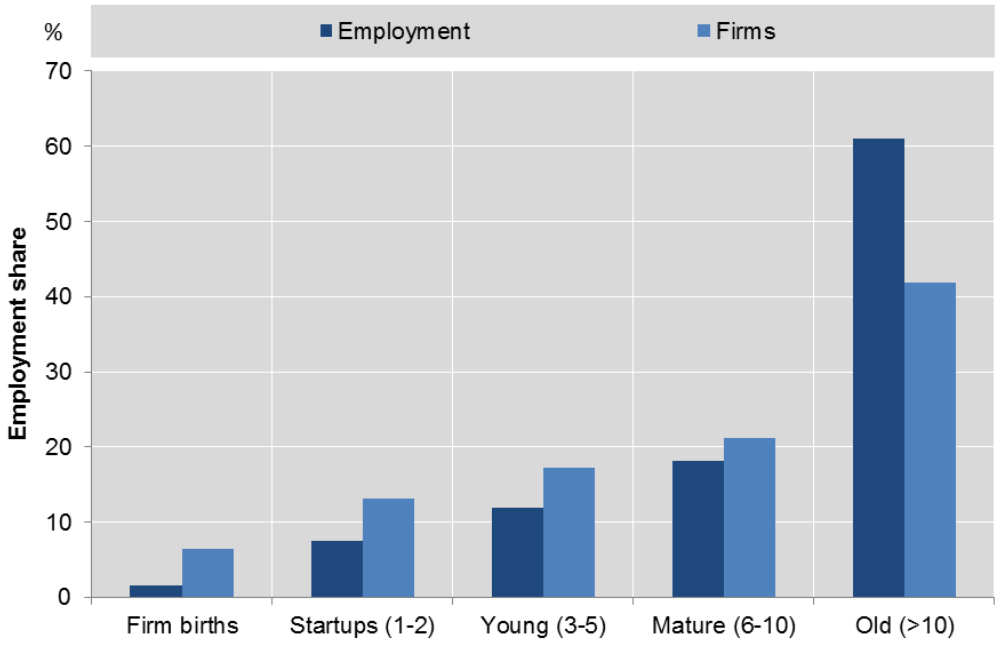
The transition dynamics show that across all age groups and initial size classes, most firms remain in the same size class over the three year period considered. This might partly reflect the tendency for the initial median size of businesses in each size class to be towards the lower bracket of the size interval. However, the figures also show that stable firms have a much lower weight in terms of net job creation than the smaller number of firms which are growing (as in the case of micro start-ups discussed above), suggesting that the former also grow less than the latter on average. Significant differences exist in the share of these high growth firms and in their weight in terms of employment.

In general, the probability of moving to another size class is relatively low, with a monotonic decline the further the "destination" size class from the initial class. The probability of shrinking, especially in terms of employment, appears to have increased in the period 2007-2010, affected by the outburst of the international financial crisis in late 2007 and the subsequent enduring recession or slow recovery in many countries. Furthermore, older firms are on average more likely to remain in the same size class at the end of the three year period and less likely to downsize or exit than younger businesses; confirming that they are less likely to experience up-or-out dynamics.

Finally, although the project is only able to analyse transition dynamics over a three year period, a snapshot of the age composition of large firms might provide suggestive evidence of the speed at which young firms achieve a certain size. Again, the evidence suggests that, on average, larger firms in the United States are much younger than similarly sized firms in the other economies considered, possibly indicating much faster growth and more room for experimentation, where fewer businesses survive, but those that do so are more successful.

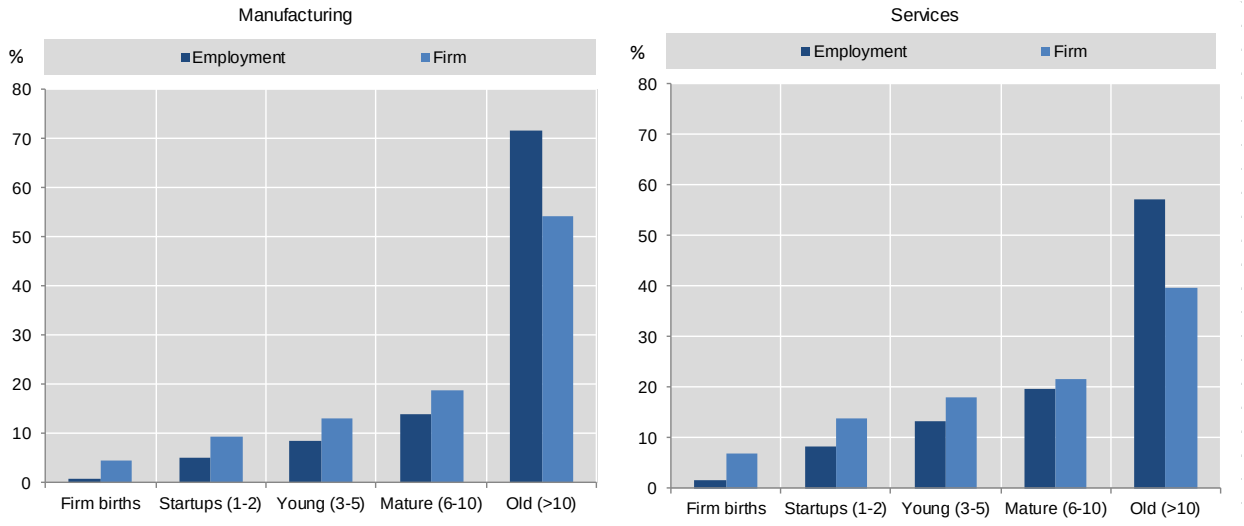
A different way of looking at these issues is to consider the share of firms and employment by age class on average across all the countries and years in the database. Around 40% of the firms are more than 10 years old, and these account for about 60% of total employment (Figure 13).

Figure 13. The majority of employment is in old firms



Note: The graph reports the share of firms and employment, respectively, by firms of different age classes in average across all available years and countries. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure 14. The majority of employment is in old firms, more so in manufacturing



Note: The graph reports the share of firms and employment, respectively, by firms of different age classes in average across all available years and countries. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Services exclude the financial business sector. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

However, important differences exist across sectors (Figure 14) and also across countries in the role of young firms, aged zero to five. For instance, in Anglo-Saxon economies (the United States, New Zealand) and in some of the Northern European countries (Norway, Sweden and the Netherlands) the share of young firms is around twice as much as compared to Finland, Belgium and Japan. This pattern is generally true across all years and industries, and also holds for the very young (0-2 year old) firms (as shown in Figure 6 and Figure 7).[18]

3.4. Sources of job creation and job destruction and employment dynamics: The role of entry, exit and firm age and size

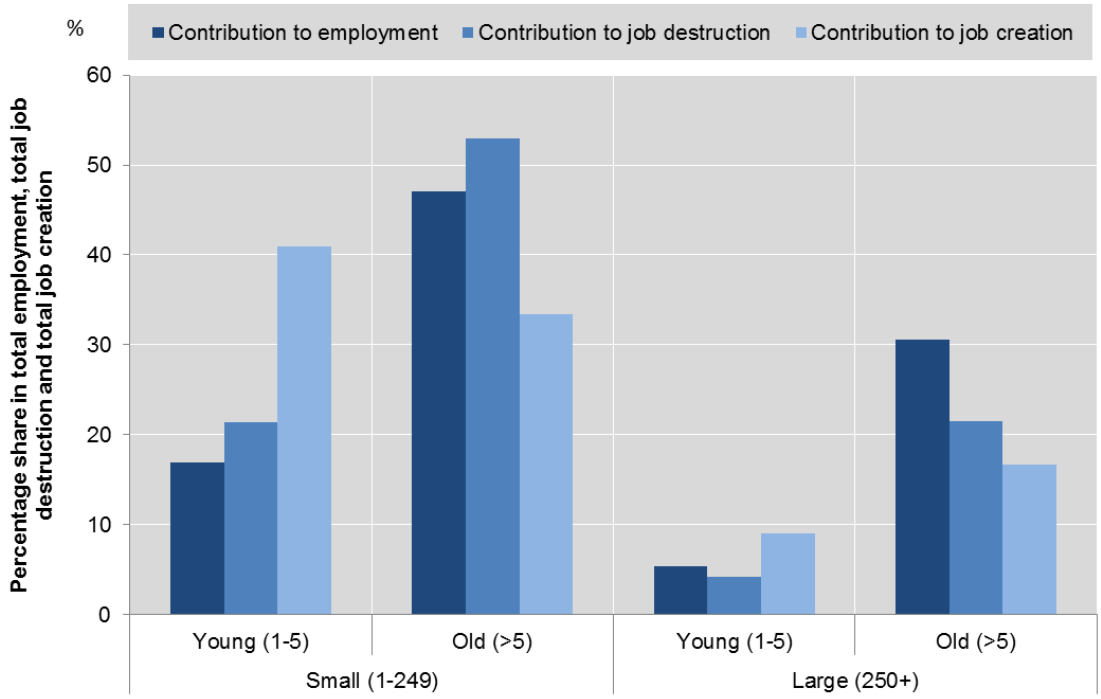
Although they represent a small portion of the total employment, young firms create a disproportionate number of jobs. Conversely, the largest contribution to job destruction comes from the group of small (less than 250 employees) and mature (six years old or older) firms. These patterns, also highlighted in Haltiwanger et al. (2013), are remarkably robust across countries and years (Figure 15).

The general pattern also holds when looking within macro-sectors. However, the higher dynamism of small and young firms is accentuated in the service sector, where young firms also represent a higher share of total employment compared to manufacturing (Figure 16).

The disproportionate contribution of young firms to employment creation emerges across all economies in the sample (Figure 17).[19] There are, however, differences in the magnitude of the phenomenon.

Figure 15. Young firms contribute disproportionately to job creation

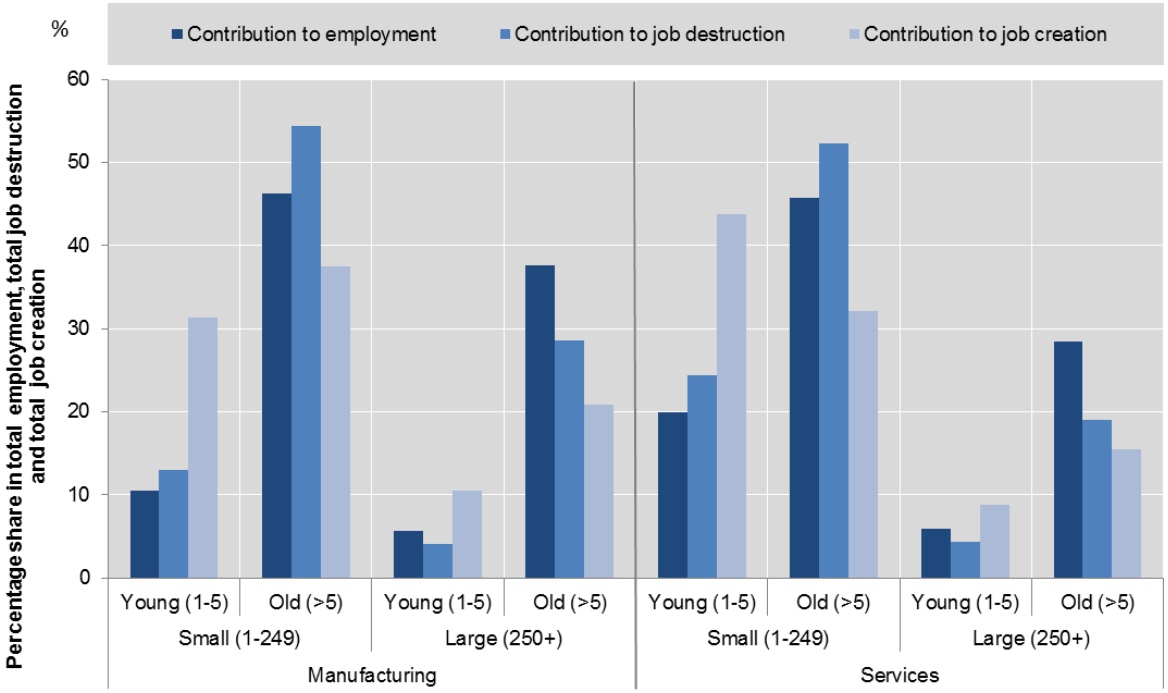
Employment, job creation and job destruction by firm age and size



Note: The graph reports the contribution to total employment, gross job creation and job destruction by firms in the reported age-size groups in average across all available years and countries (see Type C measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Canada, Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

Figure 16. Young firms contribute disproportionately to job creation

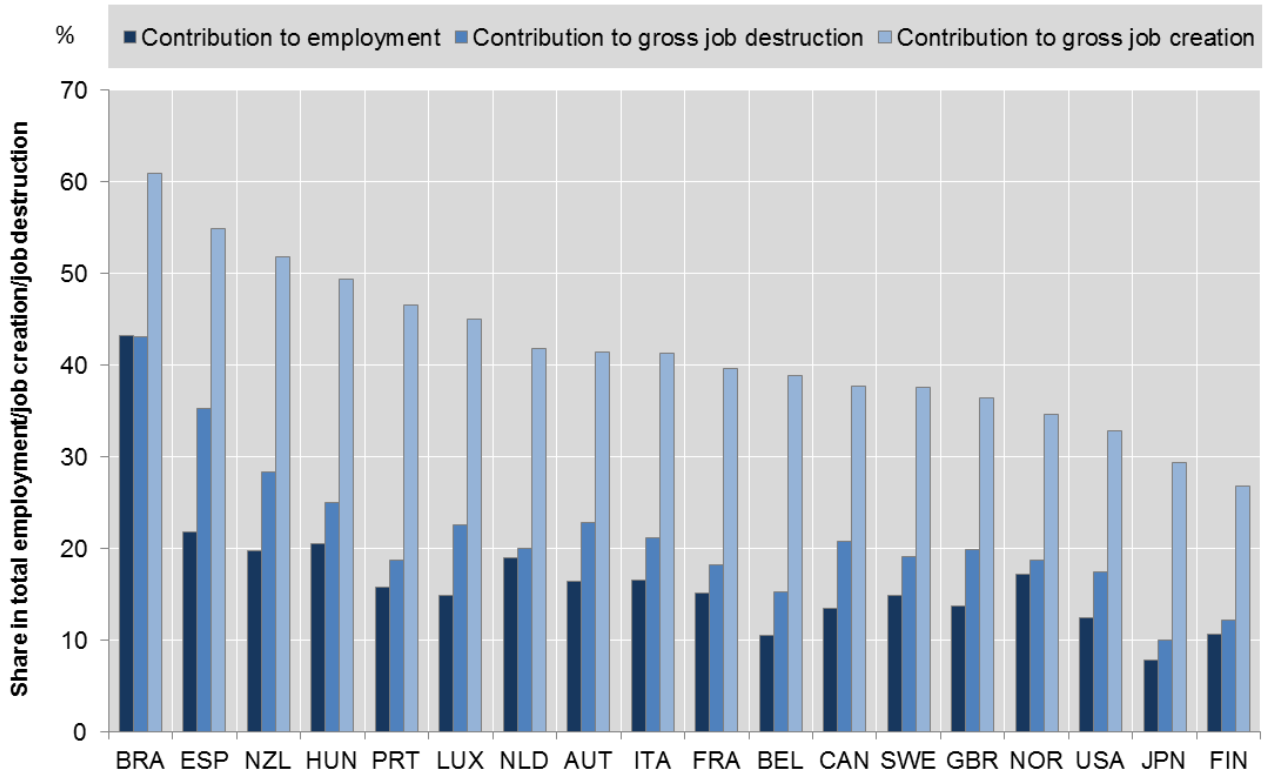
Employment, job creation and job destruction by firm age, size, and sector



Note: The graph reports the contribution to total employment, gross job creation and job destruction by firms in the reported age-size groups on average across all available years and countries (see Type C measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure 17. Young SMEs contribute disproportionately to job creation in each country

Employment, gross job creation and gross job destruction by young small and medium sized firms, 2001-11



Note: The graph reports the contribution to total employment, gross job creation and job destruction by firms in the reported age-size groups in average across all available years and countries (see Type C measures in Table 5). The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Canada, Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors included are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

As highlighted in Section 2, some of the cross-country differences in the employment share accounted for by young firms and their contribution to job creation might be attributable to differences in the accuracy with which entry and exit are recorded in different data sources. Thus, when comparing across countries it would be preferable to apply measures that are less affected by the presence of "false" entries, i.e. *de alio* entrants.

One such measure could be the share of different age/size groups to the contribution to gross job creation and gross job destruction of relative to the share of these groups in total employment. This measure would express how many of the newly created jobs can be attributed to young firms relative to how many jobs they represent.

However, the proportional contributions might still be affected by the presence of *de alio* entrants, and the direction of the bias due to the inclusion of *de alio* entrants might be ambiguous. Intuitively, the group of firms that are classified as young can be split into *de novo* and *de alio*, each of which will have its relative employment weight and its job creation rate. If, as suggested by recent evidence from Belgium (Geurts and Van Biesebroeck, 2013) *de alio* entrants have lower job creation rate, this would lead to an underestimate of the true proportional contribution of young firms. Thus the figures of proportional

contributions to gross job creation reported in Table 7 are conservative estimates, and the estimates are the more conservative the higher the proportion of *de alio* in the group of young firms.

As shown in Table 7 significant differences still exist across countries when looking at proportional contributions, which are unlikely to be fully explained by measurement error.

It is beyond the scope of this paper to investigate the drivers of these observed differences, but recent evidence suggests that national policies and business environments play a crucial role in fostering the growth of firms (see for example Bravo-Biosca, et al., 2013 and Andrews, et al., 2014) and in allowing resources to be reallocated in the economy. Future research using more detailed sectoral level data built using the same methodology as *Dynemp Express* will allow investigating these issues in more depth.

Table 7. Contribution to job creation by young small and medium sized firms

Expressed as percentage of contribution to employment by young small and medium sized firms, 2001-11

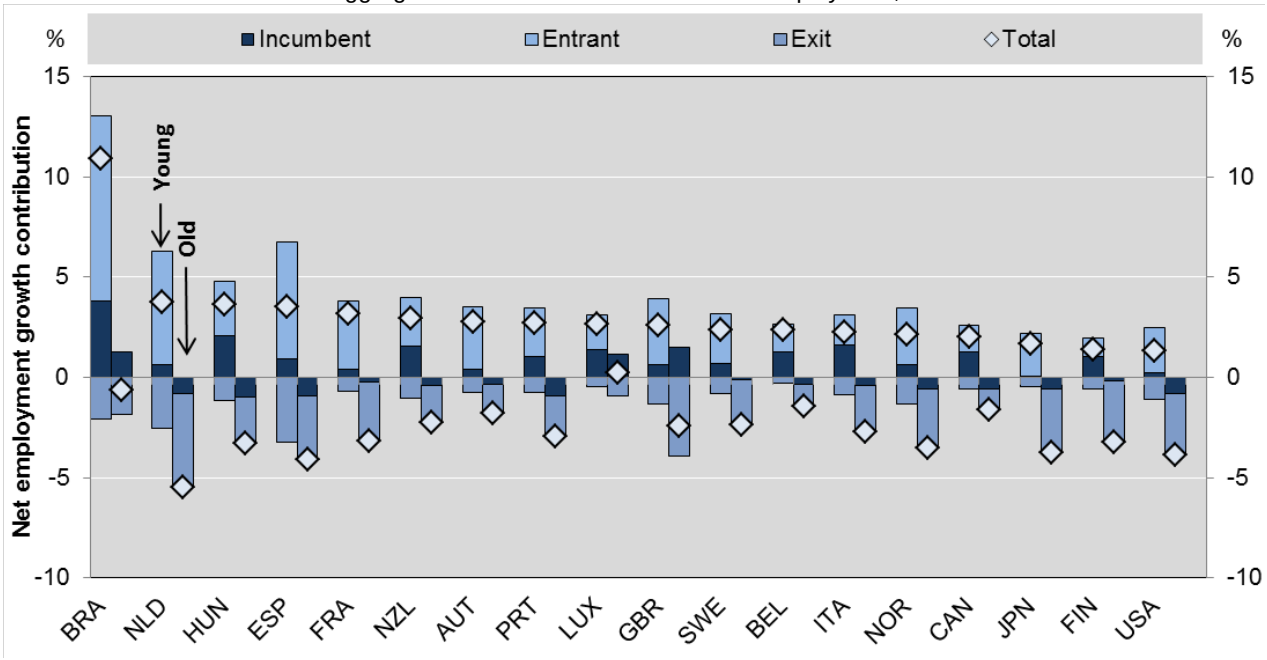
Economy	Proportional Destruction rate	Proportional Creation rate
JPN	128%	377%
BEL	145%	370%
LUX	152%	302%
PRT	119%	295%
CAN	154%	279%
GBR	145%	265%
USA	140%	265%
NZL	144%	263%
FRA	120%	261%
SWE	129%	254%
AUT	139%	252%
FIN	115%	252%
ITA	128%	250%
HUN	122%	241%
ESP	164%	237%
NLD	106%	221%
NOR	109%	202%
BRA	99%	141%

Note: The table is calculated on the values reported in Figure 16. It reports the ratio of the value of the second bar (gross job destruction by young firms over total gross job destruction) and third bar (gross job creation by young firms over total job creation), respectively, over the value of the first bar (share of employment in young firms in total employment). See also the note of Figure 16.

One important issue is the role that entry plays in explaining the disproportionate weight of young firms in employment growth. Figure 18 distinguishes between the contribution of young and old firms (first and second columns in the figure, respectively) to aggregate employment growth to the extensive margins of entry and exit and the intensive margin of net job growth of incumbent firms. Clearly, entry accounts for a significant part of the young firms' positive contribution to employment growth – although to a different extent in different countries – except in Italy and Finland, where the contribution from entry is smaller than the contribution from young incumbents' growth.

Figure 18. Young firms contribute more to aggregate employment growth

Net employment growth contributions by margin of adjustment and by firm age,
as % of aggregate non-financial business sector employment, 2001-2011



Note: Contributions are calculated as the net job creation by the group over total employment in manufacturing, non-financial business services and construction. See Type B measure in Table 5. Young firms are aged 5 years old or less, old firms are at least 6 years old. Averages across all available years. The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

Figure 18 also compares young and old firms to clearly show that the contribution of young incumbent firms to aggregate employment is larger and generally positive while those of older incumbents is always negative. However this figure cannot show the gap in the net growth rate between these two groups of firms because the statistics reported depend on both the actual net growth rates of each group and on their weight in terms of employment in the economy (see Type B measures in Table 5).

Thus, Figure 19 reports growth rates by the respective group (young and old) of incumbents (i.e. conditional on survival), helping to answer the question whether the post-entry growth of young firms is greater than that of older businesses conditional on survival (See Type A measures in Table 5). However these figures should not be considered in isolation, but rather in the context of aggregate employment growth in the economies considered and for the period of analysis. Therefore, the upper pane of Figure 19 illustrates the average employment growth rates from the OECD STructural ANalysis (STAN) Database, while the lower pane shows the average growth rates of young and small units calculated from the *DynEmp*

Express database. A comparison of the two bars for young *vs.* old in the lower pane clearly shows that in all countries the net growth of surviving incumbent young firms is much larger and positive in all cases, while those of older incumbents is often negative. This result is in line with the evidence found in the United States (Haltiwanger et al., 2013), United Kingdom (Butcher and Bursnall, 2013) and Ireland (Lawless, 2012), and confirms the existence of an "up-or-out" dynamic across all the 18 countries considered. The extent of the difference in the net growth rates between old and young varies significantly across countries, with a "net growth gap" between old and young businesses of more than 10% in Belgium, Luxembourg, Canada, and Hungary, but as small as 2% for the United States, France and Japan.

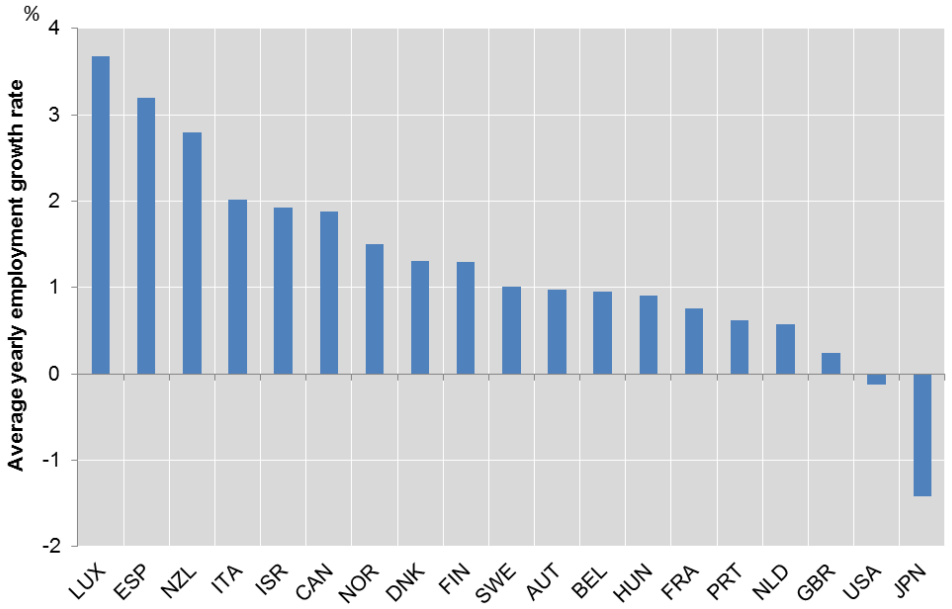
However, as stressed before, the most important take-away from these figures is not an exact ranking of countries but the fact that within the country gaps in net employment growth rates are always in favour of young surviving companies. It should also be noted that the eventual contribution of young and old firms to aggregate employment will depend not only on these growth rates, but also on the fraction of exiting (young) firms as well as on the respective weights of old and young businesses.

The cross-country differences in the role of entry and in the "up-or-out" dynamic reported above might reflect differences in sectoral composition of the economies considered and reflect averages over the ten year period under analysis: Figure B20 to B22 in Annex B provide details of the decomposition in intensive *vs.* extensive margins and Figure B23 to Figure B24 of the dynamics of young and old businesses, separately for manufacturing, business services and construction, while the next section will discuss in more detail how the "up or out" dynamic has changed over time and in particular investigates whether the crisis has affected the role of entry and young firms more than those of older businesses.

The growth of young ventures also depends on the availability of production resources, and on the ease with which resources, namely employment and capital, can be reallocated across units. The restructuring process by which new (more innovative, more productive) production units replace less innovative and less productive ones – known as creative destruction (Schumpeter, 1942) – is reflected in the positive correlation of job creation and job destruction rates in an economy. Figure 20 suggests that the relationship holds true: the scatter plot of job creation rate over job destruction rate across countries, years, age, size classes and macro-sectors, shows that the association of the two variables is significantly positive. Interestingly, the bulk of the scatter plot in Figure 19 is concentrated around the (10%; 10%) coordinates. The average rates of job destruction and job creation are 11% and 12%, respectively. These unweighted averages over the 2001-2011 period and 18 countries are similar to the average annual job creation and job destruction rates reported in previous cross-country evidence for the late 1980s and over the 1990s by Haltiwanger, et al., (2010) for seven OECD countries. [20]

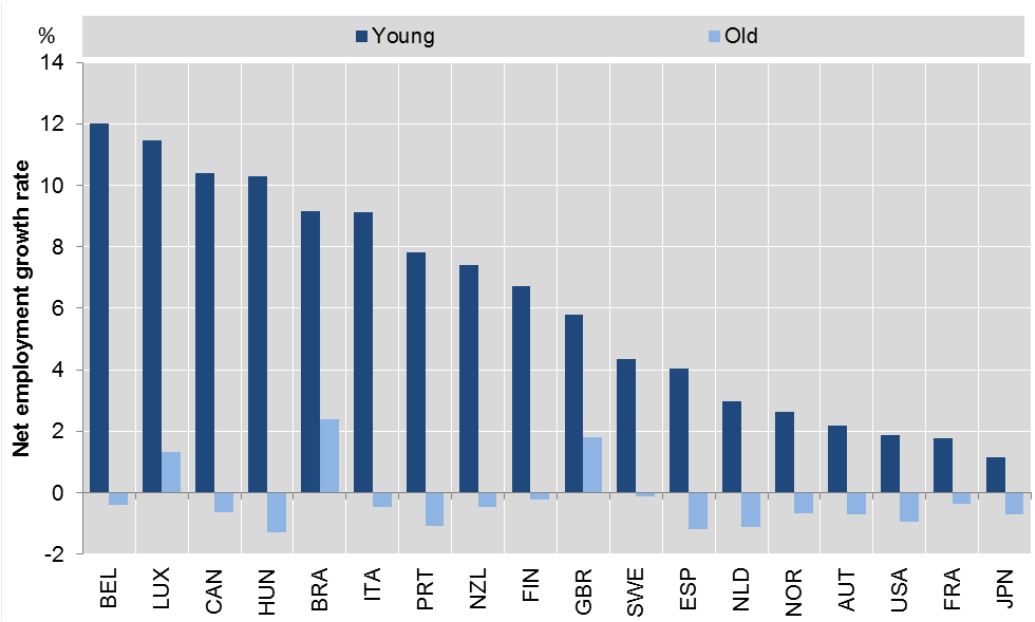
Figure 19. Young firms are more dynamic

A. Non-financial private sector, 2001-2008; OECD STAN database



Note: the measure is calculated as the variation in employment between year *t* and year *t-1* over the average employment in the two years (see type A measure of Table 5). For France the period covered is 2001-2007; for Portugal 2001-2006. For Japan, the sectors "Wholesale and retail trade" (ISIC 3.0 50 to 55) and "Real estate, renting and business services" (ISIC 3.0 70 to 74) are not covered.

B. Net employment growth rates by surviving young and old firms, 2001-2011

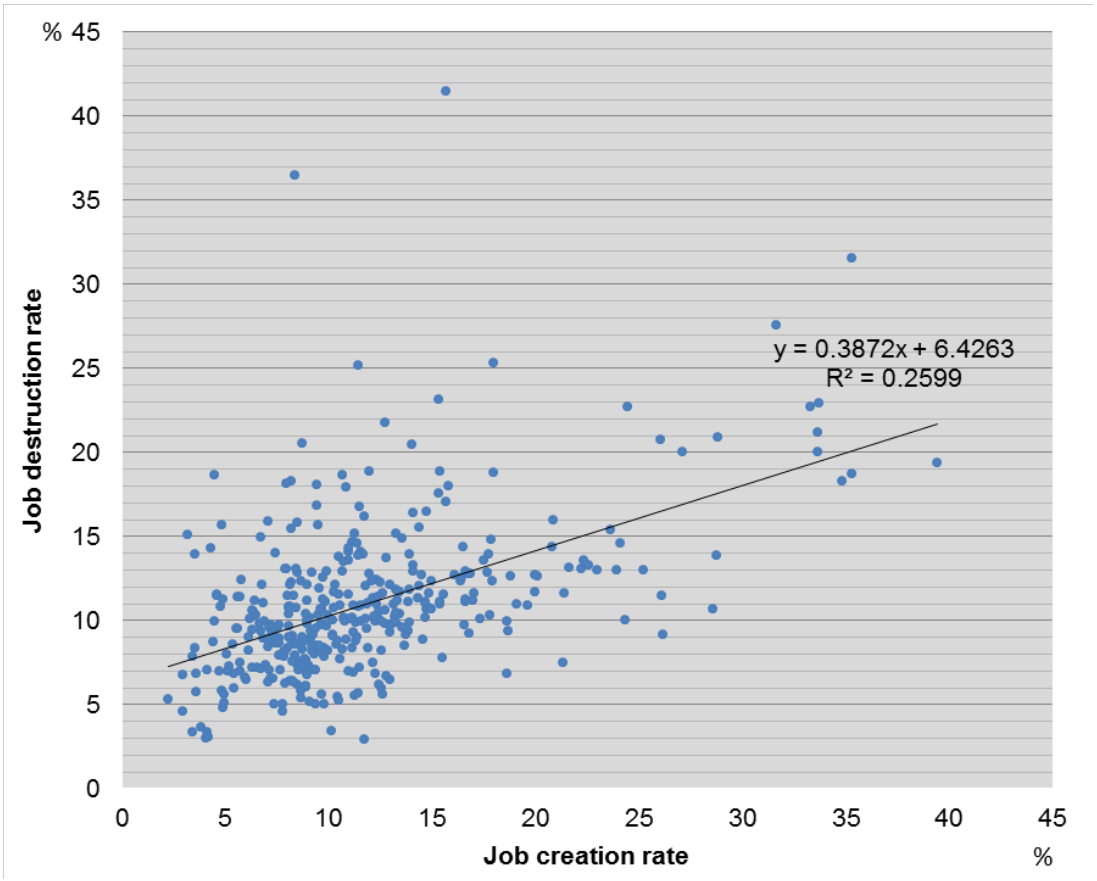


Note: Growth rates are calculated as post-entry net job creation by the group over employment in the group, on the surviving subset of firms (i.e. not taking into account entry or exit). See Type A measure in Table 5. Sectors covered are manufacturing, non-financial business services and construction. Young firms are aged 5 years old or less, old firms are at least 6 years old. Averages across all available years. The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

Source: OECD STAN Database

Figure 20. Job creation and job destruction rates are positively correlated

Scatter plot of job creation and job destruction rates across countries, macro-sectors and years



Note: each dot reports job creation and job destruction rates at the country-year-macrosector cell-level (see Type A measure in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

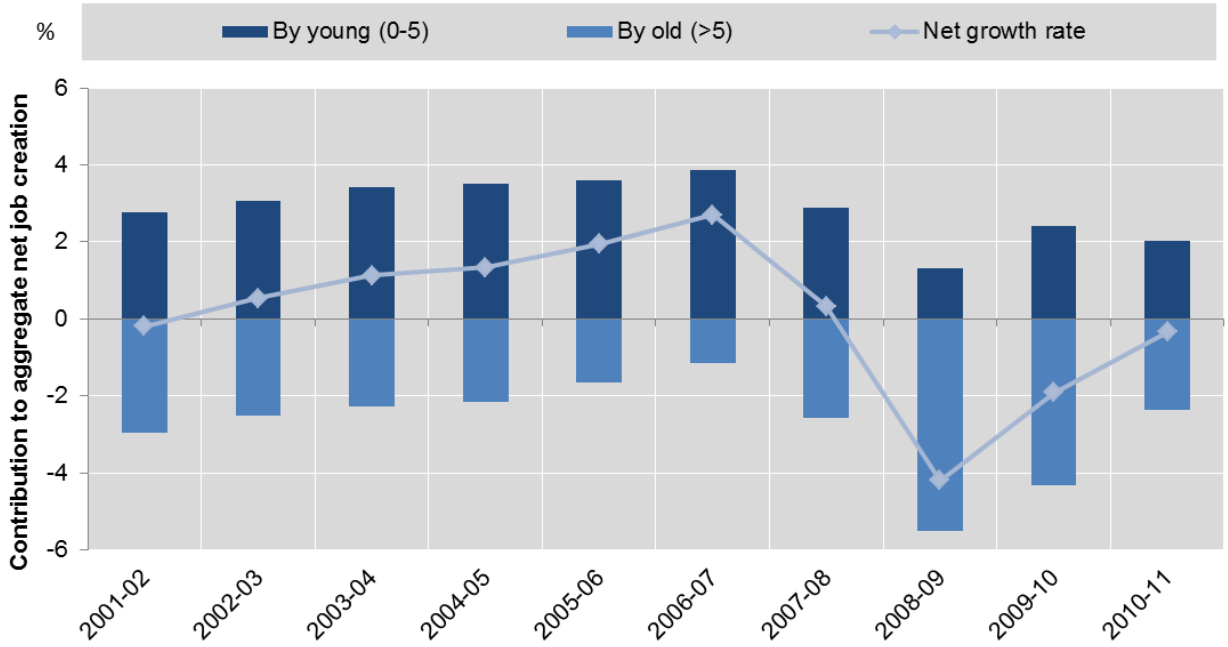
3.5. The impact of the international financial crisis

The Great Recession of 2007-09 may have affected the job creation and job destruction relationship in different ways. Firstly, aggregate employment decreased as more jobs were shed and no new posts were created. Also, workers may have been more reluctant to leave their job if they knew that there were fewer opportunities due to the negative outlook. In addition, the economic downturn starting in 2008 may have affected firms differently according to their size or age. For instance, Fort et al. (2012) find that in the United States the differential in the net job creation rate between young/small and large/mature businesses declines in cyclical downturns. They also find that older small businesses are less responsive to the crisis than small and young firms. Furthermore, as suggested by the model of Caballero and Hammour (2005), younger businesses that would generally benefit from the process of creative destruction engendered by a crisis might not be able to thrive given the lack of credit in times of a financial crisis. This can cause a negative impact on net job creation in the longer run. Therefore, besides job destruction driven by collapsing demand, unfavourable financial conditions may pose an additional hurdle for job creation, especially for those businesses that are in more need of external funding (e.g. younger businesses).

The cross-country database shows that even though young firms might have been affected disproportionally more by the financial crisis, the crisis did not change the fact that net employment growth comes almost entirely from young firms, irrespective of the state of the business cycle (Figure 21). Strong job losses by old firms are even more important in manufacturing, while the generally positive contribution from young firms is more pronounced among non-financial business services (see Figure B23 and B24 in Annex B).

Figure 21. During the crisis, old firms destroyed more jobs

Contributions to aggregate net job creation by firm age

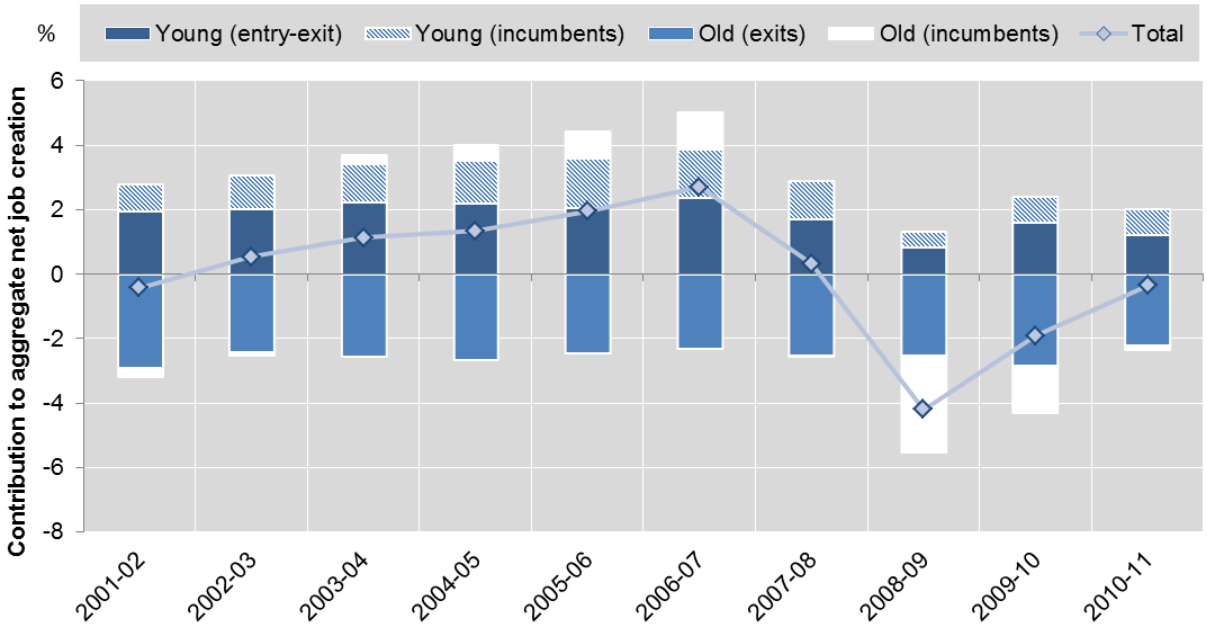


Note: Average across all available countries. Contributions are calculated as net job creation by the age groups over total average employment (See Type B measure in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure 21 above, however, does not discern the impact of the crisis on entry from that on net growth of young firms. Figure 22 confirms that – although firm births account for a large proportion of the sizeable positive contribution to total employment change – incumbent young firms remain a significant and positive source of aggregate net job creation and highlights that downsizing by incumbent old firms, rather than their exit, was a major factor behind the large drop in aggregate employment during the crisis.

Figure 22. During the crisis, old firms shed more jobs by downsizing

Contributions to aggregate net job creation by firm age and by the intensive and extensive margins

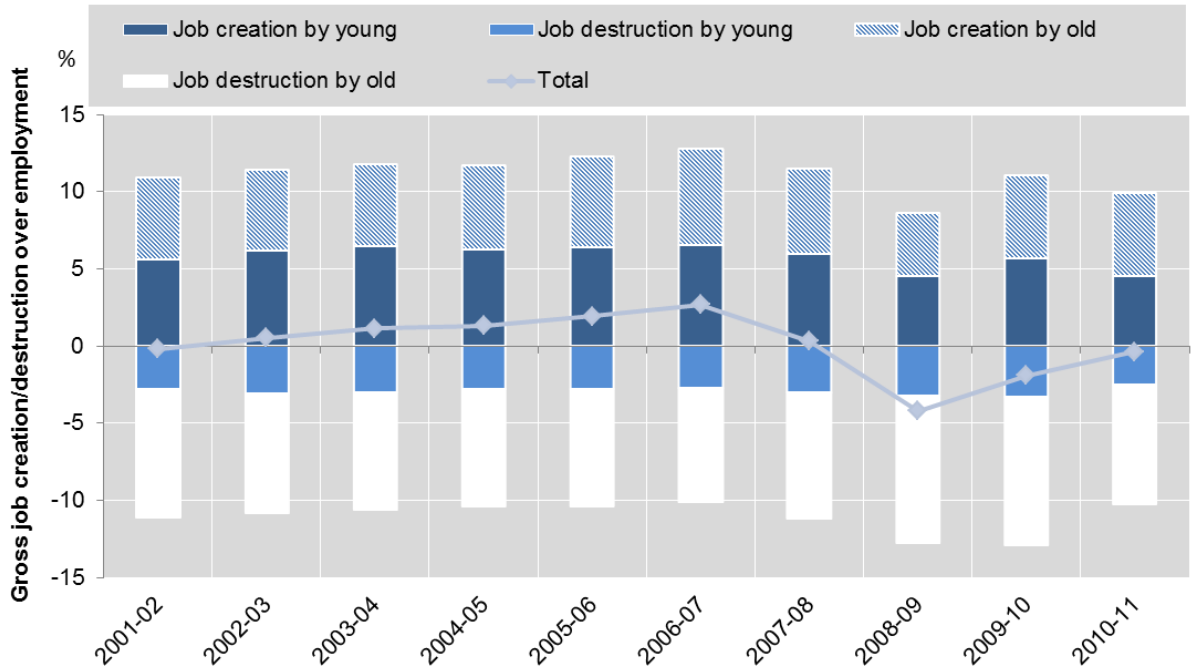


Note: Average across all available countries. Contributions are calculated as the net job creation by age groups and by incumbent status over total average employment (See Type B measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

In terms of net job losses in old firms during the crisis, Figure 23 decomposes for the years 2001 to 2011, net job variations into gross job flows (job creation and job destruction). It shows that both gross flows were affected by the crisis: in 2008-09 job destruction increased and job creation decreased sizably. Furthermore, old firms, due to their larger weight in total employment and in aggregate job flows, were much more important than young businesses in shaping the aggregate pattern of job losses during the crisis.

Figure 23. Job creation by old firms suffered the most during the crisis

Gross job creation and destruction rates by firm age

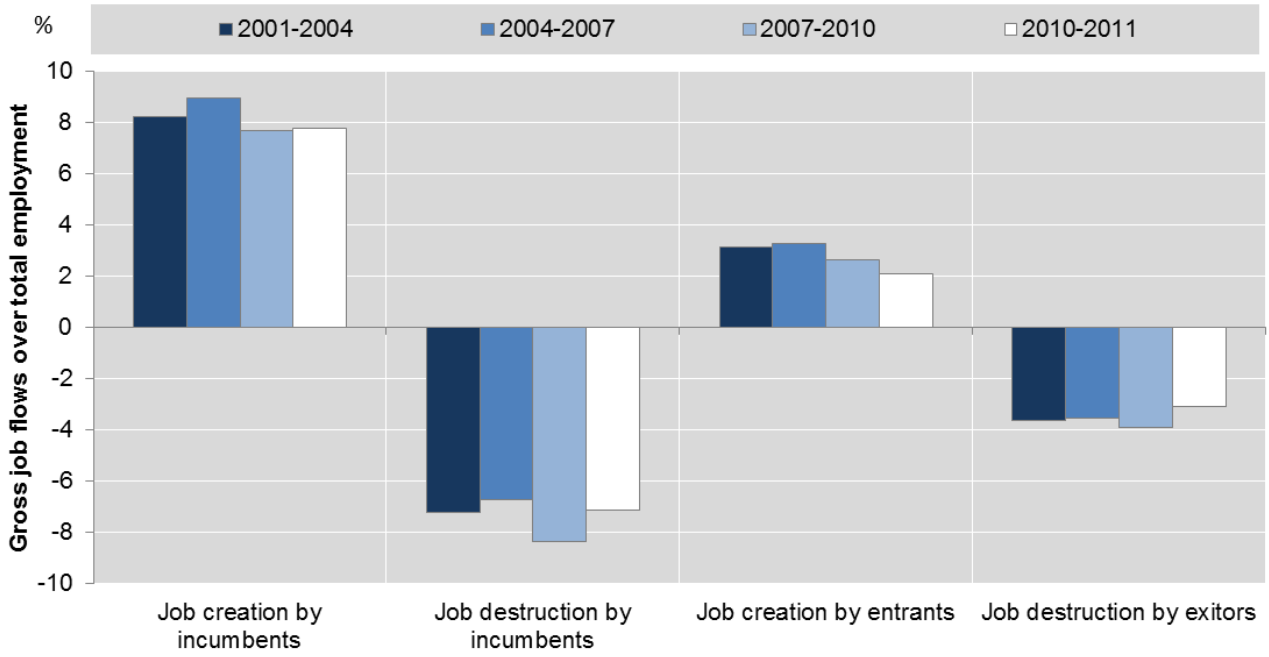


Note: Average across all available countries. Contributions are calculated as gross job creation and gross job destruction by the age group over total average employment (See Type B measure in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Turning away from the age dimension, and breaking down gross job creation and destruction by incumbents (intensive margin) and by entrants and exitors (extensive margins), Figure 24 confirms that exit can only capture a fraction of total jobs destroyed, while downsizing of incumbent businesses explains a larger fraction of job destruction. Furthermore, it may indicate the prolonged effect of unfavourable financial conditions that job creation by entrants did not pick up even in the years 2010 to 2011.

Figure 24. Most job creation and destruction by incumbents, while the role of exit increased during the crisis

Gross job flows broken down into the intensive (incumbents) and extensive (entry-exit) margins



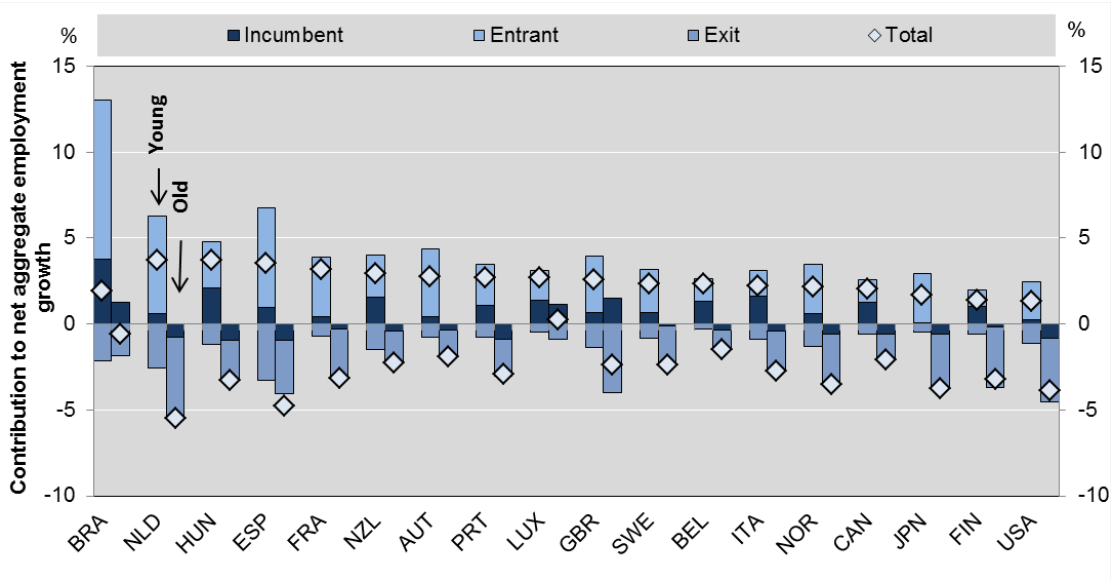
Note: Average across all available countries. Contributions are calculated as gross job creation and destruction by the age groups and by incumbent status over total average employment (See Type B measure in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure 25 goes deeper into understanding the changes in the role of entry and exit and expansion and contractions of young and old businesses before and during the crisis in each of the 18 countries considered. The figure compares the contribution to aggregate net growth of young and old firms and decomposes the contribution by entry, exit and net growth of surviving businesses in the period before the crisis (2001/02-2006/07) and during the crisis (2007/08-2009/10). The figure reveals the negative impact of the crisis on the intensive margin, both through the lowering of job expansion of young firms and the higher contraction of employment in older firms. Furthermore, the exit of older businesses also contributed significantly to the employment declines. This figure – together with Figure 22 above – has the additional advantage of breaking out the possible impact of a mis-measurement of M&A activity on the conclusions drawn above. Although evidence shows that the number of M&A deals dropped during the crisis in the United States and Europe alike (see Gatti and Chiarella, 2013), the figure suggests that changes in intensive margins played a more important role in driving the aggregate figures and differences across countries.

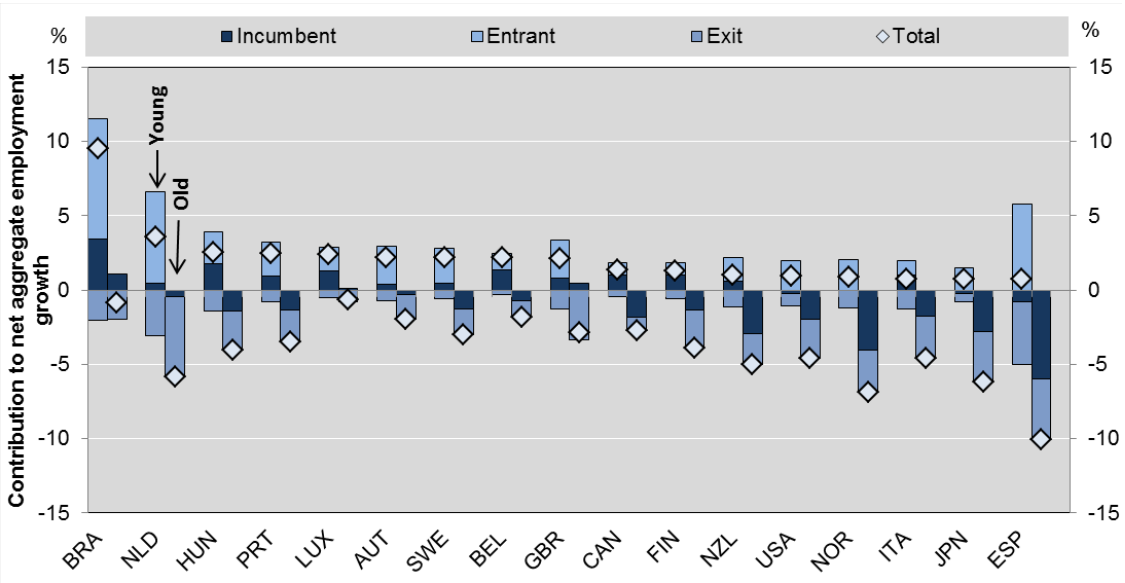
Figure 25. Contribution of young and old firms to net aggregate employment growth

By margin of adjustment, as % of aggregate non-financial business sector employment

Pre-crisis (2001-2007)



During the crisis (2007-2010)



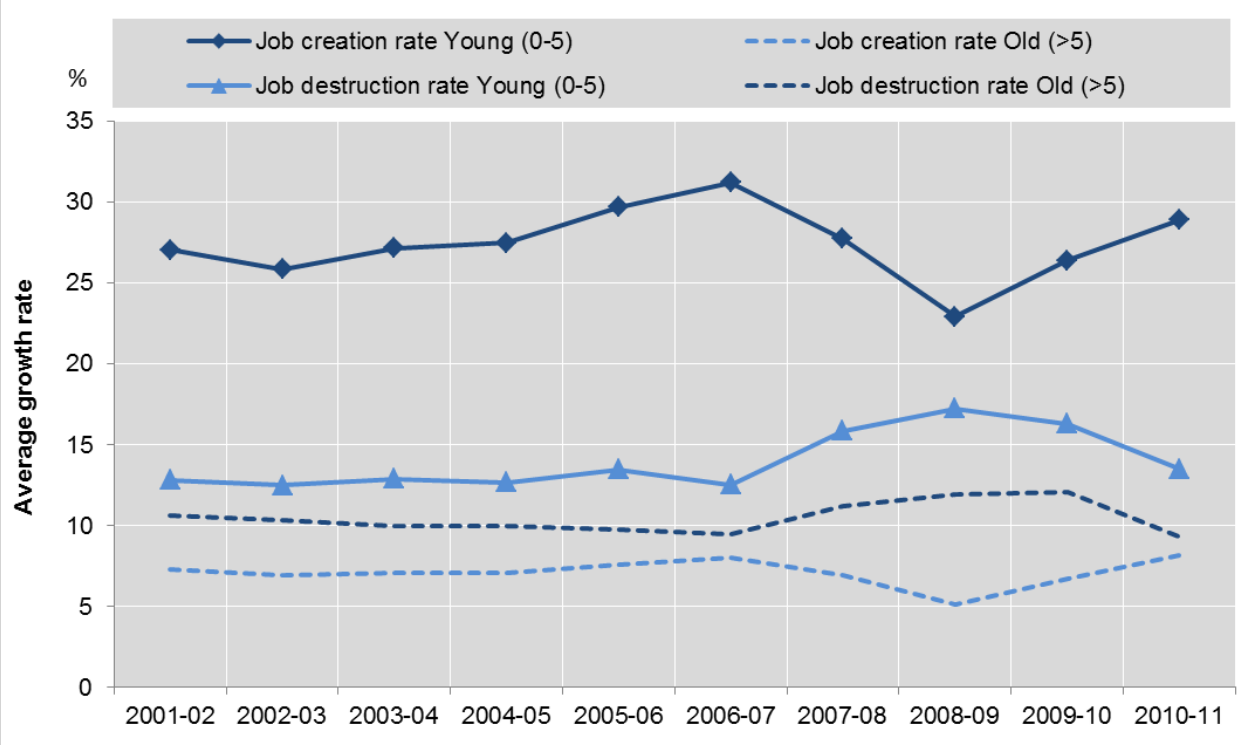
Note: Contributions are calculated as the net job creation by the group over total employment in manufacturing, non-financial business services and construction. See Type B measures in Table 5. Young firms are aged 5 years or less, old firms are at least 6 years old. Averages across all available years in the two periods indicated. The period covered is 2001-2011 for Belgium, Canada, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level. Data for Canada refer only to organic employment changes and abstract from merger and acquisition activity.

The tendencies presented thus far have concentrated on the *aggregate* impact of employment dynamics by firm groups. These impacts are a result of both the *weight* and the "group-level" *dynamics* of these firm groups (compare Type A and Type B measures in Table 5). In order to better understand the reaction of various firm groups (i.e. young *vs*. old, small *vs*. large, etc.), the focus below is shifted from aggregate contributions to group-level dynamics.

Figure 26 shows that young firms' employment dynamics were more affected during the "boom" years before the crisis and the crisis itself than old firms, both on the job creation and on the job destruction margin. The Figure also seems to suggest that while the decline in job creation was sharper than the increase in job destruction both flows were affected and for both younger and older businesses.

Figure 26. Job creation and destruction rate by young and old firms

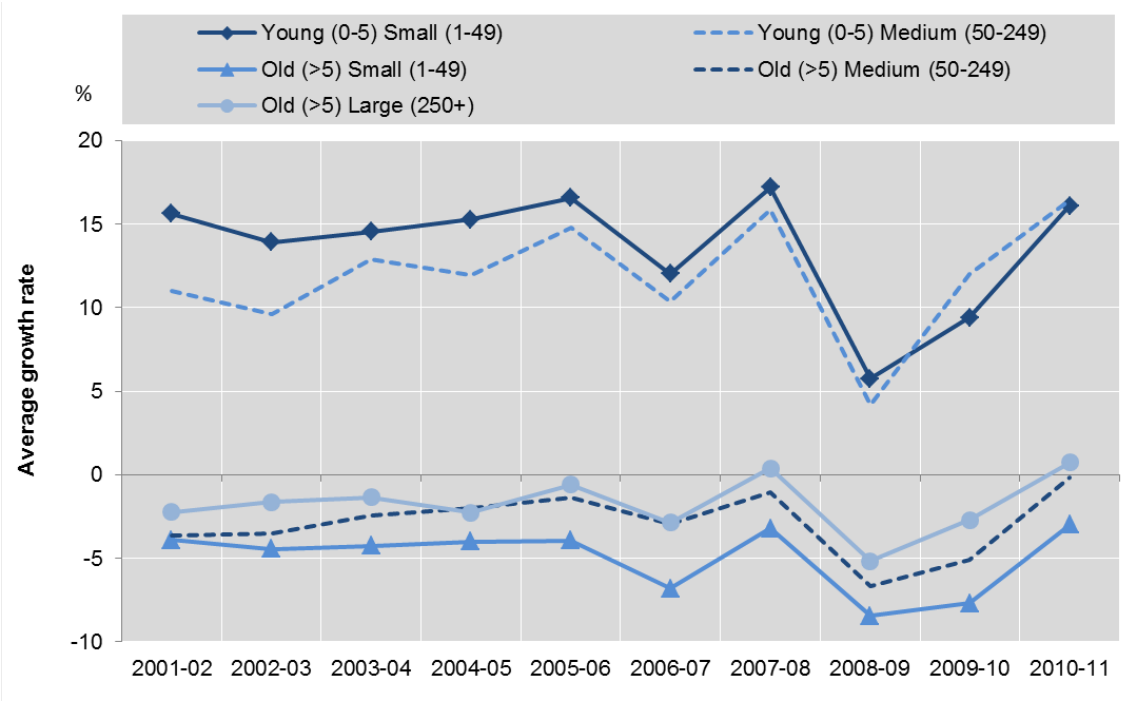
Average net growth rate over participating countries, total private sector



Note: Average across all available countries. Job creation and destruction rates are calculated as job creation or destruction by the group over employment in the group (See Type A measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors considered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure 27. No matter their size, young firms recovered faster from the crisis

Average net growth rate over participating countries, total private sector

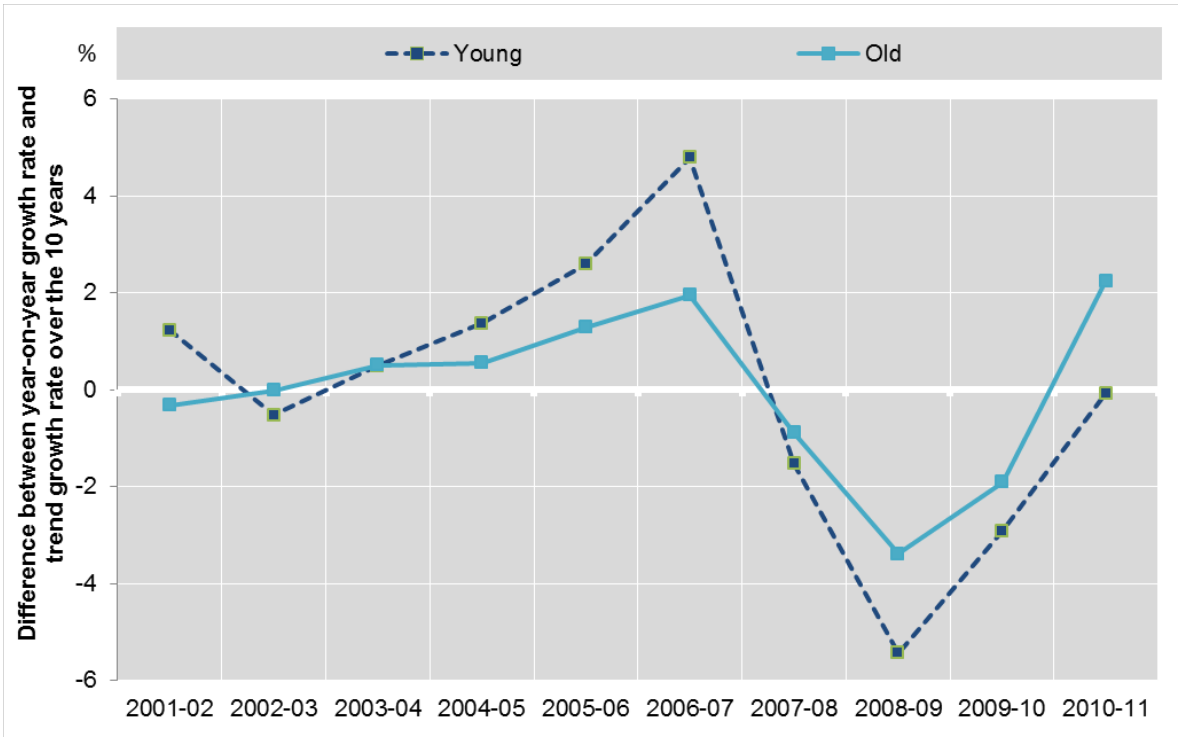


Note: Average across all available countries. Growth rates are calculated as net job creation by the group over employment in the group (see Type A measure in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure 27 shows the combined net effect of the crisis on job creation and job destruction, i.e. shows the impact of the crisis on net job growth separately for young and old businesses and splits these two groups according to their size. The stronger impact of the crisis on net job growth of younger businesses is shown clearly in the figure: the cross-country average differential net employment growth rate between young small firms and old small firms is about 20% just before the crisis, and drops to less than 15% during the financial crisis in 2008/09. Figure 28 further emphasises it, highlighting the larger drop in the net growth rate of young businesses during the crisis, relative to the average growth rate over the full period.

Figure 28. The Great Recession hit young firms relatively harder

Net growth rate in differences from the 2001-11 average



Note: Average across all available countries. Net growth rates are calculated as net job creation over total average employment (see Type A measure in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Spain, Italy, Luxembourg, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

These statistics, however, might be driven by the differential impact of the crisis not only across firms of different age and size but also across sectors and countries. Thus, section 4.2 turns to econometric analysis to describe the differential impact of the crisis on firms in different age and size groups, conditional on unobservable country, year and sector specific factors.

4. ECONOMETRIC ANALYSIS

4.1 The role of age and size in explaining gross job flow rates and net growth

This section presents the results from regression analyses of gross job flows and net job growth rate by country, year, macro-sector, and group of firms. The results show that the higher net growth rate and dynamism of young and/or small firms is robust to controlling for country-specific factors like idiosyncratic shocks and the sectoral structure of the economy. Section 4.2 investigates in greater depth the reaction of the different group of firms to the "Great Recession" of 2007-9.

Table 8 reports estimates of the following equation:

$$(1) \qquad y_{ijsct} = \alpha + \sum_{i=1,2} \beta_i Ageclass_i + \sum_{j=1,2,3} \gamma_j Sizeclass_j + I_s + \tau_{ct} + \varepsilon_{ijsct},$$

where *i* indexes age classes, *j* size classes, *s* macro-sectors, *c* countries, and *t* years; I_S is a macro-sector fixed effect, and τ are country-year fixed effects. The dependent variable *y* is alternatively the ratio of gross job creation over average total employment across the two periods, the ratio of gross job destruction over average total employment across the two periods, or the net growth rate (defined as the ratio of net job creation over average total employment across the two periods).[21] β and γ are the vectors of parameters of interest, and show whether there are significant differences in the dependent variables over the different size and age groups. The model is estimated on an unbalanced panel aggregated along the following dimensions: two age classes (below or equal to five years old; and six years old or more), three size classes (small firms below 50 employees; medium firms between 50 and 249 employees; and large firms with 250 employees or more); all available years up to 2010; three macro-sectors (manufacturing, non-financial business services, and construction) and all available countries.[22]

Columns 1 to 3 of Table 8 report estimates for when firms are only grouped in 3 size classes (small, medium and large) and the age characteristics of firms is ignored. Columns 4 to 6 classify firms according to both their size and age profiles and report coefficients for young (5 years old or less) and "small" and "medium", with old and large being the reference groups. Columns 1 to 3 confirm the general belief that small and medium sized firms (SMEs) are characterised by higher gross job creation (column 1) and, to a lesser extent, by higher job gross destruction (column 2) than larger businesses, even after controlling for country-year and sector fixed effects. In fact, the group of small firms has a 13.6 percentage point (p.p.) higher gross job creation (column 1) and 6.8 p.p. higher net employment growth rates (column 3) on average in the countries and time period considered than larger businesses

The estimates reported in columns 4 to 6 show that once the age profile of firms is controlled for, the difference in gross job creation rates and net employment growth of SMEs relative to large businesses drops to less than a quarter of the estimates reported in column 1. Conversely, the SME coefficients in the job destruction regression are only marginally affected by the inclusion of the "young" dummy. Correspondingly, the "young" dummy coefficient is significantly larger in column 4 than in column 5, suggesting that controlling for their size, young firms have much higher gross job creation rates than job destruction rates relative to older businesses, Finally, column 6 shows that on average young firms have larger net job creation than older firms, while, the group of "small" and "medium" firms present a lower net job growth rate than large firms.

The results of the estimation of Equation (1) presented in Table 8 include separate controls for age and size characterstics of firms, more interestingly Equation (2) looks at differences in job creation and

destruction rates and net employment growth across different age-size groups; i.e. assessing the role of firm age within individual size classes on the one hand, and the role of firm size within age groups on the other hand. [23]

$$(2) \qquad y_{ijsct} = \alpha + \sum_{ij} \delta_{ij} Ageclass_i * Sizeclass_j + \ I_s + \tau_{ct} + u_{ijsct}$$

Table 9 reports estimates of Equation (2). Column 1 shows that all groups of firms have higher gross job creation rates than old-large firms (the reference group). Young-small and young-medium firms, however, show by far the largest differentials. Column 2 reports estimates of differentials in gross job destruction and shows that old-large firms destroy relatively fewer jobs than the other groups of firms, with the young small firms presenting again the largest gross job destruction rates. Finally, column 3 reports the net job growth estimates, which confirm the descriptive evidence discussed in section 3.4: the group of young-small and young-medium firms are the most dynamic group and present the largest average net job growth rates. On the other hand, amongst older firms the small and medium group have the lowest growth rates.

As discussed when presenting the descriptive evidence, some of the greater dynamism of young firms can be attributed to the positive contribution of entry. In fact, the results presented in Table 8 depend on the firms' entry and exit dynamics (extensive margin), as well as on the expansion and contraction of surviving businesses (intensive margin). Therefore Table 8 and Table 9 report estimates of equations (1) and (2) respectively when restricting the analysis to post-entry firm performance. A comparison of columns 4 and 6 in Table 6 and Table 5 with column 1 and 3 of Table 9 and Table 7 show that the magnitude of the gross job creation and net job growth rate differentials of young firms – whatever their size – significantly decreases once focusing only on post-entry performance, while their sign and significance are not affected. Thus, the main results are confirmed also when looking at the intensive margin of post-entry gross job creation and net growth.

4.2 The impact of the crisis

The regression analysis also allows for the assessment of whether the 2007-9 financial crisis has particularly affected specific groups of firms. This is done by allowing the differential size-age effect to vary over the cycle, through the use of interaction variables between the different age-size categories and a "crisis" dummy that is equal to one in the two-year period 2007-9. The coefficients of the interaction terms indicate whether there were *additional* differences in job creation and destruction rates during the crisis for any specific group of firms relative to both the same group in "normal" times and relative to other groups of firms in the period of the crisis.

Consistent with the descriptive evidence shown in previous sections (namely Figure 26, Figure 27, and Figure 28), the regression estimates show that young firms were most affected by the crisis. Contrary to the evidence found in the United States (Foster et al., 2013) suggesting that only the job creation flows of young firms are affected by the crisis, cross-country estimates from the *DynEmp* project show that both the gross job creation and gross job destruction rates of young firms were particularly hit by the recession. On the other hand, old-small firms saw only a small but significant increase in their job destruction rates relative to old-large businesses (while their gross job creation rates remained unaffected).

The regression results are reported in Table 10. As in previous estimates, the reference category is old-large, and therefore dummy coefficients show the differential effects with respect to this group. The interaction of the crisis dummy with the young-small and young-medium group dummies are negative and significant for job creation (column 1), positive and significant for job destruction (column 2) and, consequently, negative and significant for net growth rate (column 3). The magnitude of the coefficients is

very similar for young-small and young-medium firms, suggesting that over the crisis the net growth rate of young firms was on average 4 percentage points lower than in the pre-crisis period, as compared to old-large firms in the same period, but still positive at 13.9 pp for young small and 10.6 pp for young-medium firms.

At a first look, these results may appear to be in contradiction with the conclusions drawn from Figures 21, 22, and 23, which show that old firms were the largest contributor to aggregate job destruction during the crisis. However, this apparent inconsistency is easily explained by the fact that *i)* old firms are always net job destroyers and this continued over the crisis, and *ii)* old firms represent a larger share of total employment and therefore when looking at measures normalised on the total economy's employment (measure type B in Table 5), as is the case in the aforementioned figures, their role is magnified with respect to younger firms. Conversely, the regression analysis here is done on "type A" measures, i.e. normalised on total employment of the reference group (i.e. age-size cell), in order to obtain a cleaner picture of the differential impact of the crisis on different age-size group dynamics, irrespective of their relative weight in the economy. In this case the regression estimates are in line with the evidence emerging from similar measures, e.g. in Figures 25 and 26. All in all, the analysis suggests that young firms were more sensitive to the business cycle and suffered relatively more from the crisis, but they remained more dynamic.

Finally, Table 13 reproduces the same regression as in Table 12, but excluding the contribution of entry to job creation.

Table 8. Gross job creation and destruction and net growth rate of firms by size and age groups

Regression of gross job creation, gross job destruction and net growth rate on group fixed effects

	1	2	3	4	5	6
Dependent variable	**Gross Job Creation ratio**	**Gross Job Destruction ratio**	**Net Growth Rate**	**Gross Job Creation ratio**	**Gross Job Destruction ratio**	**Net Growth Rate**
Young				0.216***	0.031***	0.185***
				(0.003)	(0.002)	(0.003)
Small	0.136***	0.068***	0.068***	0.028***	0.052***	-0.025***
	(0.005)	(0.003)	(0.005)	(0.003)	(0.003)	(0.004)
Medium	0.106***	0.038***	0.068***	-0.000	0.022***	-0.022***
	(0.005)	(0.003)	(0.005)	(0.003)	(0.003)	(0.004)
Macrosector F.E.	YES	YES	YES	YES	YES	YES
Country X Year F.E.	YES	YES	YES	YES	YES	YES
Observations	2,020	2,020	2,020	2,020	2,020	2,020
R-squared	0.288	0.580	0.238	0.816	0.621	0.710

Note: The left hand side variables are rates as defined in Table 5 as Type A measures. The reference categories are Old (age >5) and Large (size 250+). Young-large firms are dropped from the sample as this group of firms is likely to be affected by measurement error. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9. Gross job creation and destruction and net growth rate of firms by size-age groups

Regression of gross job creation, gross job destruction and net growth rate on group fixed effects

	1	2	3
Dependent variable	**Gross Job Creation ratio**	**Gross Job Destruction**	**Net Growth Rate**
Young-Small	0.255***	0.083***	0.172***
	(0.003)	(0.003)	(0.004)
Young-Medium	0.204***	0.054***	0.150***
	(0.006)	(0.004)	(0.006)
Old-Small	0.017***	0.053***	-0.036***
	(0.003)	(0.003)	(0.004)
Old-Medium	0.011***	0.022***	-0.011***
	(0.003)	(0.003)	(0.004)
Macrosector F.E.	YES	YES	YES
Country X Year F.E.	YES	YES	YES
Observations	2,020	2,020	2,020
R-squared	0.821	0.621	0.718

Note: The left hand side variables are rates as defined in Table 5 as Type A measures. The reference category is Old-Large (age >5; size 250+). Young-large firms are dropped from the sample as this group of firms is likely to be affected by measurement error. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10. The group of small and young firms is the most dynamic one also excluding entry

Regression of gross job creation, gross job destruction and net growth rate on group fixed effects excluding entrants

	1	2	3	4	5	6
Dependent variable	**Gross Job Creation ratio**	**Gross Job Destruction ratio**	**Net Growth Rate**	**Gross Job Creation ratio**	**Gross Job Destruction ratio**	**Net Growth Rate**
Young				0.087***	0.044***	0.043***
				(0.002)	(0.002)	(0.002)
Small	0.064***	0.075***	-0.012***	0.021***	0.053***	-0.033***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Medium	0.050***	0.043***	0.007*	0.007***	0.021***	-0.014***
	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)
Macrosector F.E.	YES	YES	YES	YES	YES	YES
Country X Year F.E.	YES	YES	YES	YES	YES	YES
Observations	2,020	2,020	2,020	2,020	2,020	2,020
R-squared	0.409	0.568	0.482	0.738	0.638	0.548

Note: The left hand side variables are rates as defined in Table 5 as Type A measures. The reference categories are Old (age >5) and Large (size 250+). Young-large firms are dropped from the sample as this group of firms is likely to be affected by measurement error. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11. The group of small and young firms is the most dynamic also excluding entry (interacted dummies)

Regression of gross job creation, gross job destruction and net growth rate on group fixed effects excluding entrants

	1	2	3
Dependent variable	**Gross Job Creation ratio**	**Gross Job Destruction ratio**	**Net Growth Rate**
Young-Small	0.111***	0.098***	0.013***
	(0.002)	(0.003)	(0.004)
Young-Medium	0.090***	0.065***	0.025***
	(0.003)	(0.004)	(0.005)
Old-Small	0.017***	0.053***	-0.036***
	(0.002)	(0.003)	(0.003)
Old-Medium	0.011***	0.022***	-0.011***
	(0.002)	(0.003)	(0.003)
Macrosector F.E.	YES	YES	YES
Country X Year F.E.	YES	YES	YES
Observations	2,020	2,020	2,020
R-squared	0.741	0.638	0.549

Note: The left hand side variables are rates as defined in Table 5 as Type A measures. The reference category is Old-Large (age >5; size 250+). Young-large firms are dropped from the sample as this group of firms is likely to be affected by measurement error. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 12. The "Great Recession" has mostly affected young and small firms

Regression of gross job creation, gross job destruction and net growth rate on group fixed effects, including an interaction of the group fixed effects with the "crisis" dummy

	1	2	3
Dependent variable	**Gross Job Creation ratio**	**Gross Job Destruction ratio**	**Net Growth Rate**
Young-Small	0.260***	0.078***	0.182***
	(0.004)	(0.004)	(0.005)
Young-Medium	0.212***	0.051***	0.161***
	(0.007)	(0.004)	(0.007)
Old-Small	0.017***	0.049***	-0.032***
	(0.003)	(0.003)	(0.004)
Old-Medium	0.011***	0.019***	-0.009**
	(0.003)	(0.003)	(0.004)
Young-Small X Crisis	-0.018**	0.025***	-0.043***
	(0.008)	(0.007)	(0.011)
Young-Medium X Crisis	-0.029***	0.021**	-0.050***
	(0.011)	(0.010)	(0.013)
Old-Small X Crisis	0.004	0.013**	-0.010
	(0.005)	(0.007)	(0.008)
Old-Medium X Crisis	0.006	0.011*	-0.005
	(0.006)	(0.007)	(0.008)
Macrosector F.E.	YES	YES	YES
Country X Year F.E.	YES	YES	YES
Observations	1,915	1,915	1,915
R-squared	0.833	0.632	0.728

Note: The left hand side variables are rates as defined in Table 5 as Type A measures. The reference category is Old-Large (5+; 250+). Firms and entrants are excluded from the calculation of job dynamics. Young-large firms are dropped from the sample as this group of firms is likely to be affected by measurement error; the "crisis" dummy is equal to one for the period 2007-8 and 2008-9. Observations for France are dropped from the sample as crisis years are not covered. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 13. The "Great Recession" has mostly affected young firms also excluding entry

Regression of gross job creation, gross job destruction and net growth rate on group fixed effects excluding entrants, including an interaction of the group fixed effects with the "crisis" dummy

	1	2	3
Dependent variable	**Gross Job Creation ratio**	**Gross Job Destruction ratio**	**Net Growth Rate**
Young-Small	0.113***	0.093***	0.021***
	(0.003)	(0.004)	(0.004)
Young-Medium	0.093***	0.063***	0.030***
	(0.004)	(0.005)	(0.005)
Old-Small	0.017***	0.049***	-0.032***
	(0.002)	(0.004)	(0.004)
Old-Medium	0.011***	0.019***	-0.009**
	(0.002)	(0.003)	(0.004)
Young-Small X Crisis	0.002	0.024***	-0.021**
	(0.005)	(0.008)	(0.009)
Young-Medium X Crisis	0.001	0.018*	-0.016
	(0.007)	(0.011)	(0.011)
Old-Small X Crisis	0.004	0.013**	-0.010
	(0.004)	(0.007)	(0.008)
Old-Medium X Crisis	0.006	0.011	-0.005
	(0.004)	(0.007)	(0.008)
Macrosector F.E.	YES	YES	YES
Country X Year F.E.	YES	YES	YES
Observations	1,915	1,915	1,915
R-squared	0.752	0.649	0.547

Note: The left hand side variables are rates as defined in Table 5 as Type A measures. Young-large firms are dropped from the sample as this group of firms is likely to be affected by measurement error. The reference category is Old-Large (5+; 250+). Entrants are excluded from the calculation of job dynamics. The "crisis" dummy is equal to one for the period 2007-8 and 2008-9. Observations for France are dropped from the sample as crisis years are not covered. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5. CONCLUSION AND NEXT STEPS

This report has provided a detailed description of the on-going distributed microdata analysis project called *DynEmp* aimed at understanding employment dynamics and also presented a preliminary set of results.

- First, the analysis showed significant cross-country differences not only in the weight that small firms have in terms of employment, but also in their age profile, e.g. in some countries, small firms are systematically older.
- Second, it has been carefully documented that the group of young firms, i.e. firms that are five years of age or younger, contribute positively to aggregate job creation in nearly every period and country considered. This was shown to be driven to a large extent by the contribution from entrants as well as higher growth rates of surviving young businesses.
- Third, there is evidence of a clear decline in start-up rates found across a wide set of countries and the existence of an "up-or-out" dynamic for young businesses.
- Fourth, the analysis provides evidence on the growth performance of young firms, showing again striking cross-country differences in the data.
- Fifth, the report shows that young firms were relatively more affected by the Great Recession compared to old ones, both via job creation and via job destruction. However, the main drivers of the aggregate decline in employment were old firms, given their larger weight in the economy. Moreover, the contribution to net employment growth of young firms remained positive during the crisis.
- And, finally, during the Great Recession there has been a further decrease in the entry rate of new firms, which was already steadily declining in most countries since the beginning of the last decade. Given the importance of firm entry on a host of economic outcomes beyond job creation (e.g. innovation, competition, productivity) this finding raises particular concerns.

Going forward, the aim of further analyses are, on the one hand, to link the observed cross-country differences in firms' dynamism to national policies and framework conditions, affecting entrepreneurship, experimentation and the growth of firms. This will rely on the second phase of the data collection *DynEmp* v2, with more detailed industry breakdowns, as well as having a closer look on high-growth enterprises. On the other hand, in order to gain a better understanding of the link between employment dynamics and economic growth and productivity, a parallel analysis and data collection is planned, called *MultiProd*, collecting micro-aggregated data on output and productivity, in a similar manner to *DynEmp*. This will allow the subsequent analysis to shed light on questions such as what drives productivity differences at the aggregate level, why some countries are better at allocating resources to more productive firms than others, and what is the role of policies in achieving better outcomes both in terms of productivity and of employment.

ANNEX A: THE *DYNEMP EXPRESS* DATABASE

The *DynEmp Express* routine

The dataset used in the report has been produced during the first phase of the *DynEmp* project, and is based on the "*DynEmp Express*" routine. The routine has been run by national representatives on business registers or comparable sources during the first quarter of 2013. The methodology and the aims of the *DynEmp* project have been extensively discussed in a number of meetings of the Working Party in Industrial Analysis at the OECD headquarters in Paris since 2011.

The "*DynEmp Express*" database includes data for the following economies: Austria, Belgium, Brazil, Canada, Finland, France, Hungary, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States. The default period is 2001-2011, however for some countries the later or earlier years are not available. There are some qualifications regarding the coverage, which are reported in Table A2.

DynEmp Express has been designed as a simplified routine which could also run quickly in large datasets; to this end, the aggregation levels are relatively coarse, and the number of statistics calculated limited. More precisely, the routine collects statistics aggregated to the level of the three broad macroeconomic sectors (manufacturing, construction, and market services excluding financial services), by year, size class and age class. The information is further disaggregated down by surviving, entering, and exiting units. For each two-year interval, an incumbent is a unit that exists both at year *t* and *t+1*; an entrant is a unit that does not exist at year *t* but it exists at year *t+1*; symmetrically, an exitor is a unit that exists in t but does not exist at *t+1*.

In order to reduce computation time and to increase homogeneity across countries, units that never grow over one employee over the observed period are dropped from the main sample, and stored in a separate dataset. The same procedure is adopted for units that appear for just one year in the dataset.

The employment size classes used are the following: 1-9; 10-49; 50-99; 100-249; 250-499; 500 or more; while the age classes considered are: 0; 1-2; 3-5; 6-10; 11 or more. Size is defined on the average of employment at time *t* and *t+1* for incumbents, on employment at time *t* for exitors, and on employment at time *t+1* for entrants. Age is defined at the end of the observed interval (year *t+1*). The age and size classifications are summarised in Table 3 of the main text.

For each cell, the routine calculates the following statistics: total employment, number of units, gross job creation, gross job destruction. Gross job creation is calculated as the sum of employment variations of all units with positive employment growth and, symmetrically, gross job destruction is calculated as the sum of employment variations (in absolute values) of all units with negative employment growth.

Source data characteristics

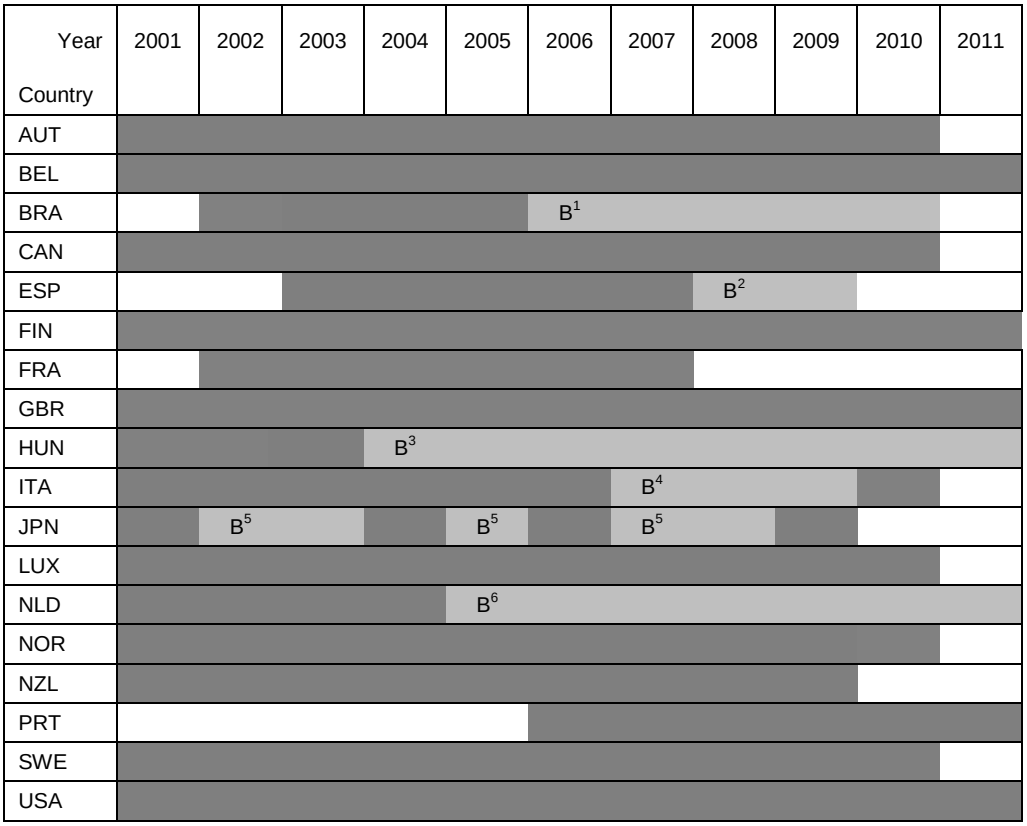
Tables from A1 to A8 present a detailed description of the national source databases. Specifically, Table A1 lists the names of the national data sources; Table A2 describes the coverage of the data in each country, as well as any possible breaks in the data or in the method it is recorded; Table A3 summarises entry and age information; Table A4 lists the sectoral classifications and coverage of the source data; Table

A5 reports the unit level of the data (plant, enterprise or group); finally, Tables A6, A7, and A8 report information on the employment variable.

Table A1. National data sources

AUT	Social security files
BEL	Business register
BRA	Annual Social Information Report (RAIS)
CAN	Enriched File Environment that contains BRA and multiple administrative data and surveys
ESP	Business Register
FIN	Business register, Structural Business Statistics Database
FRA	FICUS
GBR	Business Structure Database (BSD)
HUN	Tax records
ITA	BRA - ASIA
JPN	Establishment and Enterprise Census (EEC) and Census of Manufacturers
LUX	Register
NLD	Business Register (BRA, plant and enterprise level) Additional information available in SBS
NOR	Business Register (BRA) / Fiscal or tax register (F)
NZL	Comprehensive LEED data constructed from Longitudinal Business Frame and monthly Pay-As-You-Earn tax filing. Business Frame largely maintained using tax and company office records
PRT	Instituto dos Registos e do Notariado
SWE	Tax register
USA	Business register

Table A2. Data coverage over time and by country



Notes: Data coverage as included in the current analysis. 1. Change in economic activities classification from NACE Rev1 to NACE Rev2 in 2006. 2. Changes related to the European legal frame on BRA (177/2008) 3. Change in accounting requirements in 2004; employment and turnover thresholds for double bookkeeping lowered, resulting in more small firms appearing in the sample from 2004 onwards. 4. Change in sectoral classification (from NACE 1.1 to NACE 2). 5. Only manufacturing. 6. Change in the business register coding restricting the longitudinal analysis.

Table A3. Entry and age

Country	First appearance	Incorporation	Birth	Censoring
AUT				1972
BEL				
BRA				1992 (in some cases 1986)
CAN				
ESP				1993
FIN				
FRA				
GBR				
HUN				1992
ITA				
JPN				
LUX				
NLD				1967-2005
NOR				1996
NZL				
PRT				
SWE				
USA				1976

Table A4. Sectoral classifications

Countries	Classification followed	Excluded industries
AUT	NACE rev 1	
BEL	NACE-BELL (USA SIC also available)	Financial companies
BRA	NACE rev 1, NACE rev 2 after 2006	
CAN	NAICS	
ESP	NACE rev 1 (1993-2008), NACE rev 2 (2007 onwards)	Sections NACE rev2 A, O, P, Q, T and U (partially covered)
FIN	NACE Rev 2	Financial intermediation
FRA	NAF rev. 2003	
HUN		
GBR	UK SIC 2003 for earlier years, SIC 2007 for later years	
ITA	NACE rev 1 (1998-2001); NACE rev 1.1 (2002-2006); NACE rev 2 (from 2007)	97, 98, 99. Sectors 01-03 are available from 2008 and sector 84 is covered only for S13 institutional sector
JPN	Japan Standard Industrial Classification (JSIC) rev 8 (1976) to rev 12 (2007), which is mostly compatible with International Standard Industrial Classification (ISIC).	
LUX	Nace rev 1.1 - Nace rev 2	Only partial coverage of sectors 01, 84, 97 and 98.
NLD	NACE rev 1	
NOR	Nace rev 1.1 – Nace rev 2	Non-manufacturing
NZL	ANZSIC06	
PRT	ISIC Rev 3	
SWE	1997-2008 NACE rev 1.2 - 2009 NACE rev 2	Financial industries
USA	SIC/NAICS	Farm

Table A5. Data Unit Level

Countries	Plant/Establishment	Enterprise	Group	Non-employers included
AUT				
BEL	Start in Q4/2004 up to Q4/2009 and only including employment.			
BRA				
CAN	Few variables	Company		
ESP				
FIN				
FRA				
GBR				
HUN				
ITA				
JPN		Only from 2001	Only from 2001	
LUX	No regular updates			
NLD				
NOR	Only Manufacturing			
NZL				
PRT				
SWE				
USA				

** Firms can choose which reporting level to use, but the majority most likely uses enterprise level. See Stiglbauer (2003).*

Table A6. Employment data characteristics: timing of recording

Countries	Yearly average	Point in time
AUT		
BEL	For FTE	For HC
BRA		
CAN	Payroll	maximum
ESP		
FIN		
FRA		
GBR		
HUN		
ITA		
JPN		
LUX		
NLD		
NOR		
NZL	Monthly	
PRT		
SWE		
USA		

Table A7. Employment data characteristics: minimum employment and turnover thresholds for inclusion in the data

Countries	0-1	>1	>5	>20
AUT				
BEL				
BRA				
CAN				
ESP				
FIN				
FRA	Turnover threshold			
GBR				
HUN	HUNF50M in two consecutive years			
ITA				
JPN				
LUX				
NLD				
NOR				
NZL	>30k NZD			
PRT				
SWE				
USA				

Table A8. Employment data – recording unit

Countries	FTE	Headcount
AUT		
BEL		
BRA	Can be calculated from hours	
CAN	Payroll	PD7
ESP		
FIN		
FRA		
GBR		
HUN		
ITA		
JPN		
LUX		
NLD		
NOR		
NZL		
PRT		
SWE		
USA		

Data harmonisation

In order to harmonise data coming from different national sources, the program conducts a basic cleaning of the input data:

- it turns negative employment to missing;
- it interpolates employment records which are disproportionally smaller/bigger than those of the previous and following year;
- it replaces industry classification that varies over time with the modal 3-digit sector the unit's activity is classified by. In case of multiple modes, the program chooses the most recent mode.

Output databases

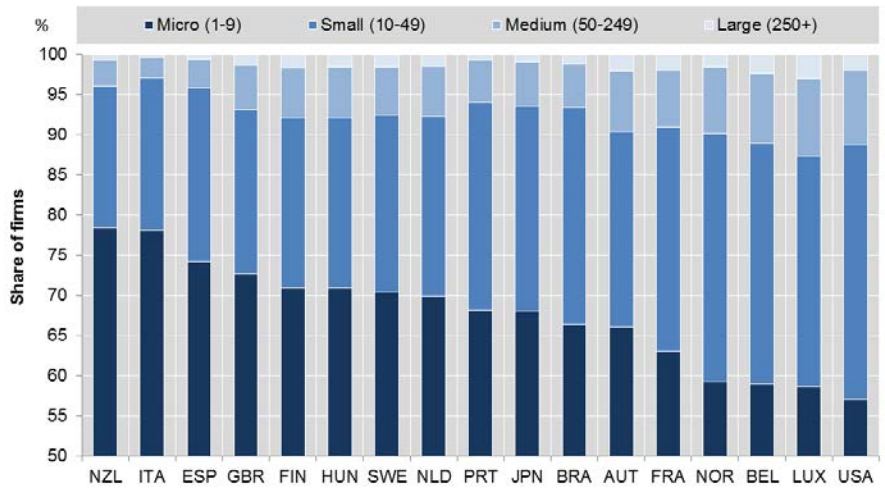
DynEmp creates five output files that can be summarised in three classes:

- Transition matrices and median size at time t and t+3 for firms of different age for the three periods: 2001-2004; 2004-2007 and 2007-2010.
- Annual contribution to gross job creation and gross job destruction of entry, exit and incumbents of different size and age.
- Yearly counts of (a) units that never employ more than one employee over their life cycle, and (b) units appearing in the register for only one year.

ANNEX B. ADDITIONAL GRAPHS

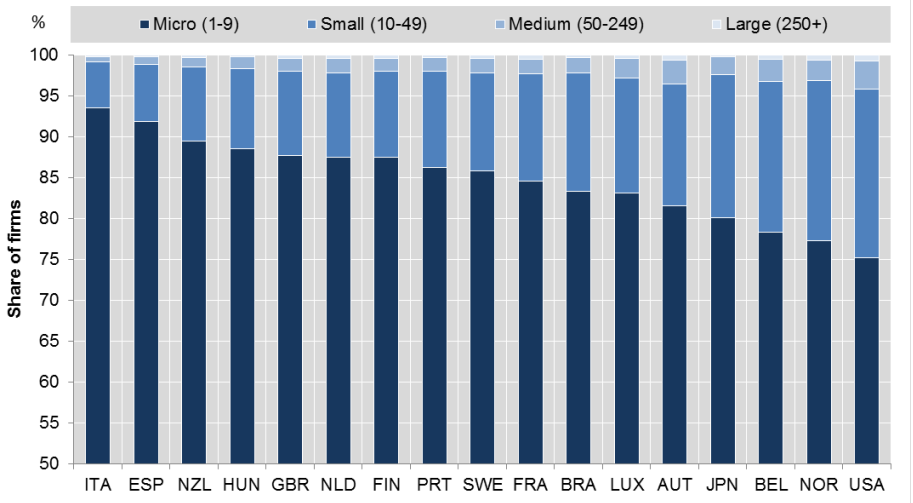
Size distributions

Figure B1. Share of firms of different size by country, manufacturing



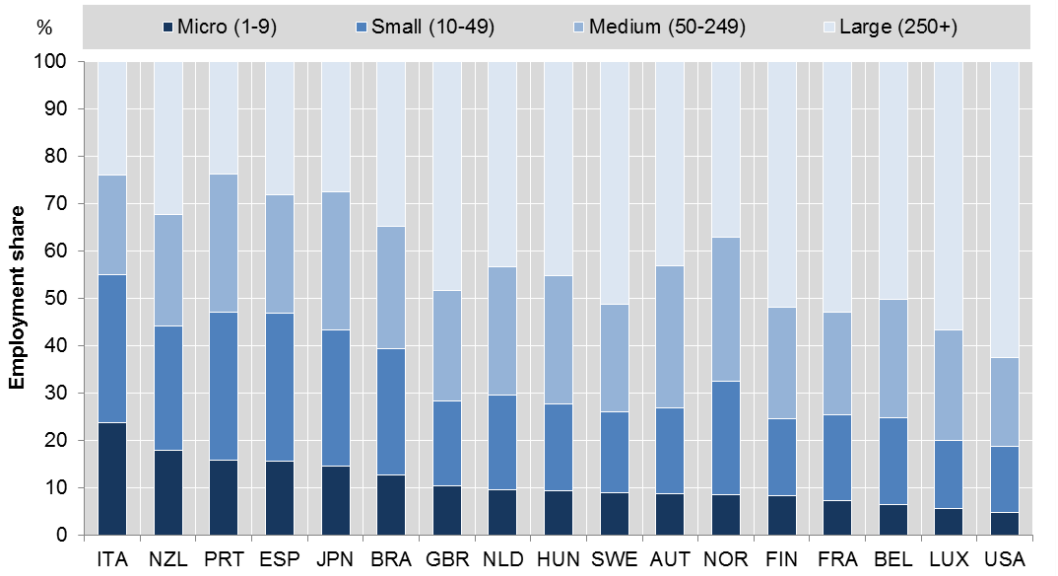
Note: The graph shows the share of firms by different size class in the total number of firms in each economy on average over the available year. The period covered is 2001-2011 for Austria, Belgium, Finland, Hungary, the Netherlands, Norway, the United Kingdom and the United States; 2001-2010 for Brazil, Spain, Italy, Luxembourg and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B2. Share of firms of different size by country, services



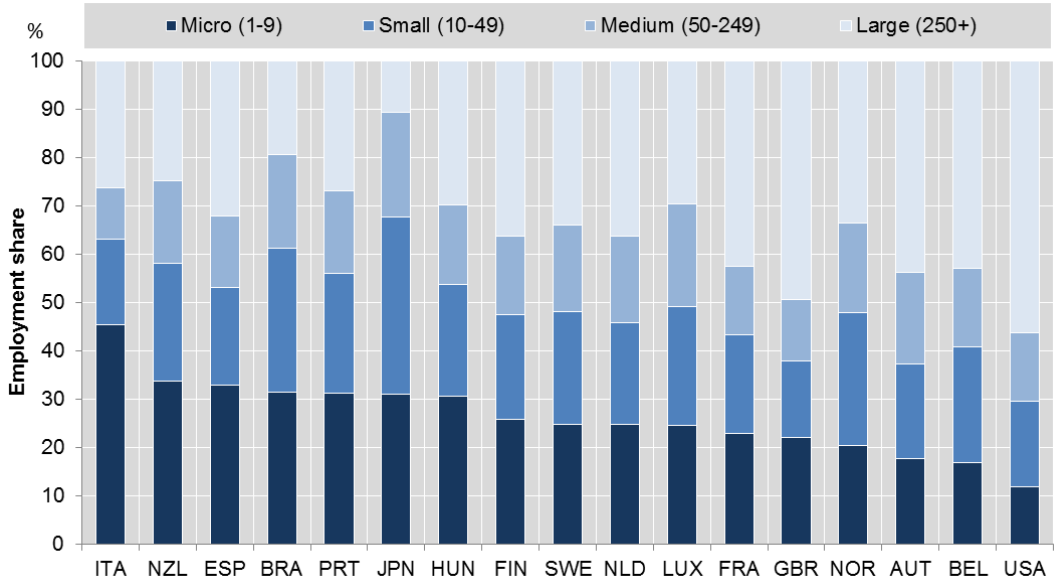
Note: The graph shows the share of firms by different size class in the total number of firms in each economy on average over the available year. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Financial services are excluded. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B3. Share of employment in firms of different size by country, manufacturing



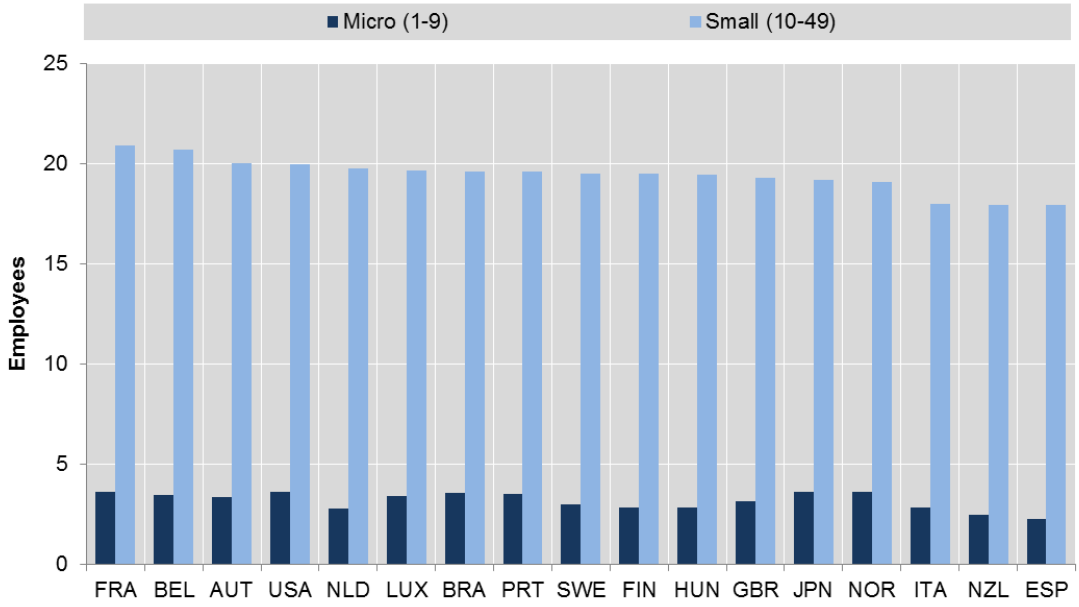
Note: The graph shows the share of firms by different size class in the total number of firms in each economy on average over the available year. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B4. Share of employment in different size by country, services



Note: The graph shows the share of firms by different size class in the total number of firms in each economy on average over the available year. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Financial services are excluded. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

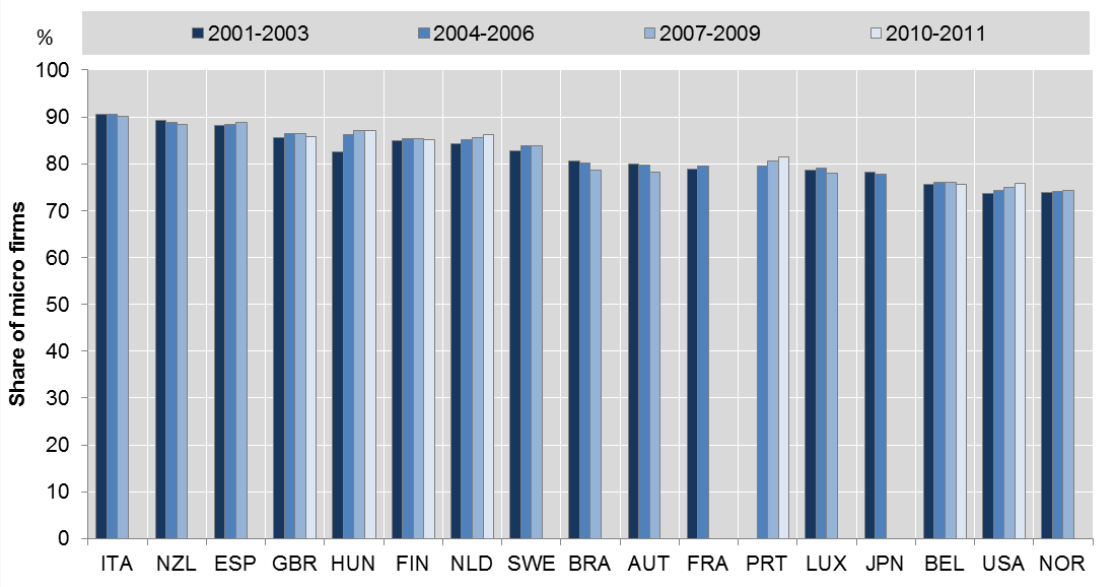
Figure B5. Average size of micro and small firms by country



Note: The chart presents the average employment size of active units in each country on average over the period. Sectors covered are: manufacturing, non-financial business services and construction. Micro firms have below 10 employees and small firms are those from 10 to 49 employees. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal.. For Japan data are at the establishment level, for other countries at the firm level. Owing to methodological differences, figures may deviate from officially published national statistics.

Figure B6. Persistent differences in size distributions of firms across countries

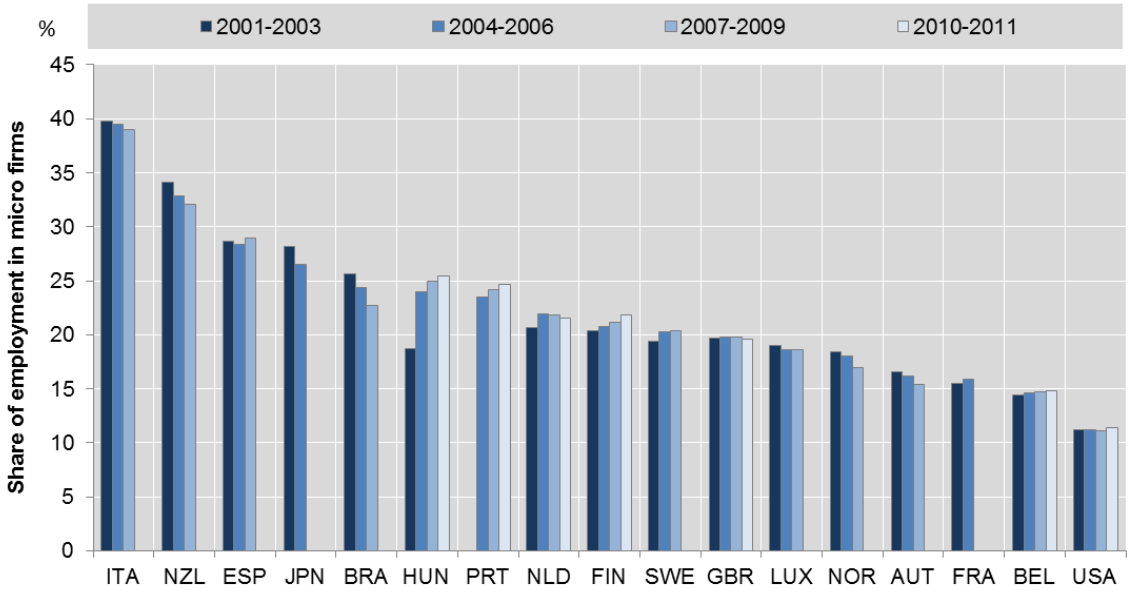
The share of micro firms (1-9 employees) by country and over time



Note: The figure reports the share of micro-start-ups in all units across different periods in each economy. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors included are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B7. Substantial and persistent differences in the distribution of employment across firm size

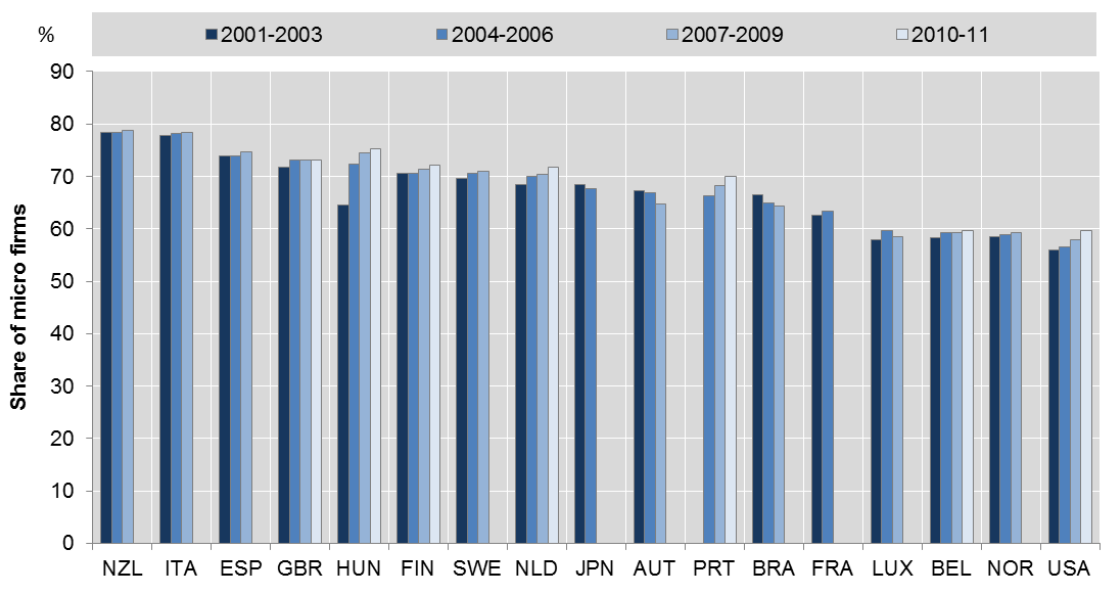
The share of employment in micro firms (1-9 employees) by country and over time



Note: The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal.. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B8. Persistent differences in size distributions across countries

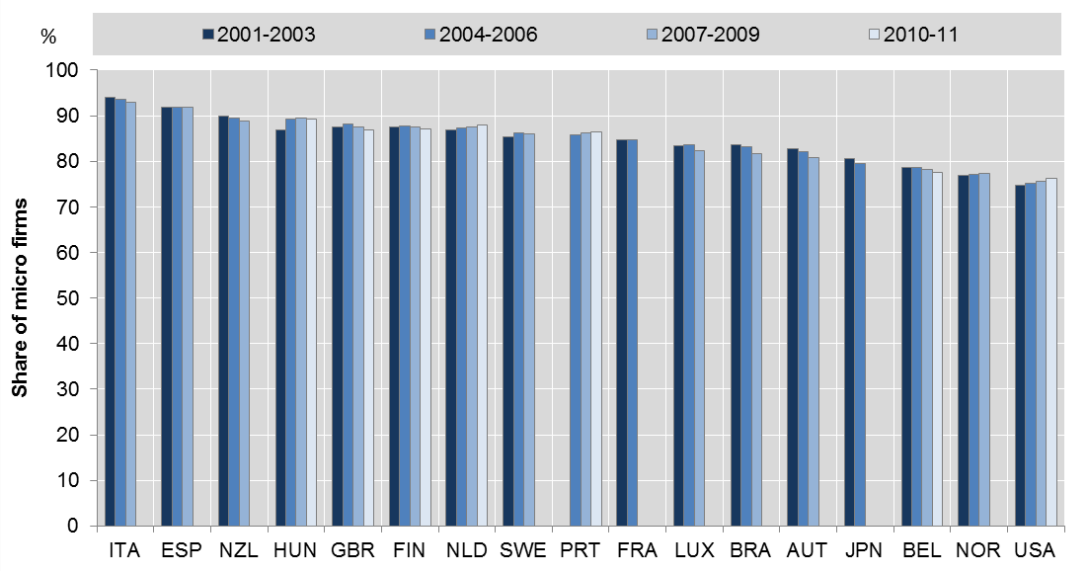
The share of micro firms (1-9 employees) by country and over time, manufacturing only



Note: The figure reports the share of micro-start-ups in all units across different periods in each economy. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B9. Persistent differences in size distributions across countries

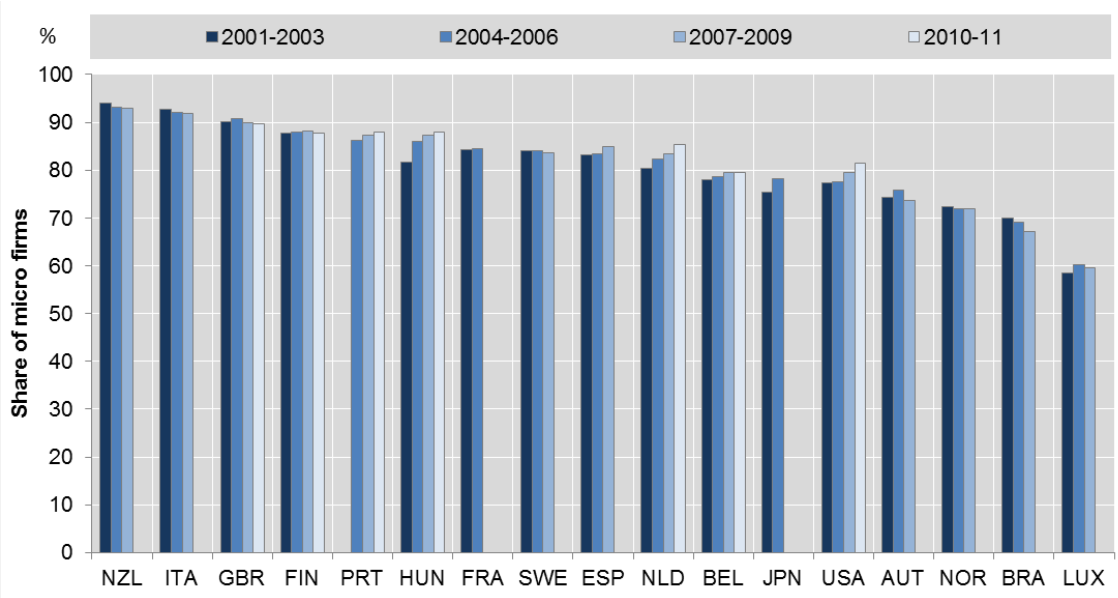
The share of micro firms (1-9 employees) by country and over time, business services only



Note: The figure reports the share of micro-start-ups in the total number of firms across different periods in each economy. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Financial services are excluded. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B10. Persistent differences in size distributions across countries

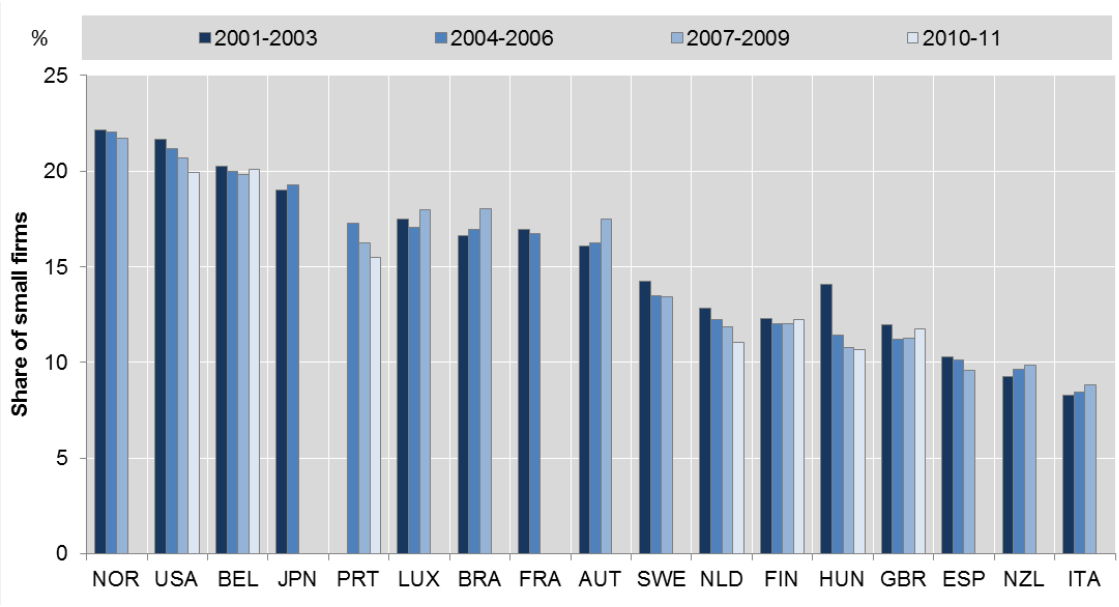
The share of micro firms (1-9 employees) by country and over time, construction only



Note: The figure reports the share of micro-start-ups in the total number of firms across different periods in each economy. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B11. Persistent differences in size distributions across countries

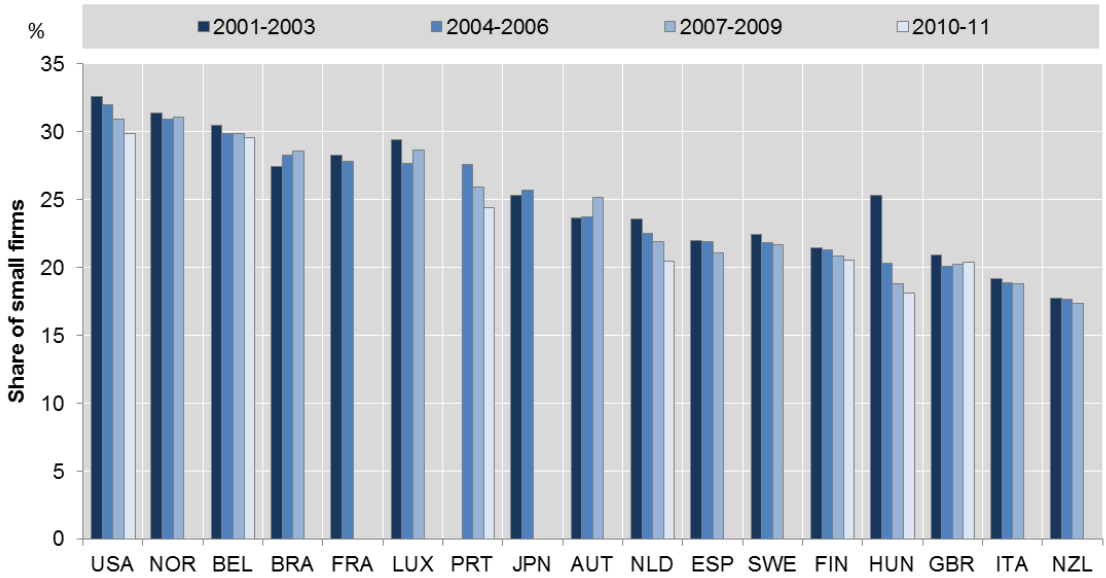
The share of small firms (10-49 employees) by country and over time



Note: The figure reports the share of small firms in the total number of firms across different periods in each economy. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Sectors covered are: manufacturing, construction, and non-financial business services. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B12. Persistent differences in size distributions across countries

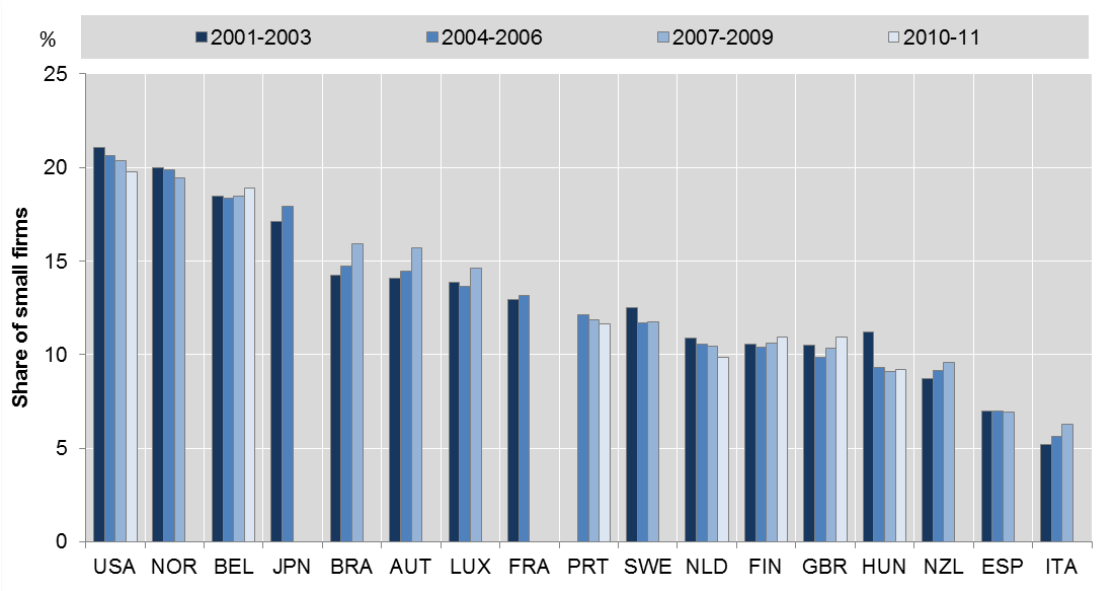
The share of small firms (10-49 employees) by country and over time, manufacturing only



Note: The figure reports the share of small firms in the total number of firms across the different periods in each economy. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B13. Persistent differences in size distributions across countries

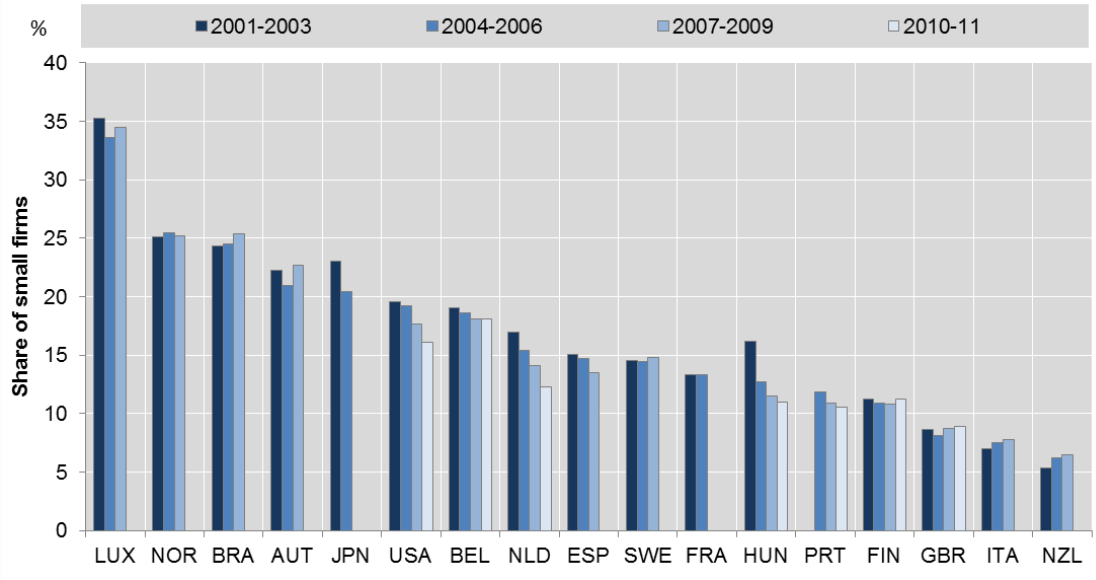
The share of small firms (10-49 employees) by country and over time, business services only



Note: The figure reports the share of small firms in the total number of firms across different periods in each economy. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Financial services are excluded.. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B14. Persistent differences in size distributions across countries

The share of small firms (10-49 employees) by country and over time, construction only

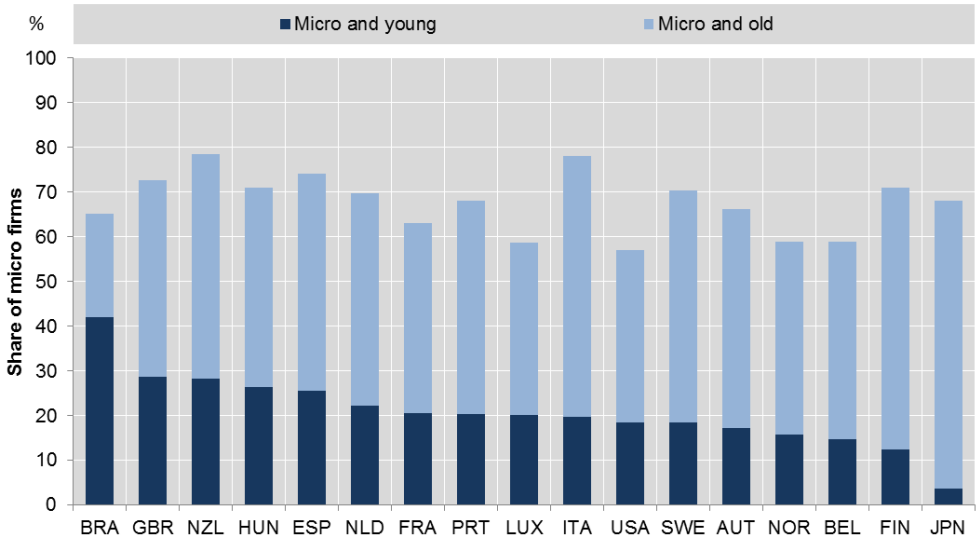


Note: The figure reports the share of small firms in the total number of firms across different periods in each economy. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Age and size distributions

Figure B15. The age composition of micro-firms differs markedly across countries

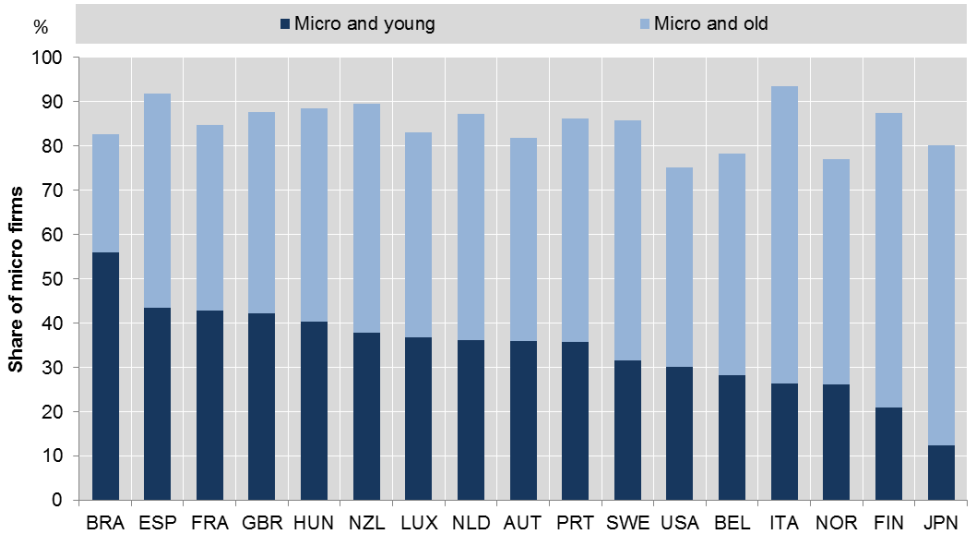
Share of micro firms among all firms, by country and by age. Manufacturing only



Note: The figure reports the share of micro-young (below 10 employees and aged 5 or less) and micro-old (below 10 employees, and more than 5 years old) firms in the total number of firms. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B16. The age composition of micro-firms differs markedly across countries

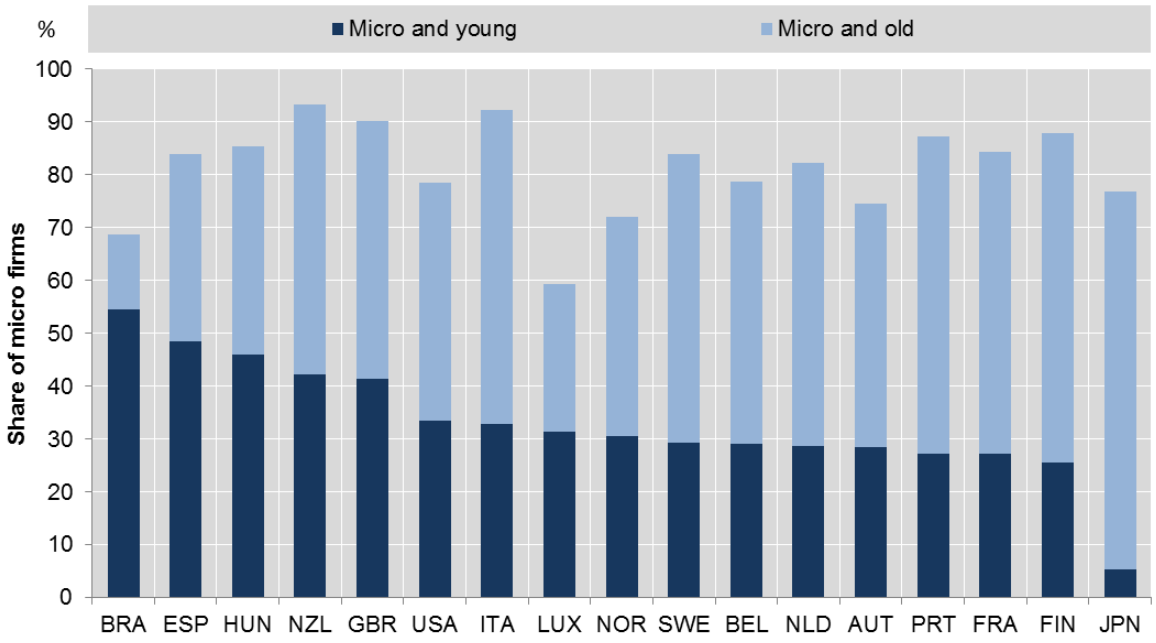
Share of micro firms among all firms, by country and by age. Business services only



Note: The figure reports the share of micro-young (below 10 employees and aged 5 or less) and micro-old (below 10 employees, and more than 5 years old) firms in the total number of firms. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Financial services are excluded. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B17. The age composition of micro-firms differs markedly across countries

Share of micro firms among all firms, by country and by age. Construction only



Note: The figure reports the share of micro-young (below 10 employees and aged 5 or less) and micro-old (below 10 employees, and more than 5 years old) firms in the total number of firms. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B18. Share of firms, employment, gross job creation and destruction accounted for by young firms

Non-financial private sector, by country and year; 3-years moving average

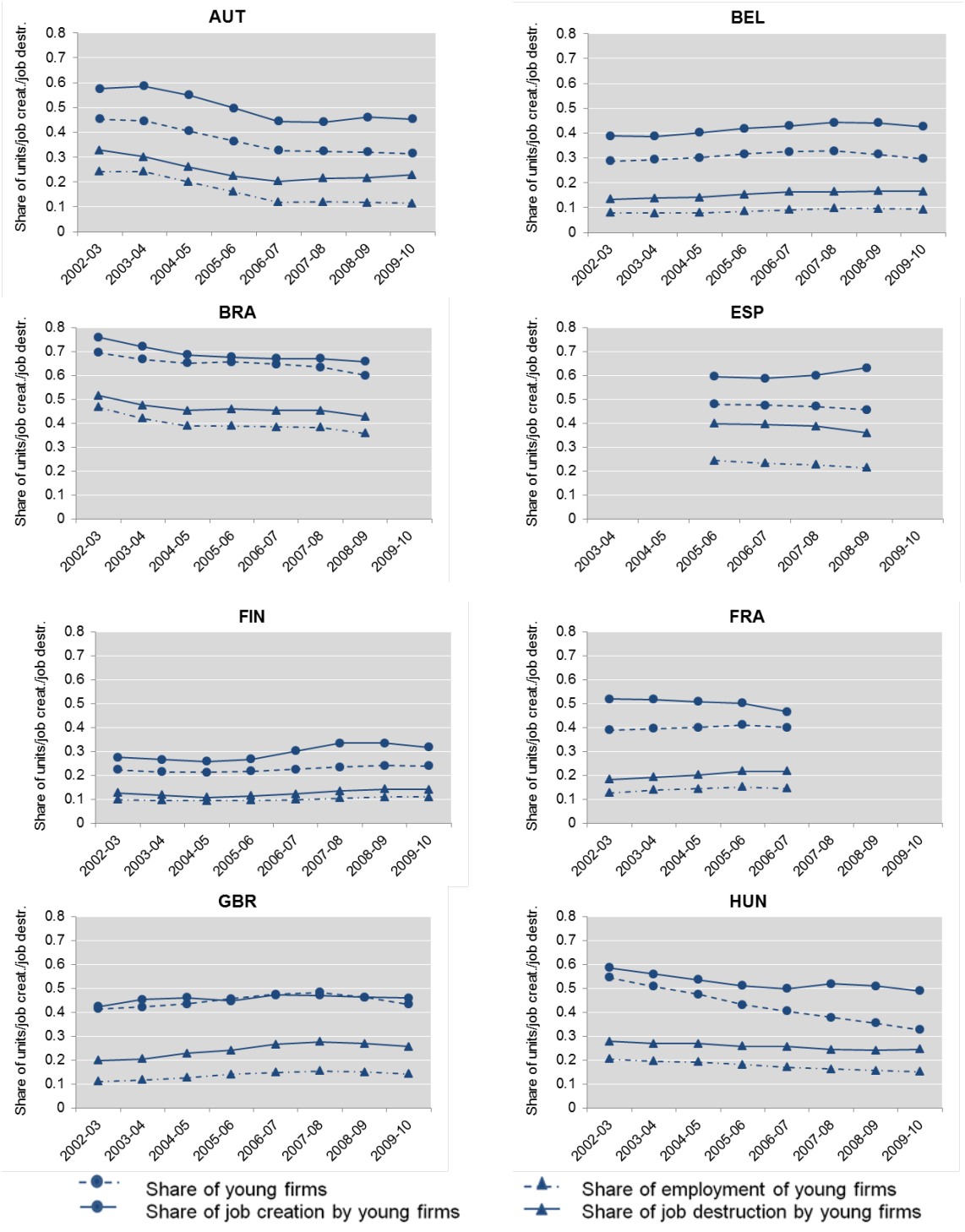


Figure B18. Share of firms, employment, gross job creation and destruction accounted for by young firms (continued)

Non-financial private sector, by country and year; 3-years moving average

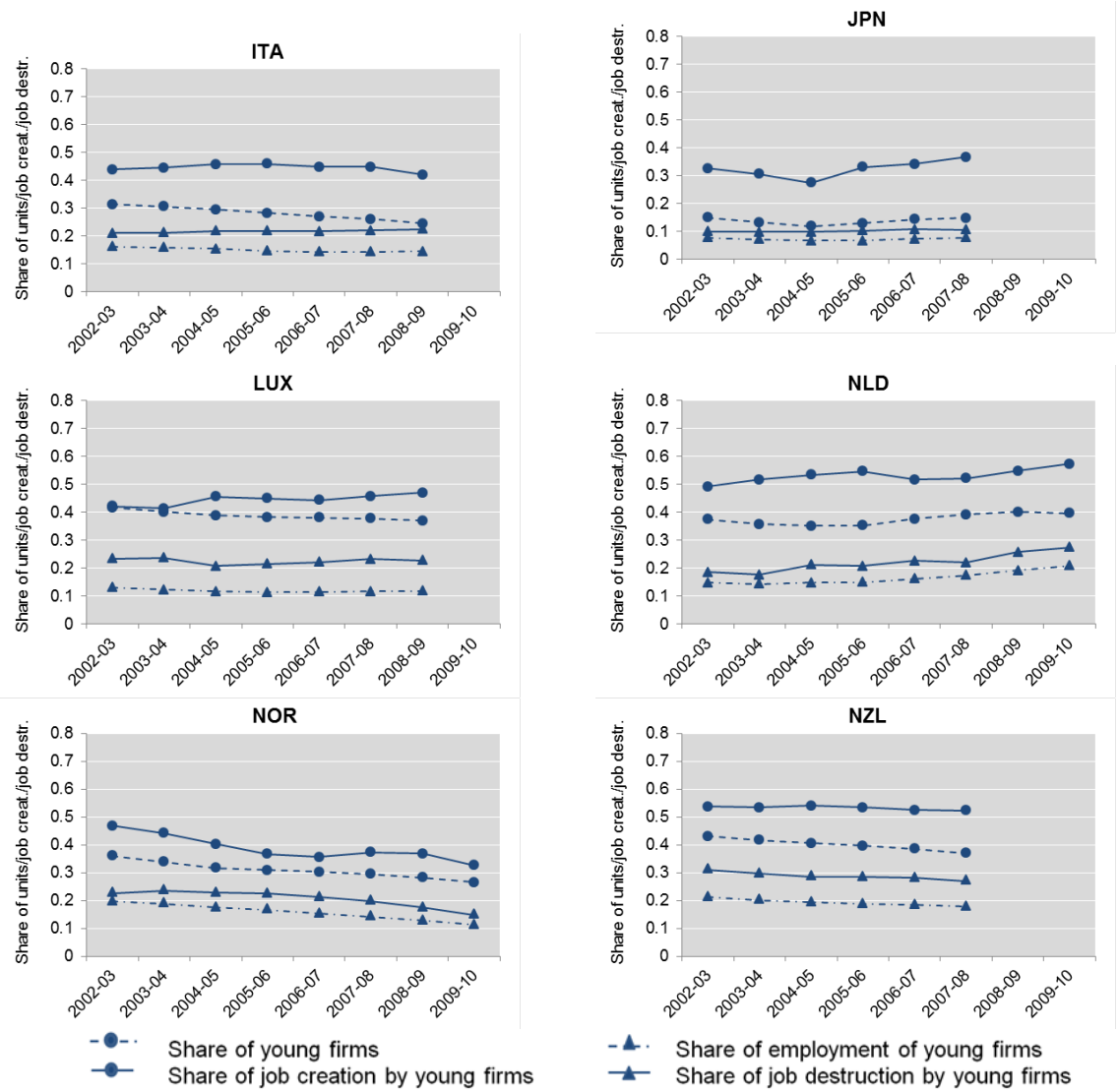
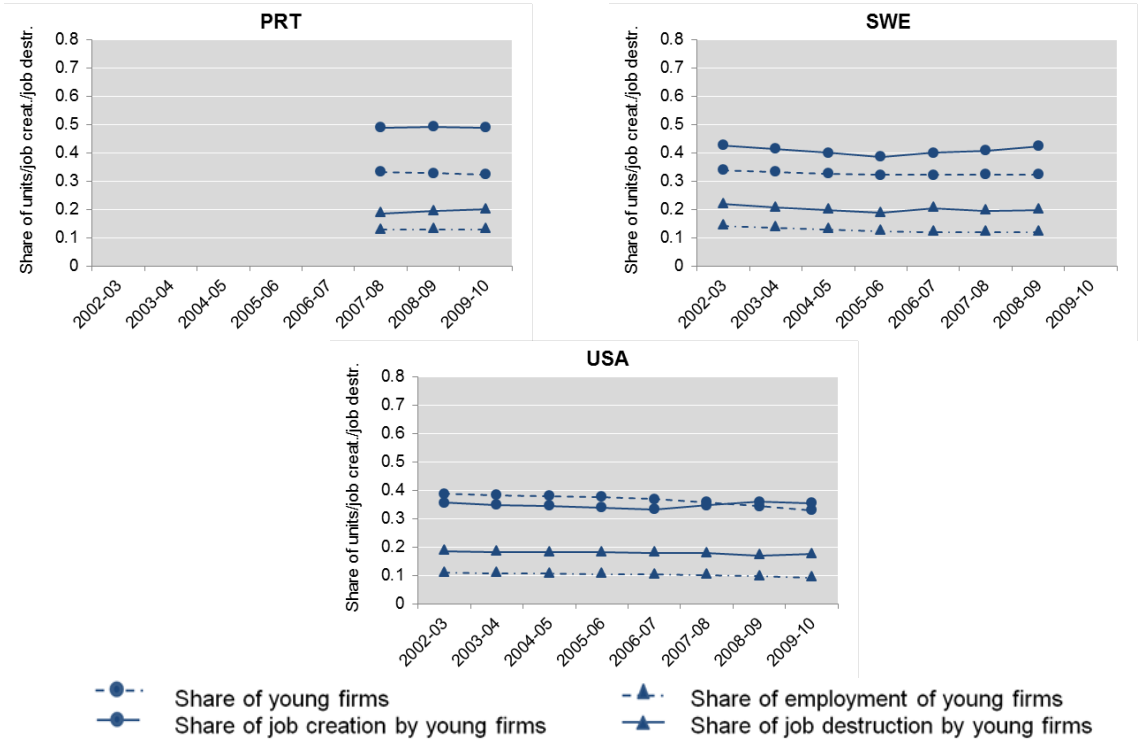


Figure B18. Share of firms, employment, gross job creation and destruction accounted for by young firms (continued)

Non-financial private sector, by country and year; 3-years moving average



Note: The graphs show the share of firms, employment, gross job creation, and gross job creation accounted for by young firms in the respective total (see type A measure of Table 5).

Figure B19. Job creation and job destruction rate

Non-financial private sector, by country and year; 3-years moving average

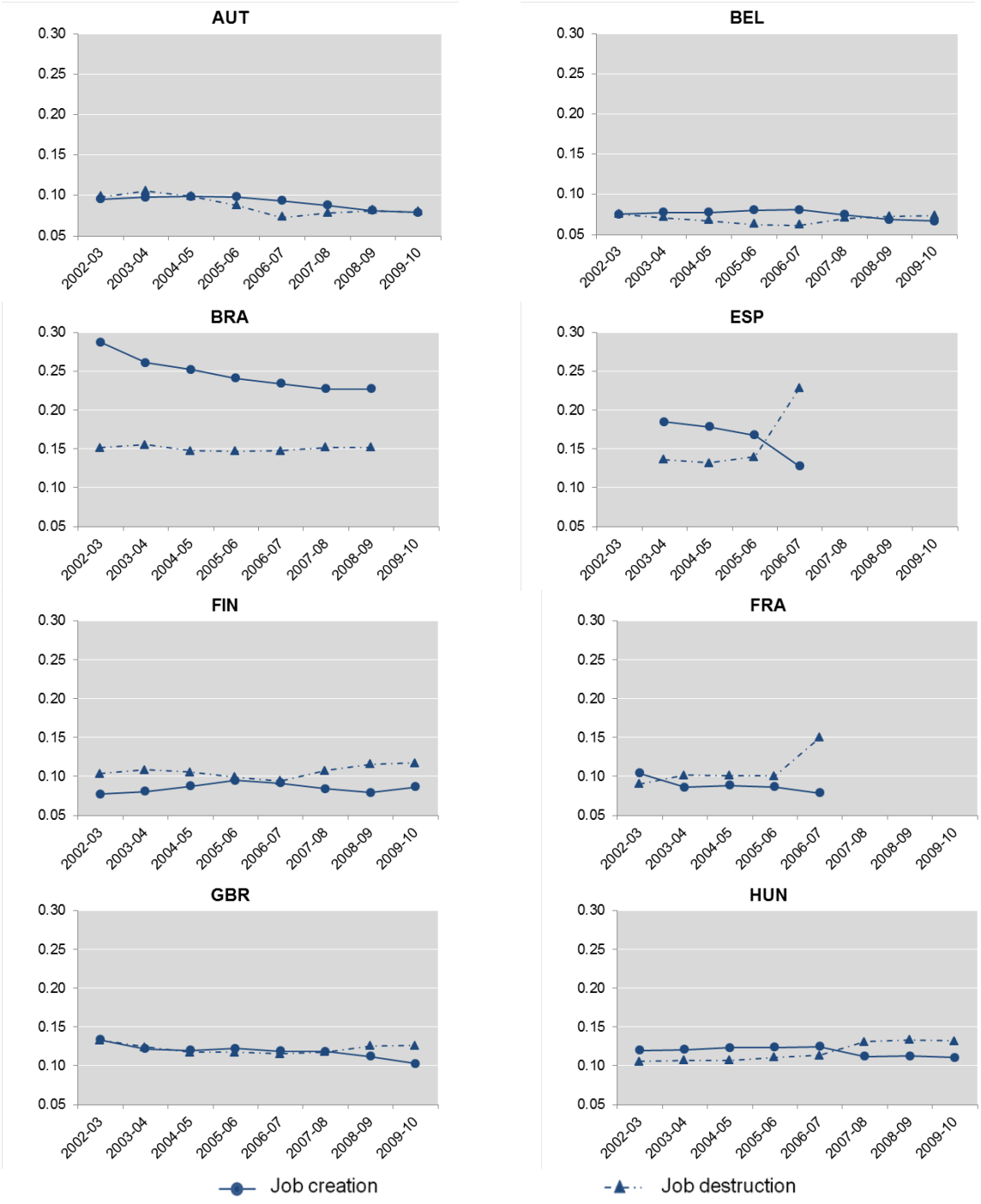
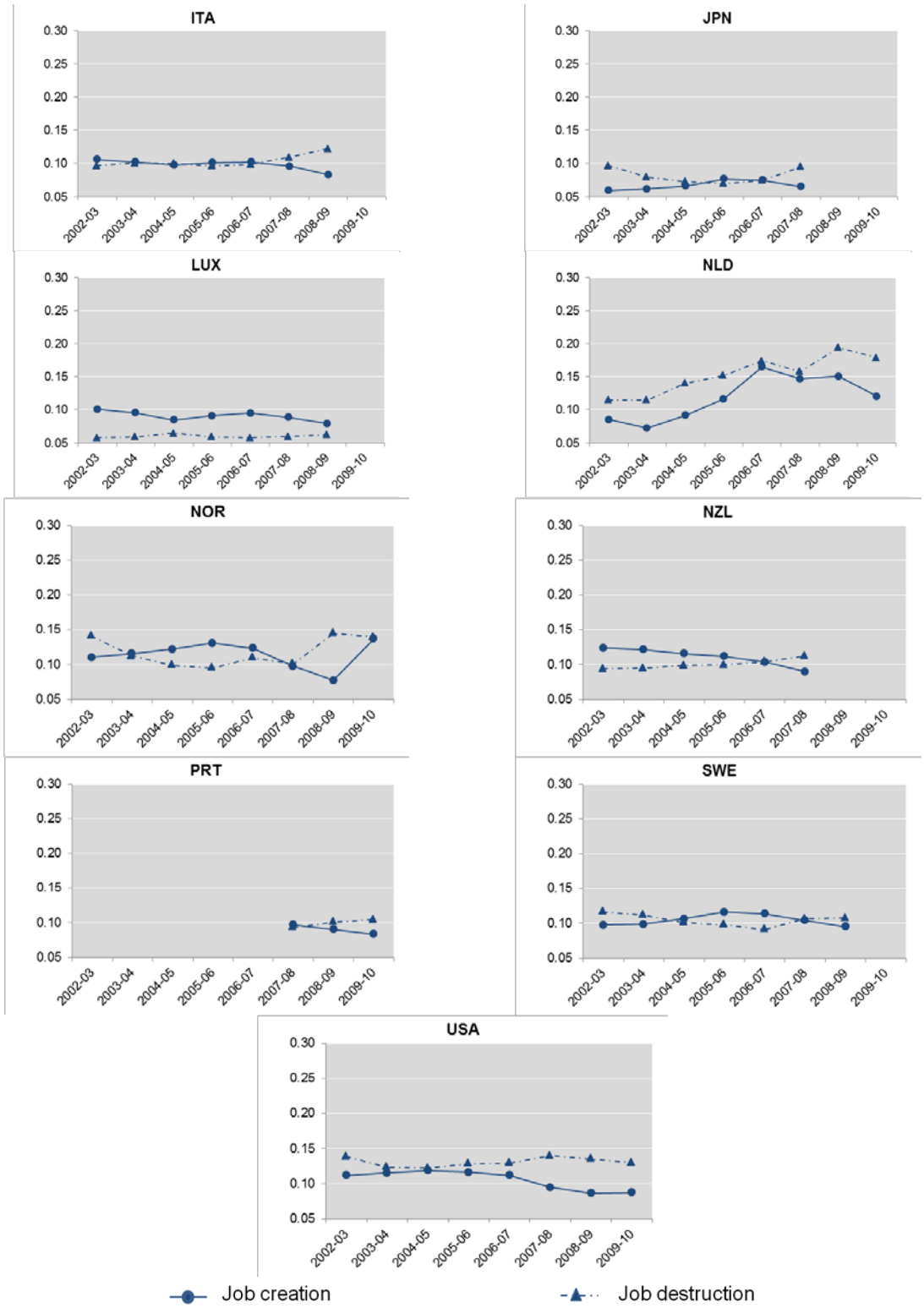


Figure B19. Job creation and job destruction rate (continued)

Non-financial private sector, by country and year; 3-years moving average

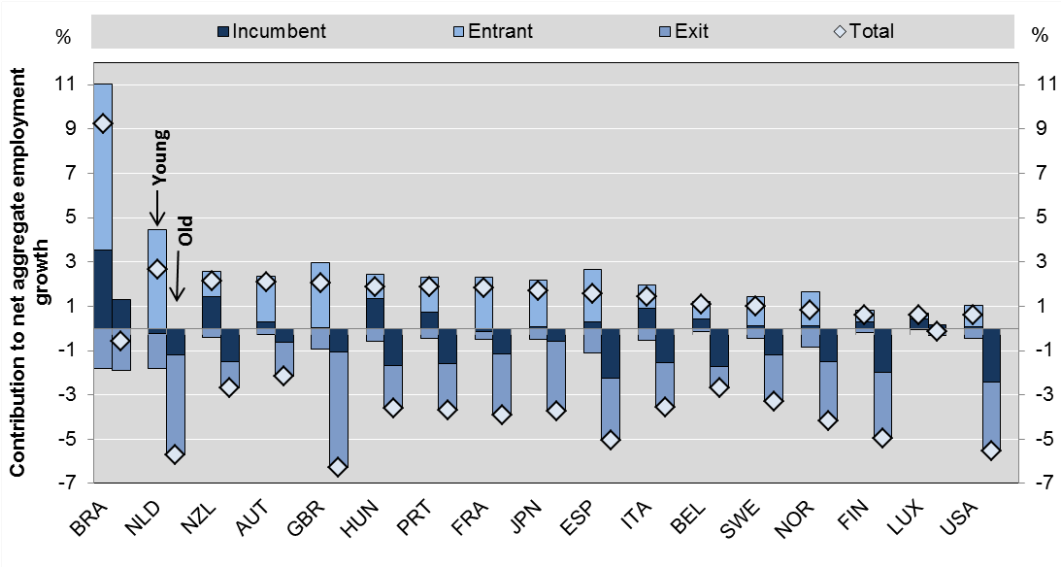


Note: The graphs show the gross job creation and gross job destruction rate, expressed as the ratio of the gross flows over the average total employment in the two years (see type A measures of Table 5).

The role of entry, exit and the intensive margin

Figure B20. Contribution of young and old firms to net aggregate employment growth

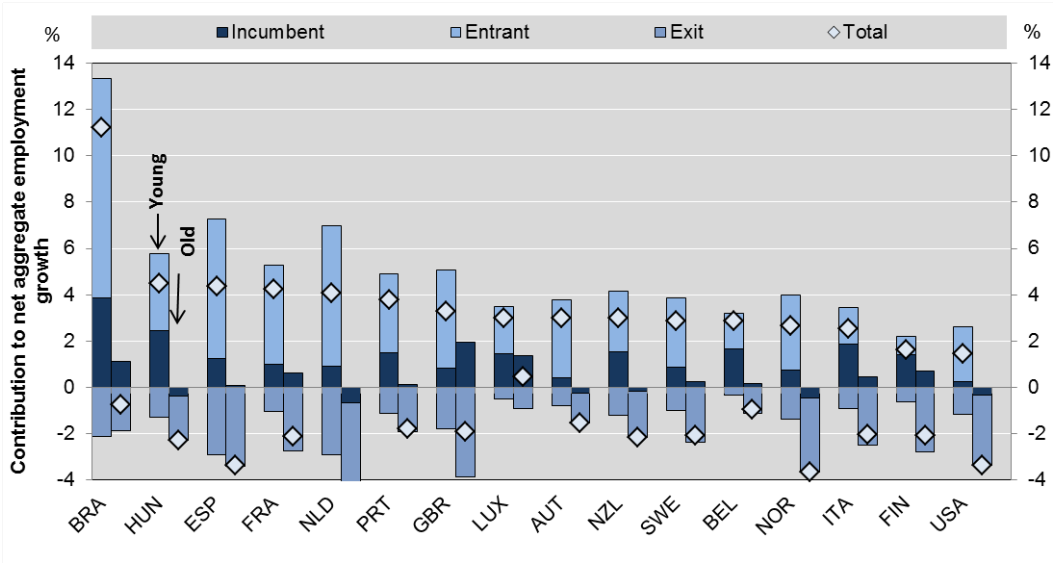
By margin of adjustment, as % of aggregate employment, 2001-2011, manufacturing



Note: Contributions are calculated as the net job creation by the group over total employment in manufacturing (See Type B measures in Table 5). Averages across all available years. Young firms are aged 5 years or less, old firms are at least 6 years old. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B21. Contribution of young and old firms to net aggregate employment growth

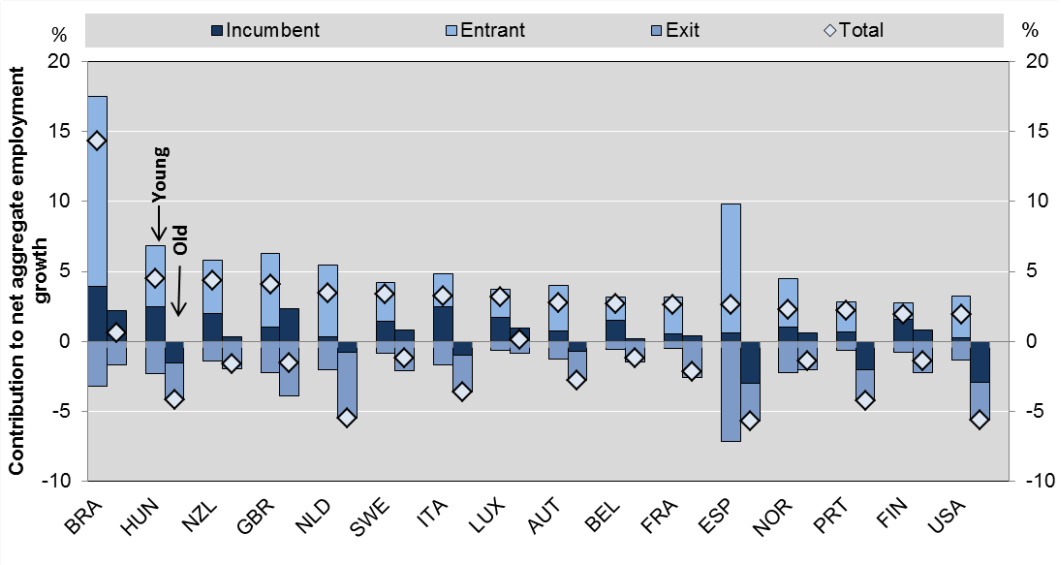
By margin of adjustment, as % of aggregate employment, 2001-2011, business services



Note: Contributions are calculated as the net job creation by the group over total employment in non-financial business services (See Type B measures in Table 5). Averages across all available years. Young firms are aged 5 years or less, old firms are at least 6 years old. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B22. Contribution of young and old firms to net aggregate employment growth

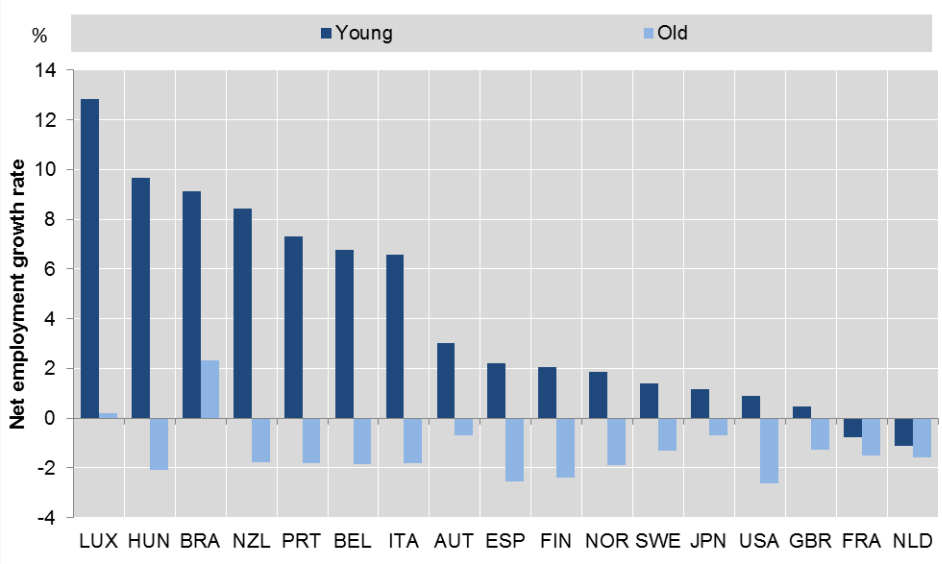
By margin of adjustment, as % of aggregate employment, 2001-2011, construction



Note: Contributions are calculated as the net job creation by the group over total employment in construction. (See Type B measures in Table 5). Averages across all available years. Young firms are aged 5 years or less, old firms are at least 6 years old. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B23. Young firms are more dynamic

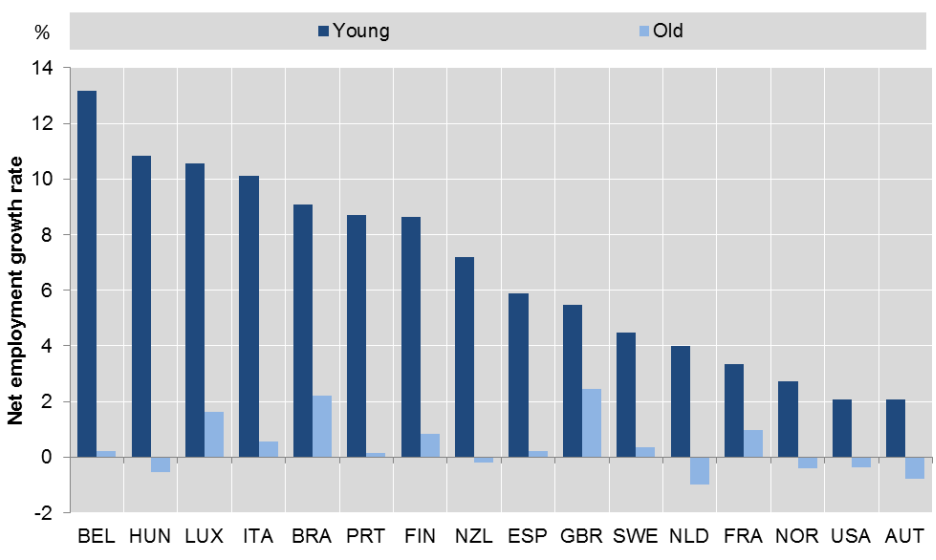
Net employment growth rates by surviving young and old firms, 2001-2011, manufacturing



Note: Growth rates are calculated as post-entry net job creation by the group over employment in the group, on the surviving subset of firms (i.e. not taking into account entry or exit). See Type A measures in Table 5. Young firms are aged 5 years or less, old firms are at least 6 years old. Averages are across all available years. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B24. Young firms are more dynamic

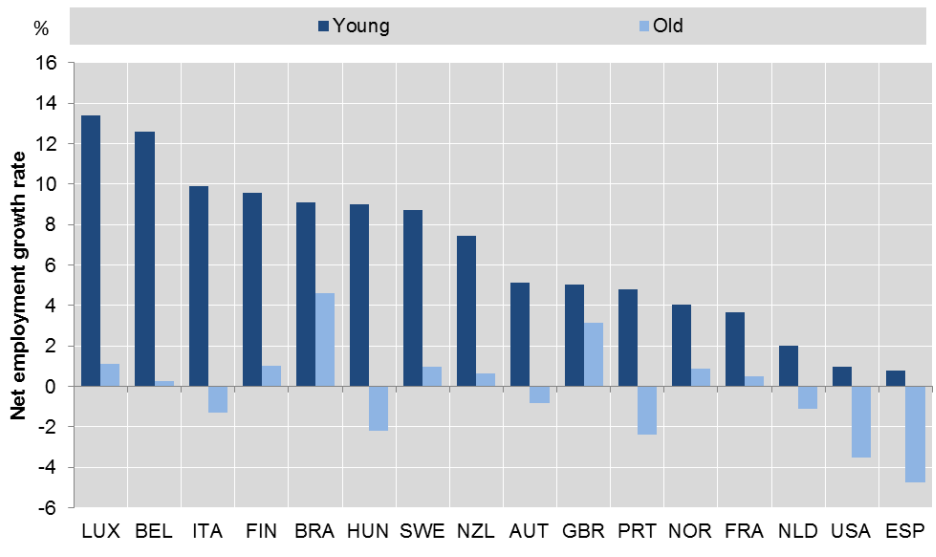
Net employment growth rates by surviving young and old firms, 2001-2011, business services



Note: Growth rates are calculated as post-entry net job creation by the group over employment in the group, on the surviving subset of firms (i.e. not taking into account entry or exit). See Type A measures in Table 5. Financial services are excluded.. Young firms are aged 5 years or less, old firms are at least 6 years old. Averages are across all available years. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B25. Young firms are more dynamic

Net employment growth rates by surviving young and old firms, 2001-2011, construction

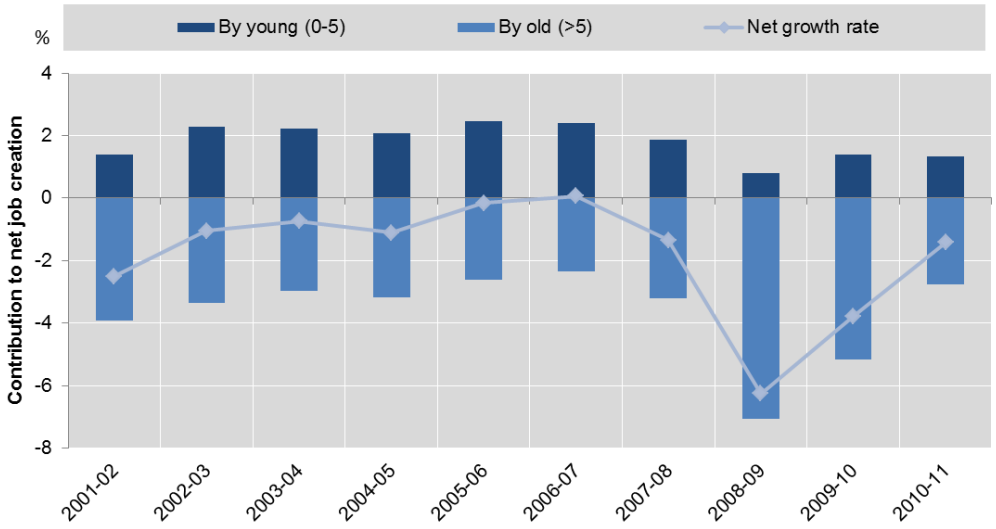


Note: Growth rates are calculated as post-entry net job creation by the group over employment in the group, on the surviving subset of firms (i.e. not taking into account entry or exit). See Type A measures in Table 5. Young firms are aged 5 years or less, old firms are at least 6 years old. Averages across all available years. The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

The role of the financial crisis

Figure B26. Contributions to net job creation by firm age in manufacturing

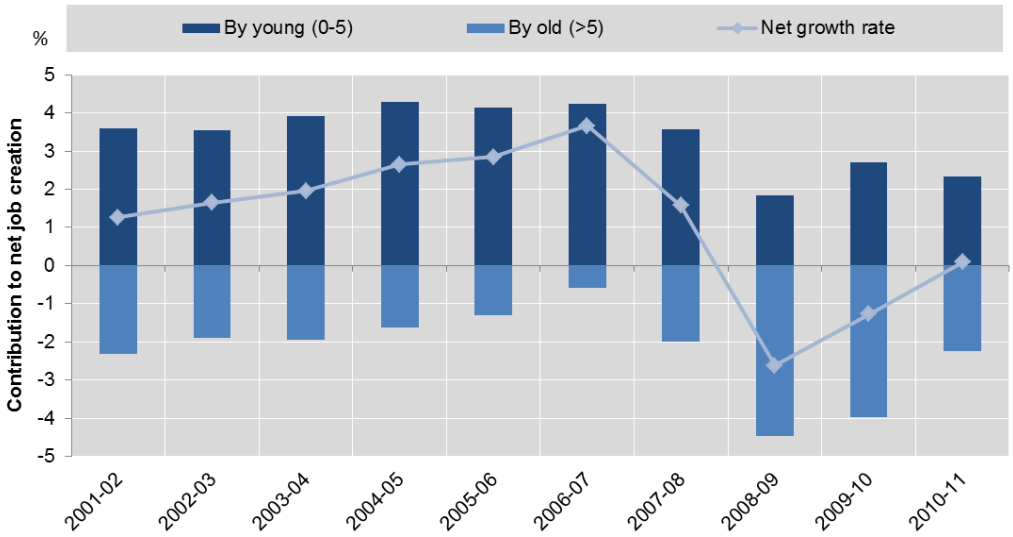
Average over countries



Note: Contributions are calculated as the net job creation by the group over total employment (See Type B measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B27. Contributions to net job creation by firm age in services

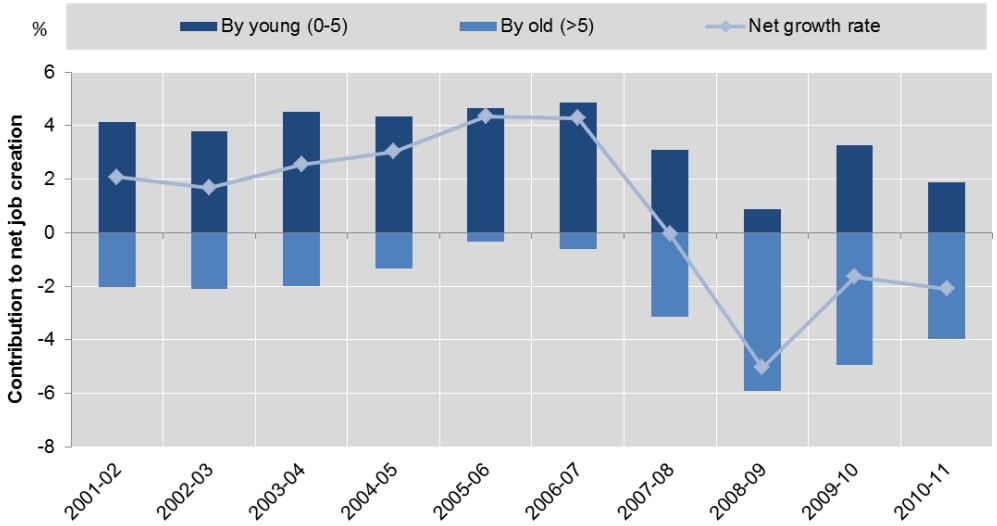
Average over countries, non-financial business services



Note: Contributions are calculated as the net job creation by the group over total employment (See Type B measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B28. ***Contributions to net job creation by firm age in Construction***

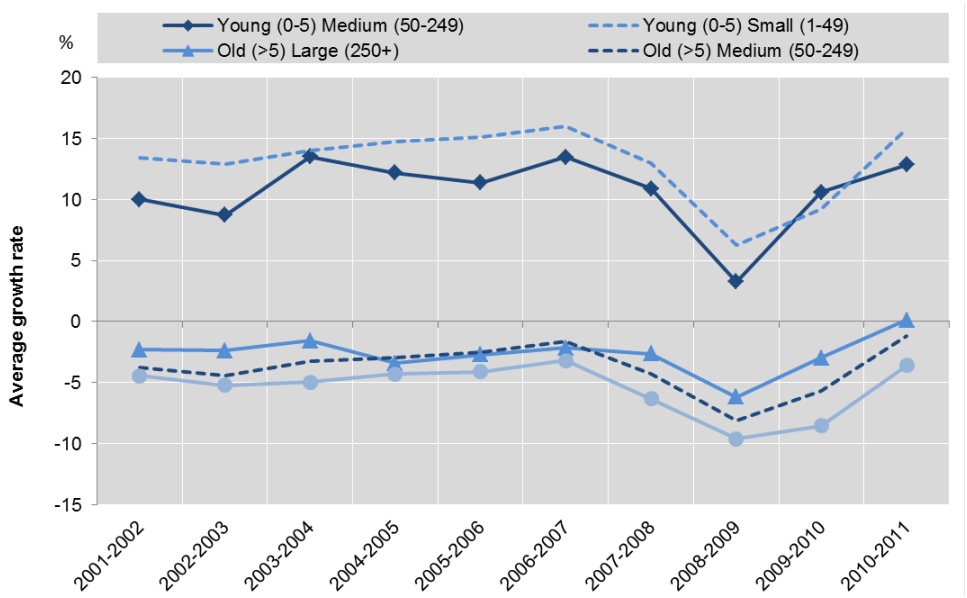
Average over countries



Note: Contributions are calculated as the net job creation by the group over total employment (See Type B measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B29. Job creation and destruction rate, manufacturing

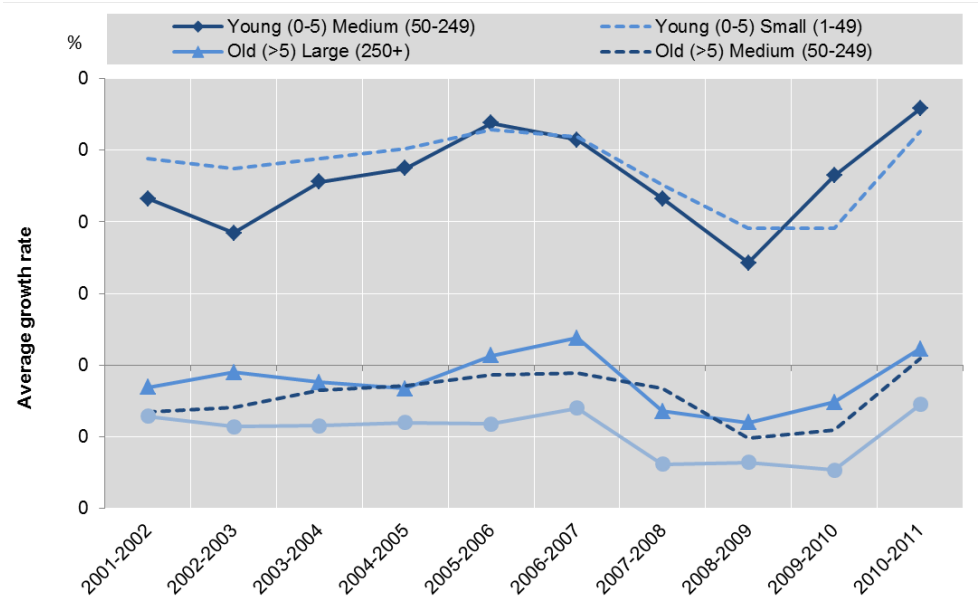
Average over countries



Note: Job creation and destruction rates are calculated as job creation or destruction by the group over employment in the group (see Type A measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

Figure B30. Job creation and destruction rate, services

Average over countries, non-financial business services



Note: Job creation and destruction rates are calculated as job creation or destruction by the group over employment in the group (see Type A measures in Table 5). The period covered is 2001-2011 for Belgium, Finland, Hungary, the Netherlands, the United Kingdom and the United States; 2001-2010 for Austria, Brazil, Italy, Luxembourg, Spain, Norway and Sweden; 2001-2009 for Japan and New Zealand; 2001-2007 for France; and 2006-2011 for Portugal. Owing to methodological differences, figures may deviate from officially published national statistics. For Japan data are at the establishment level, for other countries at the firm level.

NOTES

1 The complex workings of the labour markets, from a somewhat different angle, have become better understood due to the Nobel-prize winning contributions from Diamond (1982), Mortensen (1982) and Pissarides (1984). They introduced search frictions into the thinking about labour markets, emphasising that taking up a job requires time and effort, in order to find the right match between the job position and the skills of the employee. Healthy labour markets facilitate this search process and provide the ground for productive job-employee matches.

2 For models of the impacts of financial frictions on the aggregate economy through firm dynamics, i.e., entry, aging and exit see Cooley and Quadrini, 2001; Cabral and Mata, 2003; Clementi and Hopenhayn, 2006. Similarly, for the effects of financial development see Caselli and Gennaioli, 2003; Jeong and Townsend, 2007; Antunes et al., 2008.

3 Note that Birch (1979) had already revealed the prominent role of young and small businesses in job creation in the United States. However, he relied on data meant for credit ratings (provided by Dun & Bradstreet), and not on administrative data, such as business registers, which cover the universe of companies.

4 An important first study in the "worker flow" literature was undertaken by Blanchard and Diamond (1990).

5 Commercial databases like Amadeus or Orbis, by the electronic publishing firm Bureau van Dijk, or those produced by Dun and Bradstreet, use business-level information from various national sources. As the typology of sources may vary across countries the firm coverage is likely to substantially differ, which implies that certain groups of businesses (typically young and small ones) may be underrepresented. This underscores the need to be extremely careful when using such data in making international comparisons.

6 High-growth enterprises, as measured by employment (or by turnover), are enterprises with average annualised growth rates in employees (or in turnover) of greater than 20% a year, over a three-year period, and with ten or more employees at the beginning of the three year observation period. (See: OECD, 2012, pp. 86)

7 In a few cases, the data used are not from Business Registers from national Statistical Offices. Annex A reports the exact source for each participating country.

8 However, the information contained in BRs cannot distinguish between hires and layoffs/quits – contrary to employee level data or matched employer-employee data – but only measures the employment changes (positive or negative) from the combination of the two.

9 As mentioned above in the current analysis the unit of analysis is the enterprise, but DynEmp can calculate statistics at different level of aggregation (e.g. establishments).

10 See Table 5.

11 This equality is stated formally as follows:

$$Rate\_NJC_{ct} = \frac{E_{c,t+1} - E_{ct}}{0.5 * (E_{c,t+1} + E_{ct})} = \Sigma_{i=1}^{I} w_{it} GrRate\_E_{it},$$

where the weights are $w_{it} = \frac{E_{i,t+1} + E_{it}}{E_{c,t+1} + E_{ct}}$ and $GrRate\_E_{it} = \frac{E_{i,t+1} - E_{it}}{0.5 * (E_{i,t+1} + E_{it})}$, is the unit-level employment growth rate, defined analogously to the measures above with average employment in the denominator.

12 For additional references of earlier experiences and different methodologies see Vilhuber (2009).

13 The choice of excluding these units from this first phase of the analysis (*DynEmp Express*) was also driven partly by a need to circumvent limitations of computer memory in some countries with a large number of units. These units will be included in the second phase of the analysis (*DynEmp* v2).

14 Canada could not be included in this figure as relevant statistics were not available.

15 Note that standard revenue based estimates of total factor productivity of young businesses are often downward biased, since young firms charge on average lower prices than incumbents (because of lower market power and lack of reputation), while when measured using physical total factor productivity their productivity is similar if not slightly higher than mature businesses, see on this issue the work of Foster, Haltiwanger and Syverson, 2008 and 2012.

16 Following a cohort for several years is included in the second stage of the analysis, *DynEmp* v2.

17 Inactive firms are those for which information on employment is not available in the business registers. The definition thus includes both permanent exits and temporarily inactive firms.

18 Methodological differences across participating countries in accounting for firms' mergers and acquisitions, censoring in the birth year, and structural breaks in the series, may partly affect how firm age is measured and contribute to explain some of the observed differences. See Annex A for a detailed description of the source data.

19 Figure B18 in the Annex B reports the shares of firms, employment, gross job creation, and gross job destruction accounted for by young firms by country and year in 3-years moving average.

20 The OECD countries considered are Finland, France, Germany, Italy, Portugal, United Kingdom and United States. The reported average rate is 12.7% for both job destruction and job creation (see Table B.1 of Haltiwanger, Scarpetta and Schweiger, 2010).

21 These are the Type A measures listed in Table 5.

22 Observations relative to the biennium 2010-11 are excluded as data are available only for a few countries; the period covered is 2001-2010 for Austria, Belgium, Brazil, Finland, Hungary, Italy, Luxembourg, the Netherlands, Norway, Sweden, the United Kingdom, the United States (9 intervals in total); 2001-2009 for Japan and New Zealand (8 intervals); 2003-2009 for Spain (6 intervals); 2001-2008 for France (7 intervals); and 2006-2010 for Portugal (4 intervals). For each year, there are 15 observations for each country (5 size-age classes by 3 sectors), except for Luxembourg, for which one or two observations each year are dropped due to the confidentiality restrictions (15 observations are dropped in total); and Japan, for each only one sector (manufacturing) is available. This makes the sample of 2 020 observations included in Tables 6 to 9. In Tables 10 and 11 the number of observations lower to 1 915 as France is excluded.

23 The groups are young-small; young-medium; old-small; old-medium; old-large. Young-large firms are excluded from the sample as this group of firms is likely to be affected by measurement error (e.g. reorganisations due to M&A activity are likely to be included in this group). Old-large is the reference group.

REFERENCES

Aghion P., T. Fally and S. Scarpetta (2007) "Credit Constraints", *Economic Policy*, October 2007, 731-779

Alfaro, L., A. Charlton and F. Kanczuk (2009) "Plant-Size Distribution and Cross-Country Income Differences," NBER Chapters, in: NBER International Seminar on Macroeconomics 2008, pages 243-272, National Bureau of Economic Research, Inc.

Andrews D., and C. Criscuolo (2013), "Knowledge-Based Capital, Innovation and Resource Allocation," OECD Economics Department Working Papers 1046, OECD Publishing.

Andrews D., C. Criscuolo and C. Menon (2014). "Do resources flow to Patenting Firms? Cross-Country Evidence from Microdata". STI Policy Paper, Forthcoming, OECD.

Antunes, A., T. Cavalcanti and A. Villamil (2008), "The effect of financial repression and enforcement on entrepreneurship and economic development" *Journal of Monetary Economics* 55, 278-297.

Anyadike-Danes, M., C-M. Bjuggren, S. Gottschalk, W. Hölzl, D. Johansson, M. Maliranta, A. Myrann (2013): "Accounting for job growth: disentangling size and age effects in an international cohort comparison", working paper

Arnold, J., G. Nicoletti and S. Scarpetta (2011), "Does Anti-Competitive Regulation Matter for Productivity? Evidence from European Firms", *IZA Discussion Papers,* No. 5511.

Audretsch, D.B. (2012): "Determinants of High-Growth Entrepreneurship", OECD/DBA International Workshop, Copenhagen, 28 March 2012.

Baldwin, J., T. Dunne and J. Haltiwanger, (1998), "A Comparison of Job Creation and Job Destruction in Canada and the United States", *Review of Economics and Statistics*, vol. 80(3), pages 347-356, August.

Baldwin, J.R., R. Dupuy, and W. Penner (1992), "Development of longitudinal panel data from business registers: the Canadian Experience", *Statistical Journal of the United Nations*, 9, pp. 289-303.

Barlevy, G. (2002), "The sullying effect of recessions", *Review of Economic Studies* 69, 65-96.

Bartelsman, E., J. Haltiwanger, S. Scarpetta (2013), "Cross-Country Differences in Productivity: The Role of Allocation and Selection", *American Economic Review*, 103(1) 305-334.

Bartelsman, E., S. Scarpetta and F. Schivardi (2005),"Comparative analysis of firm demographics and survival: evidence from micro-level sources in OECD countries", *Industrial and Corporate Change*, 14(3) 365-391

Bassanini, A., et al. (2010), "Institutional Determinants of Worker Flows: A Cross-Country/Cross-Industry Approach", *OECD Social, Employment and Migration Working Papers*, No. 107, OECD Publishing. doi: 10.1787/5kmbqvstc09x-en

Becker, R. A., John Haltiwanger, Ron S. Jarmin, Shawn D. Klimek, and Daniel J. Wilson, (2006) "Micro and Macro Data Integration: the Case of Capital." In A New Architecture for the U.S. National Accounts, edited by Dale W. Jorgenson, J. Steven Landefeld, and William D. Nordhaus, 541–609. Chicago: University of Chicago Press.

Benedetto, G., Haltiwanger, J., Lane, J., & McKinney, K. (2007), "Using worker flows to measure firm dynamics", *Journal of Business & Economic Statistics*, *25*(3).

Bentolila, S. and G. Bertola (1990), "Firing Costs and Labour Demand: How Bad Is Eurosclerosis?," *Review of Economic Studies*, Wiley Blackwell, vol. 57(3), pages 381-402, July.

Bertrand, M. and F. Kramarz (2002), "Does Entry Regulation Hinder Job Creation? Evidence From The French Retail Industry," *The Quarterly Journal of Economics*, MIT Press, vol. 117(4), pages 1369-1413, November.

Birch, D. L. (1979), "The Job Generation Process",. Cambridge, MA: MIT Program on Neighborhood and Regional Change.

Blanchard, O. J. and P. Diamond (1990), "The Cyclical Behavior of the Gross Flows of U.S. Workers." *Brookings Papers on Economic Activity*, 1990, (2), pp. 85-155.

Braguinsky, S., L. G. Branstetter and A. Regateiro (2011), "The Incredible Shrinking Portuguese Firm," *NBER Working Papers 17265.*

Bravo-Biosca, A. (2011), "A look at business growth and contraction in Europe." Nesta Working Paper No. 11/02.

Bravo-Biosca, A., C. Criscuolo and C. Menon (2013), "What Drives the Dynamics of Business Growth?", *OECD Science, Technology and Industry Policy Papers*, No. 1, OECD Publishing. doi: 10.1787/5k486qtttq46-en

Brown, C., & Medoff, J. L. (1988), "The impact of firm acquisitions on labor". In *Corporate takeovers: Causes and consequences* (pp. 9-32). University of Chicago Press.

Bugamelli, M.; L. Cannari, F. Lotti and S. Magri (2012) "The innovation gap of Italy's production system: roots and possible solutions," Questioni di Economia e Finanza (Occasional Papers) 121, Bank of Italy, Economic Research and International Relations Area.

Butcher, B. and M. Bursnall (2013), "How Dynamic is the Private Sector? Job Creation and Insights from Workplace-Level Data," National Institute Economic Review 2013 225: F4

Buera, F. J. and B. Moll (2012) "Aggregate Implications of a Credit Crunch" NBER Working Paper No. 17775.

Caballero, R. J. and M. Hammour (1994), "The Cleansing Effect of Recessions", *American Economic Review*, Vol. 84, No. 5 (Dec., 1994), pp. 1350-1368.

Caballero, R. J., & Hammour, M. L. (2005), The cost of recessions revisited: A reverse-liquidationist view. *The Review of Economic Studies*, *72*(2), 313-341.

Cabral, L. M., and Mata, J. (2003), "On the evolution of the firm size distribution: Facts and theory". *American economic review*, 1075-1090.

Cabrales, A. and H. A. Hopenhayn (1997), "Labor-market flexibility and aggregate employment volatility", *Carnegie-Rochester Conference Series on Public Policy* 46 (1997) 189-228.

Caselli, F., and Gennaioli, N. (2003), *Dynastic management* (No. w9442). National Bureau of Economic Research.

Clementi, G. L., and Hopenhayn, H. A. (2006), "A theory of financing constraints and firm dynamics". *The Quarterly Journal of Economics*, *121*(1), 229-265.

Coad, A. S-O. Daunfeldt, D. Johansson and K. Wennberg (2014), "Who Do High-Growth Firms Hire?" *Industrial and Corporate Change*, February 2014; Vol. 23, No. 1.

Cooley, T. F., & Quadrini, V. (2001), Financial markets and firm dynamics.*American Economic Review*, 1286-1310.

Cooper R. and J. Haltiwanger, (1993). "The Aggregate Implications of Machine Replacement: Theory and Evidence," NBER Working Papers 3552.

Criscuolo, C., & Martin, R. (2009), "Multinationals and US productivity leadership: Evidence from Great Britain". *The Review of Economics and Statistics*, *91*(2), 263-281.

Davis, S. J. and J. Haltiwanger (1999), "Gross job flows," *Handbook of Labor Economics*, in: O. Ashenfelter and D. Card (ed.), Handbook of Labor Economics, edition 1, volume 3, chapter 41, pages 2711-2805.

Davis, S. J. and J. Haltiwanger, (1990) "Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic Implications," *NBER Chapters*, in: NBER Macroeconomics Annual 1990, Volume 5, pages 123-186

Davis, S. J., Haltiwanger, J., Jarmin, R., and Miranda, J. (2007), Volatility and dispersion in business growth rates: Publicly traded versus privately held firms. In *NBER Macroeconomics Annual 2006*, *Volume 21* (pp. 107-180). MIT Press.

Davis, S. J., J. Haltiwanger and S. Schuh (1998) "Job Creation and Destruction," MIT Press Books, The MIT Press

Decker R., J. Haltiwanger, R.S. Jarmin, and J. Miranda, (2013), "The Secular Decline in Business Dynamism in the U.S. ", working paper.

Desmet, K., & S. L Parente (2010). Bigger is better: market size, demand elasticity and innovation ». *International Economic Review*, *51*(2), 319-333.

Diamond, P. (1982), "Wage Determination and Efficiency in Search Equilibrium", *Review of Economic Studies* 49, 217—227.

Dunne, T., M. J. Roberts, and L. Samuelson (1989) “Plant turnover and gross employment flows in the U.S. manufacturing sector,” *Journal of Labor Economics*, 7 (1): 48-71.

Eaton, J. and S. Kortum and F. Kramarz (2004), "Dissecting Trade: Firms, Industries, and Export Destinations," *American Economic Review*, vol. 94(2), pages 150-154, May.

Ericson, R. and A. Pakes (1995), “Markov-Perfect Industry Dynamics: A Framework for Empirical Work” *The Review of Economic Studies*, Vol. 62, No. 1 (Jan., 1995), pp. 53-82.

Fort, T. C., J. Haltiwanger, R.S. Jarmin and J. Miranda (2012), “How Firms Respond to Business Cycles: The Role of Firm Age and Firm Size”, NBER Working Paper 19134.

Foster, L., Grim, C., & Haltiwanger, J. (2013), "Reallocation in the Great Recession: Cleansing or Not?" *US Census Bureau Center for Economic Studies Paper No. CES-WP-13-42*.

Foster, L., J. Haltiwanger, and C. Syverson. (2008). "Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability?" *American Economic Review*, 98(1): 394-425.

Gal, P. N., A. Hijzen and Z. Wolf (2013), "The Role of Institutions and Firm Heterogeneity for Labour Market Adjustment: Cross-Country Firm-Level Evidence," IZA Discussion Papers 7404, Institute for the Study of Labor (IZA).

Garicano, L., Lelarge, C., & Van Reenen, J. (2013), *Firm size distortions and the productivity distribution: Evidence from France* (No. w18841). National Bureau of Economic Research.

Gertler, M. and S. Gilchrist, (1994), “Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms,” *The Quarterly Journal of Economics*, 109 (2), 309-340.

Geurts K., and J. Van Biesebroeck, (2013) Job creation, firm creation, and de novo entry. Working paper, mimeo.

Gomes, J., Greenwood, J., and Rebelo, S. (2001), “Equilibrium unemployment”, *Journal of Monetary Economics*, *48*(1), 109-152.

Guner, N., G. Ventura and Y. Xu (2008), “Macroeconomic Implications of Size-Dependent Policies,” Review of Economic Dynamics 11, 721-744.

Hall, Robert E, (1993), "Macro Theory and the Recession of 1990-1991," *American Economic Review*, vol. 83(2), pages 275-79, May.

Haltiwanger, J. (2011), "Job Creation and Firm Dynamics in the United States," NBER Chapters, in: Innovation Policy and the Economy, Volume 12, pages 17-38 National Bureau of Economic Research, Inc.

Haltiwanger, J., R.S. Jarmin and J. Miranda (2013), “Who Creates Jobs? Small Versus Large Versus young”, The Review of Economics and Statistics 95(2) 347-361.

Haltiwanger, J., S. Scarpetta and H. Schweiger, (2010), "Cross country differences in job reallocation: the role of industry, firm size and regulations," Working Papers 116, *European Bank for Reconstruction and Development*, Office of the Chief Economist

Hethey-Maier, T., and Schmieder, J. F. (2013), *Does the Use of Worker Flows Improve the Analysis of Establishment Turnover? Evidence from German Administrative Data* (No. w19730). National Bureau of Economic Research.

Hijzen, A., R. Upward and P. W. Wright, (2010), "Job Creation, Job Destruction and the Role of Small Firms: Firm-Level Evidence for the UK," *Oxford Bulletin of Economics and Statistics*, Department of Economics, University of Oxford, vol. 72(5), pages 621-647, October.

Hopenhayn, H. A, (1992), "Entry, Exit, and Firm Dynamics in Long Run Equilibrium," *Econometrica,* vol. 60(5), pages 1127-50, National Working Paper 17910.

Hopenhayn, H. and R. Rogerson, (1993), "Job Turnover and Policy Evaluation: A General Equilibrium Analysis," *Journal of Political Economy*, vol. 101(5), pages 915-38, October.

Hsieh, C. and P.J. Klenow, (2009), "Misallocation and Manufacturing TFP in China and India," *The Quarterly Journal of Economics*, vol. 124(4), pages 1403-1448, November.

Ibsen, R. and N. C. Westergård-Nielsen, (2011) "Job Creation by Firms in Denmark," IZA Discussion Papers 5458, Institute for the Study of Labor (IZA).

Jeong, H., and Townsend, R. M. (2007), "Sources of TFP growth: occupational choice and financial deepening". *Economic Theory, 32*(1), 179-221.

Jovanovic, B. (1982), "Selection and the Evolution of Industry," *Econometrica*, Vol. 50, No. 3.

Klapper, L., L. Laeven, and R. Rajan, (2006), "Entry regulation as a barrier to entrepreneurship," *Journal of Financial Economics*, Elsevier, vol. 82(3), pages 591-629, December.

Lawless, M., (2012), "Job Creation and Destruction in Recession," Economic Letters 01/EL/12, Central Bank of Ireland.

Lawless, M., (2013), "Age or Size? Determinants of Job Creation," Research Technical Papers 02/RT/13, Central Bank of Ireland.

Lazear, E. P. and J. R. Spletzer (2012), "Hiring, Churn and the Business Cycle", *National Bureau of Economic Research Working Paper* No. 17910.

Lotti F, E Santarelli, and M. Vivarelli (2003) "Does Gibrat's law hold among young, small firms?" *Journal of Evolutionary Economics* 13:213-235.

Melitz, M, (2003), "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity". *Econometrica* 71: 1695-1725.

Melitz, M. and G Ottaviano. (2008), "Market Size, Trade, and Productivity". *Review of Economic Studies* 75: 295-316.

Mortensen, D. (1982), The Matching Process as a Noncooperative Bargaining Game, in J McCall (ed.), *The Economics of Information and Uncertainty*, University of Chicago Press.

Moscarini, G. and F. Postel-Vinay (2012), "The Contribution of Large and Small Employers to Job Creation in Times of High and Low Unemployment", *American Economic Review*, 102(6): 2509-39.

Neumark, D., B. Wall, J. Zhang (2008), "Do Small Businesses Create More Jobs? New Evidence for the United States from the National Establishment Time Series", IZA Discussion Paper No. 3888, December 2008, Bonn, Germany.

OECD (2012), *Entrepreneurship at a Glance 2012*, OECD Publishing. doi: 10.1787/entrepreneur_aag-2012-en

Ouyang, M. (2009), "The scarring effect of recessions", *Journal of Monetary Economics* 56, 184-199.

Pissarides, C. (1984), "Search Intensity, Job Advertising, and Efficiency", *Journal of Labor Economics* 2, 128—143.

Rajan, R. and L. Zingales, (1998), "Financial Dependence and Growth," *American Economic Review*, American Economic Association, vol. 88(3), pages 559-86, June.

Restuccia, D. and R. Rogerson (2013),"Misallocation and productivity," *Review of Economic Dynamics*, Elsevier for the Society for Economic Dynamics, vol. 16(1), pages 1-10, January.

Scarpetta, S., et al. (2002), "The Role of Policy and Institutions for Productivity and Firm Dynamics: Evidence from Micro and Industry Data", *OECD Economics Department Working Papers*, No. 329, OECD Publishing. doi: 10.1787/547061627526

Schreyer, P. (2000), "High-Growth Firms and Employment", OECD Science, Technology and Industry Working Papers, 2000/03, OECD Publishing

Schumpeter, J. (1942), "Capitalism, Socialism, and Democracy". New York: Harper & Bros.

Sharpe, S., (1994), "Financial Market Imperfections, Firm Leverage, and the Cyclicality of Employment," *American Economic Review*, 84(4), 1060-74.

Sraer, D., and Thesmar, D. (2007), Performance and behavior of family firms: Evidence from the French stock market. *Journal of the European Economic Association*, *5*(4), 709-751.

Stiglbauer, A., (2003), "Job and Worker Flows in Austria 1978-1998." PhD dissertation, University of Linz.

Sutton J. (1997), "Gibrat's legacy" *Journal of Economic Literature* vol. 35(1): 40-59.

Vets, P. and K. Geurts (2011), "Dynamics on the Belgian labour market - June 2008 – June 2010". Working paper, mimeo.

Vilhuber, L. (2009), "Adjusting imperfect data: overview and case studies," in Wage structure, raises and mobility: International comparisons of the structure of wages within and across firms.

Ziebarth, N. (2012), Misallocation and productivity during the Great Depression. *Unpublished Working Paper, University of Iowa*, *10*.