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Young Firms and Industry Dynamics in Belgium

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Abstract – Recent studies reveal the importance of entrants and young firms for job creation, productivity and economic growth. Some scholars argue that the falling rate at which new firms are established, can explain, to a certain extent, the productivity slowdown witnessed in most OECD countries. Belgium appears to stand out unfavourably from other countries in its very low start-up rate. This paper reviews the empirical cross-country evidence, provides some additional analysis of the role of young firms in industry-level employment and productivity dynamics in Belgium and concludes with a discussion of the implications for economic policy.

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Executive summary

Recent studies reveal the crucial role of young firms in job creation and industry-level productivity growth. There is growing concern that the declining entry of new firms could help explain, to a certain extent, the productivity slowdown witnessed in many OECD countries. The decrease in firm entry and productivity growth was apparent before the start of the 'Great Recession' following the 2007-2008 global financial crisis. The crisis may however have exacerbated this structural problem, as a 'missing generation' of entering firms can have a lasting negative impact on economic growth.

Firm-level data reveal substantial, persistent and even increasing heterogeneity in performance across firms. As the international competitiveness of economies appears to depend on a relatively small number of highly productive firms, analyses based on firm-level data can be useful to complement the traditional macro-economic perspective. Firm-level data clearly show the need to investigate the distribution of variables over the entire population of firms and indicate that conclusions based on the average 'representative' firm may be biased.

In this paper, we present the mounting evidence on the importance of young firms in employment and productivity dynamics. We point out the main results of recent analyses, coordinated by the OECD Directorate for Science, Technology and Innovation, which offer cross-country evidence on industry dynamics, based on national firm-level data. The common findings and differences of the results for Belgium, with respect to other participating countries, are discussed and complemented with additional analyses.

Early firm-level studies focus on the relationship between the size of firms and some indicator of growth (for example, job creation or sales growth). More recently, studies point out the important distinction between firm age and firm size. It appears that young – mostly small – firms account for a disproportionate share in job creation. On the contrary, old small firms, which make up the largest percentage of firms in all countries, tend to destroy more jobs than they create. Young firms also contribute substantially to industry-level productivity growth, although this occurs only some time after entry. Most entering firms have a productivity level below the industry average. Average productivity increases with age, because of organizational learning but also due to market selection, as many entrants that do not succeed in competing with established firms, are forced to exit within two to three years after entry. Learning and market selection are reflected in a positive contribution, of productivity growth of young firms, to industry-level productivity growth. The older firms become, the more market shares appear to shift away from less productive incumbents towards more productive incumbents.

As this paper shows, Belgium performed rather well in terms of net job creation over the period 2000-2014, in comparison with the three neighbouring countries France, Germany and the Netherlands. The jobs lost in most manufacturing industries were compensated for by strong employment growth in market services. The industry-specific pattern of employment growth hampered productivity growth in Belgium as it implies a shift of employment from industries with high productivity levels (mainly manufacturing industries) towards less productive service industries. However, our results underline the

importance of the decrease in industry-level productivity growth as the main explanation of the aggregate productivity growth slowdown. The apparent trade-off between employment growth and productivity growth, which is most evident in market service industries, reveals the potential tension between different policies and suggests that in the introduction of labour market measures aimed at integrating more low-skilled persons in the economy – warranted because of the historically low employment rate in Belgium- a 'productivity sacrifice' needs to be accounted for.

Belgium stands out unfavourably from other OECD countries, in its low entry of new firms. The survival rate of young firms in Belgium does not differ much from other countries and post-entry growth of surviving start-ups actually appears to be relatively high. Over the period 2001-2011, the entry rate and the share of young firms decreased, which is a cause of concern as young firms are found to have a positive impact on industry-level productivity growth.

In view of the evidence that young firms – rather than small firms – are crucial for industry dynamics, the IMF and the OECD argue that economic growth would be achieved more efficiently by targeting tax support on young firms instead of favouring size-contingent tax benefits. The specific tax benefit for young innovative companies, introduced by the Belgian federal government in 2006, and the Start-up Plan that was initiated in 2015, seem to be good practice in targeting tax incentives on young firms as it minimises the budgetary cost and the tendency to favour less dynamic incumbents at the expense of dynamic young firms. Policy should however not be restricted to transactional support (grants, subsidies and tax benefits), but should also consider 'relational support' to the 'entrepreneurial ecosystem' of firms, universities, science parks, incubators and venture capitalists that are instrumental in generating knowledge spillovers, academic spinoffs and the formation of highly specialized human and social capital. Likewise, the focus on young firms does not imply that the key role of large incumbents in spawning entrepreneurial managers, who are capable of establishing and growing businesses, should not be acknowledged.

Considering the position of Belgium in rankings on factors that seem to explain cross-country differences in the entry of new firms, such as bankruptcy regulation, contract enforcement, access to finance and product market regulation, it seems that access to finance is the major barrier for entrants and young firms in Belgium. A recent survey indicates that start-ups in Belgium face vital problems in obtaining financing by banks. Banks motivate their rejection of demands for loans by the lack of collateral or equity of start-ups. Because of the financial crisis, venture capitalists have also become more averse to finance risky early-stage investment.

1. Introduction

Studies based on firm-level data provide robust evidence of substantial, persistent and generally increasing heterogeneity in performance across firms, even within narrowly defined industries. These studies call into question the relevance of a focus on the average ('representative') firm and show the need to investigate the – often highly skewed – distribution of variables over the entire population of firms within industries (see, for example, Caves 1998; Bartelsman and Doms 2000; Altomonte et al. 2011; Lopez-Garcia et al. 2014). Altomonte and Békés (2016) point at the evidence that the competitiveness of countries and industries relies on a relatively small number of highly productive firms (see, for example, Mayer and Ottaviano 2007, Barba Navaretti et al. 2011, 2016). Economic growth depends on the extent to which labour and capital are reallocated towards the most efficient firms within industries. Indicators derived from firm-level data provide a necessary complement to macro-economic measures of competiveness that are used to monitor imbalances between EU Member States in the European Semester procedure[1]. According to Barba Navaretti et al. (2016), the competiveness of countries cannot be properly evaluated without an assessment of the dynamics relating to the competiveness of firms.

Whereas early studies focused on the relationship between firm size and some growth indicator, more recent empirical works stress the distinction between the size and the age of firms. In all countries, the vast majority of firms is predominantly small or medium-sized but countries clearly differ in the age composition of (small) firms. These differences may have considerable implications for the industry-level evolution in employment and productivity. Andrews et al. (2015) point out that, contrary to popular belief, not all small firms contribute to net job creation. Only young firms – which are mostly small firms – account for a disproportionate share in job creation. For old small firms, the largest group in all countries, gross job destruction generally exceeds gross job creation. There is mounting evidence of the necessity to account for firm age in the analysis of industry dynamics (see Evans 1987 a, b; Dunne, Roberts and Samuelson 1988, 1989; Davis and Haltiwanger 1992; Fort et al. 2013; Haltiwanger, Jarmin and Miranda 2013; Barba Navaretti et al. 2014; Criscuolo, Gal and Menon 2014 a, b; Decker et al. 2014, 2016; Lawless 2014; Andrews et al. 2015; Calvino, Criscuolo and Menon 2015, 2016).

Most studies on the role of firm age assess the contribution of young firms to industry-level employment or output. Fewer studies investigate the relationship between firm age and productivity (for example, Huergo and Jaumandreu 2004; Fukuda 2013; Hyytinen and Maliranta 2013; Verschelde et al. 2014, Du and Temouri 2015, Dumont et al. 2016, Haltiwanger et al. 2016). Daunfeldt, Elert and Johansson (2014) find, for Sweden over the period 1997-2010, substantial differences between high-growth firms defined in terms of employment and high-growth firms defined in terms of productivity, although young firms are more likely to be high-growth firms irrespective of which growth indicator is considered. The authors conclude that there may be a tension between a policy that aims to promote employment growth and a policy that aims to stimulate productivity. Given the important contribution of young firms to industry-level productivity growth, the general decline in the entry of new firms, witnessed in many OECD countries, may explain to some extent the decrease in productivity growth (see, for example,

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[1] The European Semester is the yearly cycle of economic policy coordination set up by the European Union, which consists in a detailed analysis of the plans of budgetary, macroeconomic and structural reforms of EU Member States and results in country-specific recommendations for the next 12-18 months.

OECD 2015c). Whereas in most OECD countries the fall in the start-up rate was already apparent before the 'Great Recession', the crisis may have exacerbated the decline, a cause for concern, since Gourio, Messer and Siemer (2016) point out that a 'missing generation' of entering firms can have a lasting negative impact on GDP and productivity.

Although Belgium historically has an employment rate well below the OECD average and a rather high unemployment rate, especially among the youth, its labour market has held up relatively well in the face of the euro area crisis. This paper reveals that in terms of net job creation over the period 2000-2014, Belgium actually performed better than its three neighbouring countries France, Germany and the Netherlands. This is explained by strong employment growth in market services as most manufacturing industries shed jobs. Productivity growth in Belgium seems to have been hampered by a shift of employment, from industries with high productivity levels (mainly manufacturing industries), towards less productive industries. The apparent trade-off between employment growth and productivity growth is most evident in the group of market services.

To provide more insight into the aggregate pattern of employment and productivity growth in Belgium, this paper aims to gather existing evidence on the role of young firms in industry dynamics. The paper draws heavily on recent and ongoing analyses coordinated by the OECD Directorate for Science, Technology and Innovation that offer cross-country evidence on the dynamics of employment and productivity, based on national firm-level data, with specific attention to the role of young firms. This paper summarizes the main results of these projects so far, pointing out the similarities and differences of the results for Belgium in comparison to other participating countries.

The main conclusion from this paper is that Belgium stands out unfavourably in its low entry of new firms. Whereas the survival rate of young firms in Belgium does not differ much from other countries, post-entry growth of surviving start-ups actually appears to be relatively high. This finding hints at barriers to the entry of new firms that may be more consequential in Belgium than in other countries. Given the importance of young firms for industry-level productivity growth, the low start-up rate may be linked to the fact that the recent productivity slowdown in most OECD countries appears to be more distinct in Belgium (see OECD 2016 for recent productivity performance).

The paper is organized as follows. Section 2 provides a short overview of the recent evolution in employment and productivity growth in Belgian industries. Section 3 discusses the sources and limitations of firm-level data and reports the main results of cross-country analyses of industry dynamics based on firm-level data as well as some specific results for Belgium. Section 4 concludes the paper by considering potential implications for economic policy of recent empirical work on the role of young firms in industry dynamics.

2. Industry dynamics in Belgium

Section 2 provides a general overview of the recent evolution in employment growth (Section 2.1) and productivity growth (Section 2.2) in Belgium, based on official industry-level data from the Institute for National Accounts. The Institute for National Accounts was created in 1994 to coordinate the collection and construction of macro-economic statistics and is jointly managed by Statistics Belgium, the National Bank of Belgium and the Federal Planning Bureau. Data from Eurostat are used to compare the evolution in Belgium with the three neighbouring countries (France, Germany and the Netherlands) that serve as a benchmark to determine the maximum of wage increases in Belgium, based on the law to 'Promote Employment and the Safeguarding of Competitiveness' that was introduced by the federal government in 1996.

2.1. Employment dynamics (2000-2014)

Total domestic employment in the Belgian economy, measured in number of persons employed (head count), increased by 11% over 2000-2014, or a net job creation of 440 300 units. This performance is better than the net increase that was recorded, over the same period, in the three neighbouring countries (Germany 7 % and France and the Netherlands 6 %)[2]. As shown in Graph 1, in Belgium -– as in the other three countries – the net increase in total employment is mainly due to market services, since employment in manufacturing industries decreased in all four countries.

Graph 1   Net employment creation (in persons) in Belgium by main aggregate industries (2001-2014)
Annual change in thousands

Source: Institute for National Accounts.

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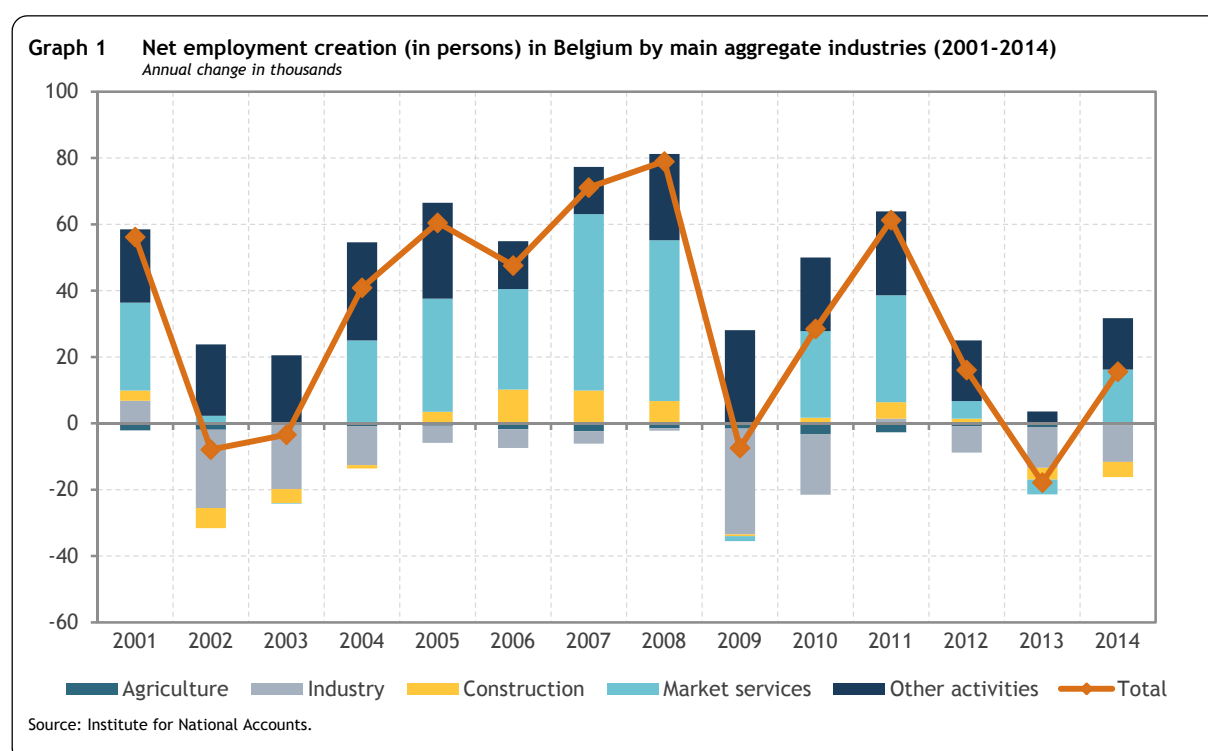
[2]   However, the employment rate in Belgium is still substantially lower than in Germany, the Netherlands and France. In 2014, the employment rate for the age group 20-64 (EU2020 target) was 67.3 % in Belgium against 77.7% in Germany, 75.4 % in the Netherlands and 69.4 % in France.

Between 2000 and 2014, Belgian manufacturing industries shed 22 % of their employment, against 23 % in France, 19 % in the Netherlands and 4 % in Germany. By contrast, employment in market services increased by 16 % in Belgium, 15 % in Germany, 13 % in France and 6 % in the Netherlands. Employment also increased in the construction industry in Belgium (9 %) and in France (21 %) whereas it strongly decreased in Germany and in the Netherlands, -16 % in both countries.

This pattern is confirmed by data on the evolution in the employment volume, measured as the number of hours worked, as shown in Graph 2. Over 2000-2014, the total number of hours worked increased by 8 % in Belgium, 3 % in the Netherlands, 2% in France, but only by 1% in Germany. In all four countries, the growth rate of employment is lower when employment is measured in terms of hours worked than in terms of persons employed. In manufacturing industries, which witnessed net job destruction, the decrease in employment is faster in terms of hours worked than in terms of persons employed (-24 % in Belgium, -27 % in France, -19 % in the Netherlands and -7 % in Germany). As part-time contracts are more common in services than in manufacturing, the increase in employment measured in hours worked is slower than growth based on persons employed. The employment volume in market services increased by 14 % in Belgium, 10 % in France, 6 % in Germany and by only 4 % in the Netherlands. In the construction industry, labour volume increased in Belgium (8 %) and in France (14 %) but strongly decreased in Germany and in the Netherlands (-17 %).

Graph 2   Net employment creation (in hours worked) in Belgium by main aggregate industries (2001-2014)
Annual change in thousands

Source: Institute for National Accounts.
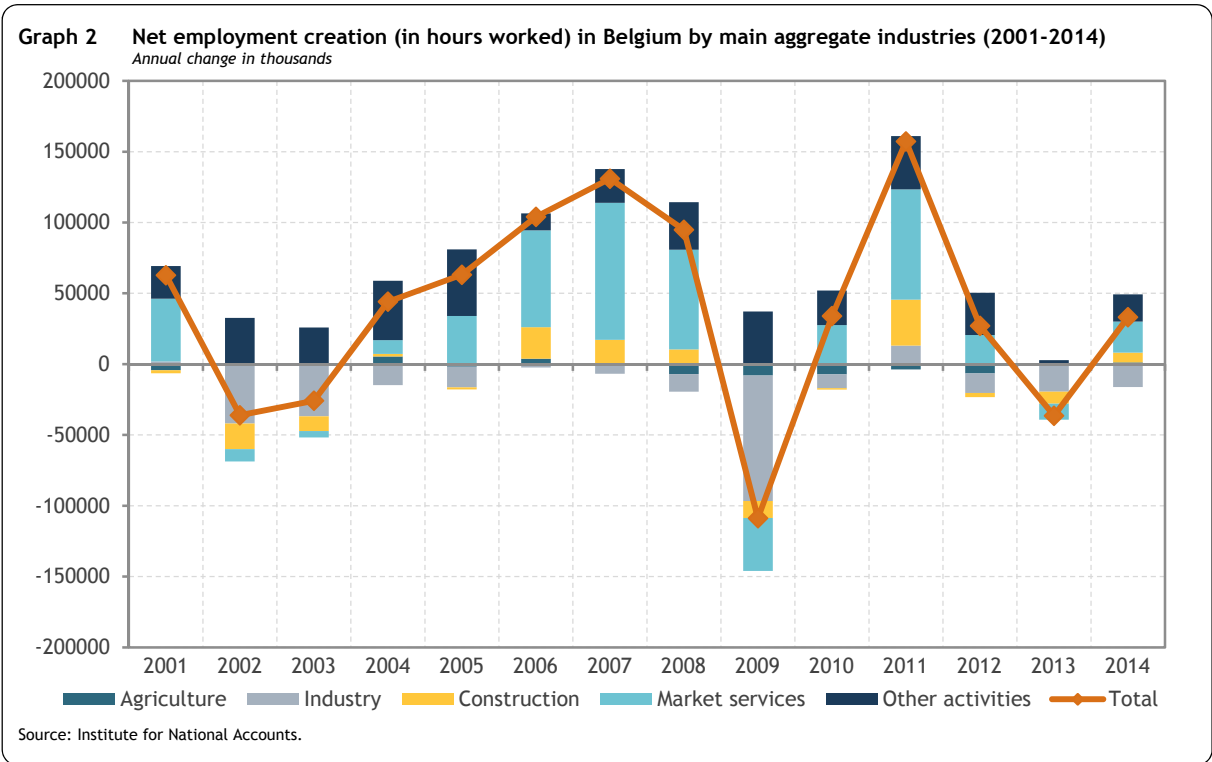
In the economy as a whole, the role of self-employed persons in the net increase in domestic employment in Belgium, as shown in Graph 3, is more limited than in each of the three neighbouring countries. In Belgium, 12% of total net job creation (in terms of persons) between 2000 and 2014 was by self-employed persons whereas it was 14% in Germany, 26% in France and 44% in the Netherlands.

Graph 3   Net employment creation (in persons) in Belgium: employees and self-employed
Annual change in thousands

| Employees | Self-employed | Total |

Source: Institute for National Accounts.
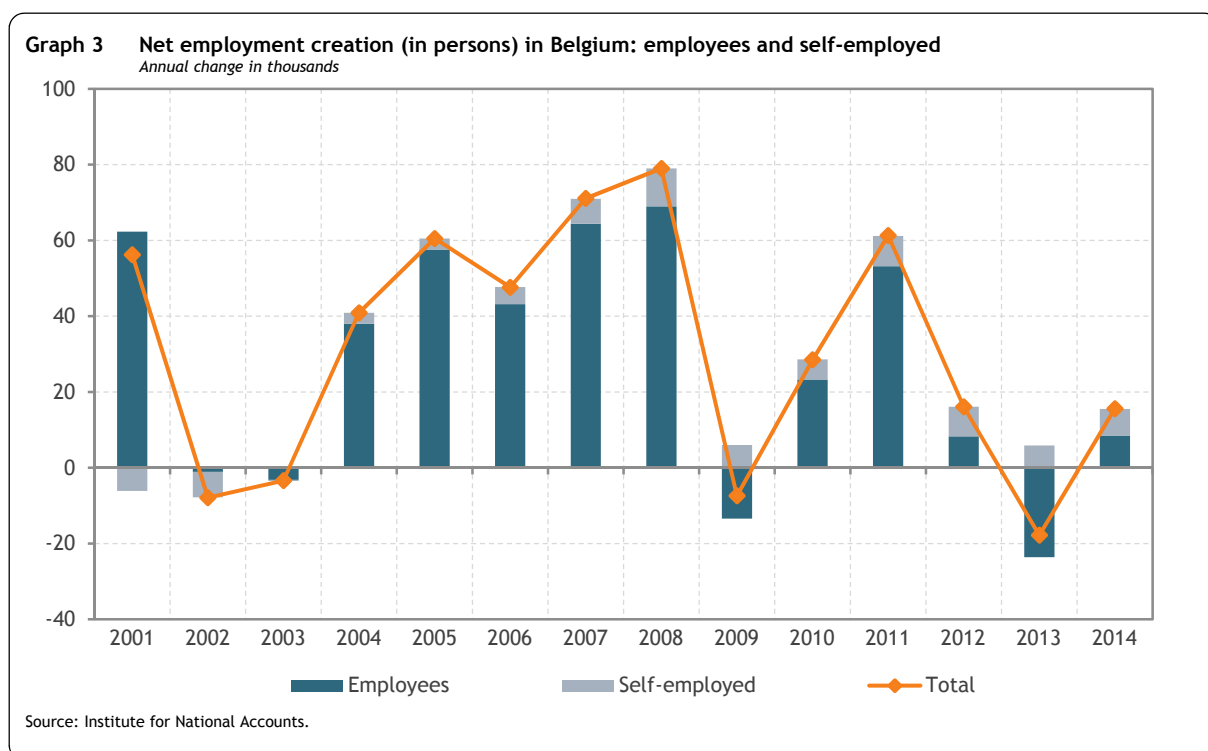
However, the relative importance of self-employed persons is more pronounced in market services employment creation. In Belgium, self-employed persons created more than one job in five (21 %), between 2000 and 2014, as opposed to only 17 % in France and 7 % in Germany, although this is well below 36 % for the Netherlands. Since the 2008 crisis, the contribution of self-employed persons to net employment creation has always been positive in Belgium, France and the Netherlands, but not in Germany.

The contribution of self-employed persons to net job creation in Belgium has been particularly important in Legal and accounting activities; activities of head offices, management consultancy activities, architectural and engineering activities, technical testing and analysis (MA); Computer programming, consultancy, and information service activities (JC) and Advertising and market research, other professional, scientific and technical activities, veterinary activities (MC).

As Table 1 shows, the share of self-employed in total domestic employment measured in persons was in 2014 in Belgium comparable with the Netherlands but higher than in Germany and in France.

Table 1   Share of self-employed persons in total domestic employment (in persons), 2014
In %

	Belgium	Germany	France	Netherlands
Total	17	10	10	17
Agriculture	63	47	55	51
Manufacturing	5	3	5	5
Construction	24	21	18	35
Market services	24	12	10	18
Other activities	8	8	7	14

Source: Eurostat and Institute for National Accounts.

In the four countries, the highest share of self-employed was in agriculture with a particularly high share in Belgium, whereas the relative importance of self-employment was the weakest in manufacturing industries. In market services, Belgium had the highest share of self-employment followed by the Netherlands, and well above the German and French share. In the construction industry, almost one in three persons is self-employed in the Netherlands, as opposed to almost one in four in Belgium and one in five in Germany and France.

2.2. Productivity dynamics (2000-2014)

The growth rate in labour productivity, measured as value added (in chain-linked euros[3]) per hour worked, over the period 2000-2014, is 13 % in Belgium, as opposed to 14 % in the Netherlands, 15 % in France and 17 % in Germany. This growth rate strongly varies according to the group of industries considered. As Table 2 indicates, the Belgian performance was particularly strong in manufacturing and the construction industry, with the highest cumulative growth rate over 2000-2014 among the countries of comparison. On the other hand, Belgian performance was particularly weak in agriculture and in other activities that are dominated by non-market services. In market services that account for the largest part of the economy, Belgian labour productivity growth was the weakest of the four countries, slightly below the French growth.

Table 2 **Cumulative growth rate of hourly labour productivity, 2000-2014**
In %

Country	Total	Agriculture	Manufacturing	Construction	Market services	Other activities
Belgium	13	22	52	29	11	-5
Germany	17	44	33	3	14	5
France	15	51	49	-18	12	9
Netherlands	14	44	36	3	16	-2

Source:a Institute for National Accounts and Eurostat. Note: Market services include industries from G to N (see table A.1 in Annex) and Other activities include industries B, D, E, O, P, Q, R, S, T, U (Statistical Classification of Economic Activities in the European Community, NACE Rev. 2 - 2008).

Over the period 2000-2014, the contribution of the main aggregate industries to labour productivity growth diverged between countries. In Belgium, the main contributors to labour productivity growth were manufacturing industries (7 pp[4]) and market services (6 pp), whereas other activities had a negative contribution (-2 pp), compensated for by the positive contribution of the construction industry and agriculture. Manufacturing industries (7 pp) and market services (7 pp) were also the largest contributors to German labour productivity growth. In this country, however, the contribution of other activities as well as the contribution of the construction industry and agriculture was positive (1 pp). In France and in the Netherlands, market services contributed most to labour productivity growth of the total economy (7 pp in France and 8 pp in the Netherlands). The contribution of the manufacturing industries was clearly smaller (5 pp in France and 4 pp in the Netherlands). Moreover, in France, the construction industry had a negative contribution (-1 pp) and in the Netherlands, the negative contribution came from other activities (-1 pp).

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[3]   Chain linking provides time series of value added in real (inflation-adjusted) terms.

[4]   pp: percentage points.

The annual contributions to labour productivity growth of the main aggregate industries have changed over time, across countries and over the business cycle, as illustrated in the following graphs.

In Belgium, the double-dip recession led to negative labour productivity growth in 2008 and 2009 and once again in 2011 and 2012. However, these negative growth rates were limited in comparison to those of Germany or the Netherlands. In the most recent year available (2014), all industries made a positive contribution to the increase in labour productivity growth.

Graph 4   **Hourly labour productivity growth contribution of the main activities, Belgium**
In %

Legend: Agriculture · Manufacturing · Construction · Market services · Other activities · Total

Source: Institute for National Accounts.
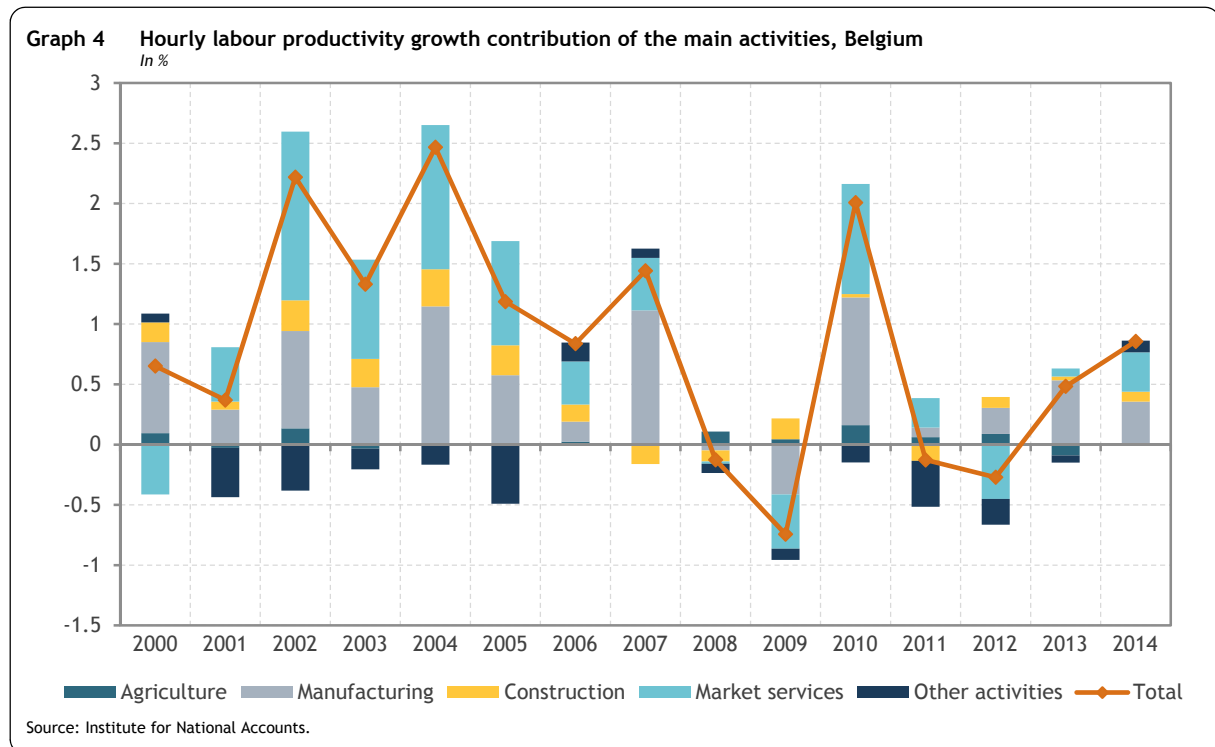
In Germany, the recession led to more negative labour productivity growth, but negative growth was limited to 2009, mainly due to a strong negative contribution of manufacturing industries and to a lesser extent of market services. Since 2012, the contribution of manufacturing industries to labour productivity growth has been relatively limited.

Graph 5   Hourly labour productivity growth contribution of the main activities, Germany
In %

Source: Eurostat.
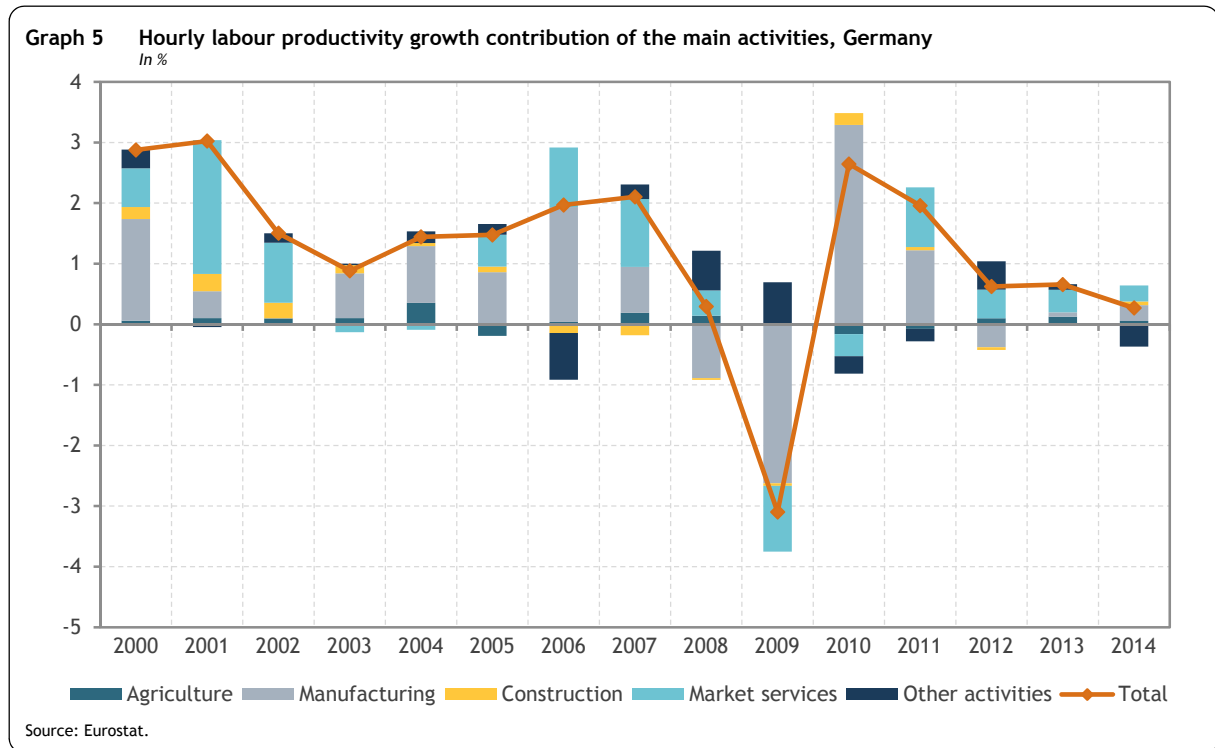
Labour productivity growth was negative for three years in France, from 2007 to 2009, because of the negative contribution of the construction industry and other activities. These two industries again provided a negative contribution in 2014 and almost counteracted the positive contribution of manufacturing industries and market services.

Graph 6   Hourly labour productivity growth contribution of the main activities, France
In %

Source: Eurostat.

Graph 7   Hourly labour productivity growth contribution of the main activities, the Netherlands
In %

Source: Eurostat.
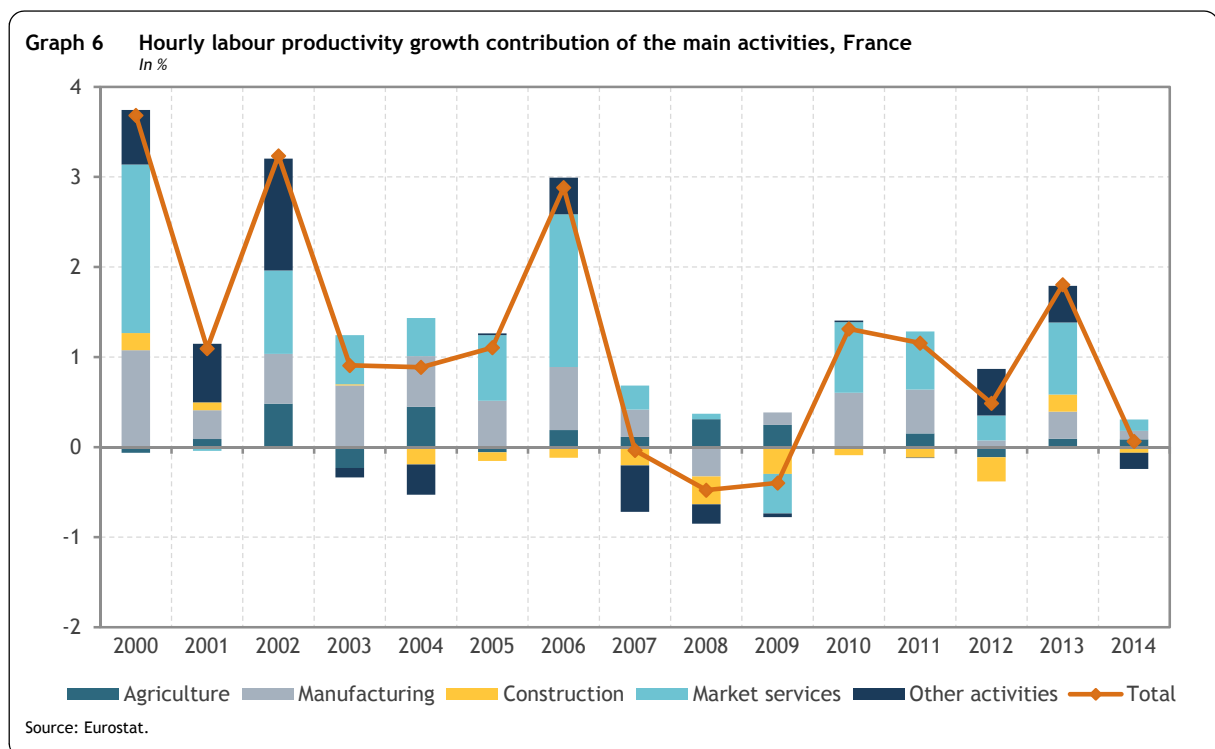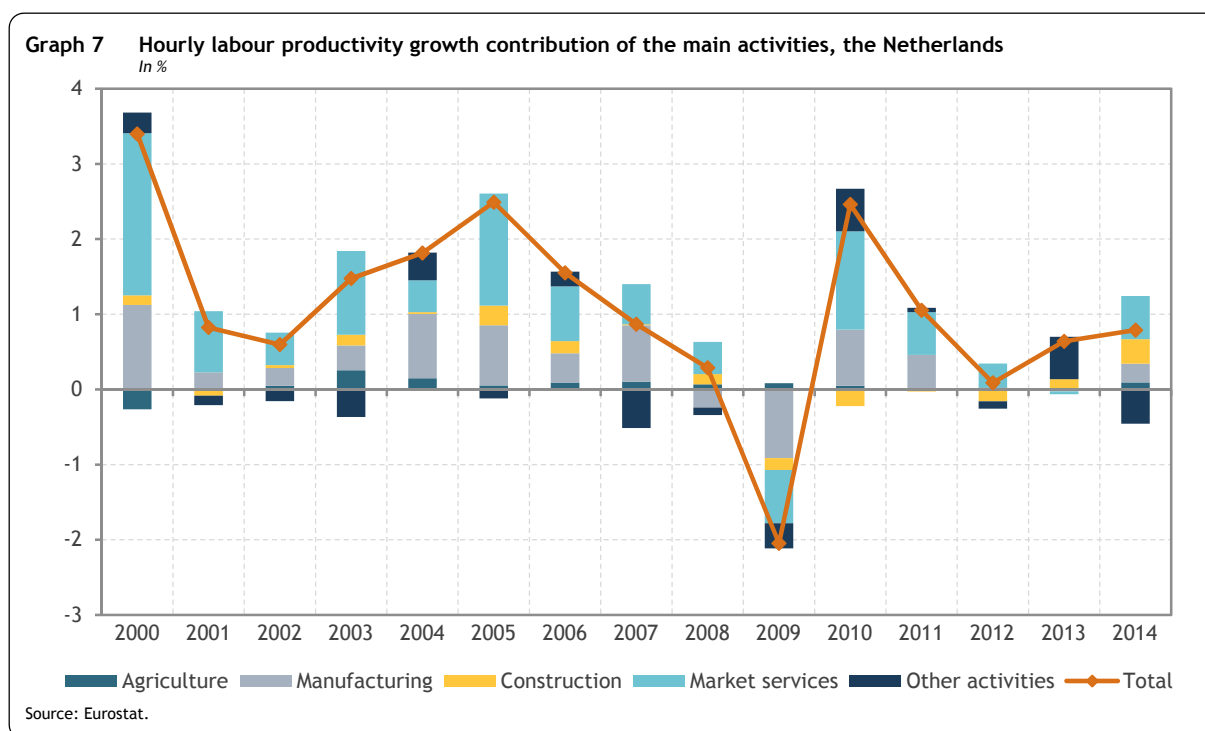
In the Netherlands, the crisis also led to a negative growth rate of labour productivity that can be explained by negative contributions of all aggregate industries with the exception of agriculture. Since then, the contribution of manufacturing industries and market services has been generally positive. The most recent year is marked by a relatively strong negative contribution of other activities.

In the economy as a whole, the slower labour productivity growth in Belgium compared to the three neighbouring countries is explained mainly by the very weak contribution of total factor productivity (TFP)[5], in particular with regard to the evolution in Germany and the Netherlands (see Biatour and Kegels 2015 for more details). In addition, whereas the contribution of non-ICT capital deepening is relatively high in Belgium, the contribution of ICT-capital deepening is lower than in neighbouring countries.[6] In manufacturing industries, the relatively good performance of Belgium in labour productivity growth comes from a relatively higher contribution of TFP and of non-ICT capital deepening.

Aggregate productivity is the weighted average of the productivity of industries with each industry's share in overall labour volume considered as the weight[7]. Consequently, the change in the productivity growth rate of the total economy results not only from productivity growth of individual industries but also from changes in the sector composition of total hours worked. A shift-share analysis is often used to decompose labour productivity growth into an intra-industry productivity growth effect, a structural change effect and an interaction effect. The intra-industry effect (or within effect) equals the sum of

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[5]   Total factor productivity is the part of the output level that is not explained by the level of all inputs in the production process (for example labour and capital) and is considered as a proxy for technical progress that is not embodied in the production factors.

[6]   The assessment of ICT capital deepening is rather sensitive to which investment deflator is used in the computation of the capital stock. The data of the shift-share analysis, reported in this section, are based on a national investment deflator and the results diverge from those reported in OECD (2016), which are based on data using a harmonized ICT investment deflator.

[7]   The value added of all industries are aggregated using a Laspeyres index. For the calculation of the contribution of each industry to aggregate labour productivity growth, the share of the industry in total nominal value added is used as weight.

productivity growth in the individual industries, in the absence of structural change. If this effect were larger than aggregate productivity growth, the expectation would be that industries with higher productivity growth witness a decrease of their share in total employment. The structural effect (or between effect) is equal to the contribution to overall productivity growth of a shift of employment resources from low- to high-productivity industries or conversely. This effect is indicative of the restructuring process occurring in an economy. The interaction effect (or dynamic effect) captures the dynamic component of structural change. It takes into account the link between the variation of productivity and the variation of hours worked. The interaction effect is positive when the first two effects are complementary (productivity growth is positive (negative) in expanding (contracting) industries in terms of hours worked) and is negative when the first two effects are substitutes (productivity growth is positive (negative) in contracting (expanding) industries in terms of hours worked). In Europe, the sign of the interaction effect is usually negative because in the majority of industries, the productivity change and the labour input change have opposite signs. Formally, the decomposition can be written as:

$$\frac{\Delta LPH}{LPH_{t-1}} = \sum_i \frac{\Delta LPH_i}{LPH_{i,t-1}} \frac{Y_{i,t-1}}{Y_{t-1}} + \sum_i \frac{LPH_{i,t-1}}{LPH_{t-1}} \left(\frac{L_{i,t}}{L_t} - \frac{L_{i,t-1}}{L_{t-1}}\right) + \sum_i \frac{1}{LPH_{t-1}} (\Delta LPH_i) \Delta \left(\frac{L_i}{L}\right) \qquad (1)$$

In this equation, LPH is labour productivity defined as value added in volume divided by hours worked, Y is nominal value added, L denotes the number of hours worked, t is the time index and i is the industry index.

Table 3   Shift share analysis, Belgium, Germany, France and the Netherlands
Average annual growth rate in percent

	Belgium	Germany	France	Netherlands
2000-2014				
Labour productivity	0.85	1.18	1.07	1.10
Within effect	0.92	1.27	1.09	1.31
Between effect	-0.04	-0.08	0.02	-0.16
Dynamic effect	-0.03	-0.01	-0.04	-0.05
2000-2007				
Labour productivity	1.41	1.77	1.43	1.74
Within effect	1.56	1.77	1.24	2.01
Between effect	-0.11	0.02	0.23	-0.21
Dynamic effect	-0.05	-0.02	-0.04	-0.06
2007-2014				
Labour productivity	0.29	0.50	0.64	0.46
Within effect	0.22	0.72	0.92	0.57
Between effect	0.10	-0.23	-0.23	-0.08
Dynamic effect	-0.02	0.01	-0.04	-0.03

Note: The within effect is estimated with weights based on the share in nominal value added. Possible discrepancy in the sum is due to aggregation of value added in volume with Laspeyres index. Data for France and Germany are limited to 2000-2013.
Source: FPB based on Eurostat and Institute for National Accounts.

The shift-share analysis at the two-digit industry level shows that the within effect, over the period 2000-2014, is larger than the aggregate labour productivity growth in the four countries. This suggests that industries with higher productivity growth witnessed a decrease of their employment share in the total

economy. The between or structural effect, measuring the contribution to labour productivity growth of a shift in employment, is negative in Belgium, Germany and the Netherlands.

This confirms that the increase in hours worked has occurred in industries with a relatively lower productivity level which is consistent with the increase in hours worked in services, usually with lower productivity levels and the decrease in hours worked in manufacturing industries with higher productivity levels. The dynamic effect (interaction term) is slightly negative in all countries, with the within and between effects being substitute rather than complement (productivity growth is positive (negative) in contracting (expanding) industries in terms of hours worked). Borio et al. (2016) provide evidence for a panel of 21 countries (among which Belgium), over the period 1979-2009, that credit booms (a strong expansion in private credit relative to GDP) have a negative impact on productivity by shifting labour towards industries with below-average productivity levels.

The comparison of the shift-share results between the periods before and after the Great Recession makes it possible to underline the strong slowdown of the labour productivity growth in the four countries, which was mainly caused by the slowdown recorded at industry level. Belgium is the only country for which the between effect has become positive since 2008, the employment shifting from low- to high-productivity industries.

As mentioned in the introduction, Daunfeldt, Elert and Johansson (2014) report evidence for Sweden that employment growth and productivity growth do not necessarily correlate positively. This is in line with other findings of a trade-off between productivity and employment (Beaudry and Collard 2002, OECD 2007, Boulhol and Turner 2009, Altomonte 2010, Dew-Becker and Gordon 2012, Junankar 2014, Borio et al. 2016). Boulhol and Turner (2009) argue that a trade-off could result from labour market reforms that aim at integrating low-productivity workers into employment and, if so, imply the 'productivity sacrifice' of these reforms. The fact that manufacturing industries in Belgium, over the period 2000-2014, combine relatively strong productivity growth with falling employment and service industries witness strong employment growth but rather weak productivity growth, suggests that a trade-off between employment and productivity also applies to Belgium.

Graph 8 shows, for the period 2001-2014, the link between the average annual employment growth rate (hours worked) and average labour productivity growth. For manufacturing industries, employment growth and productivity growth appear to correlate positively. As employment decreased in all manufacturing industries except two, this indicates that the industries that shed the most (least) jobs experienced the lowest (highest) growth in productivity. In manufacturing industries, Basic pharmaceutical products and pharmaceutical preparations (CF) stands out with the highest employment growth as well as the highest labour productivity growth. For market services – which mostly witnessed positive employment growth – there appears to be a trade-off, since those industries with the highest employment growth rate had the lowest productivity growth. Two market service industries with high employment growth, experienced negative labour productivity growth between 2000 and 2014: Real estate activities (L) and Administrative and support service activities (N).

Graph 8   Link between employment growth and labour productivity growth for two-digit industries in Belgium
2000-2014
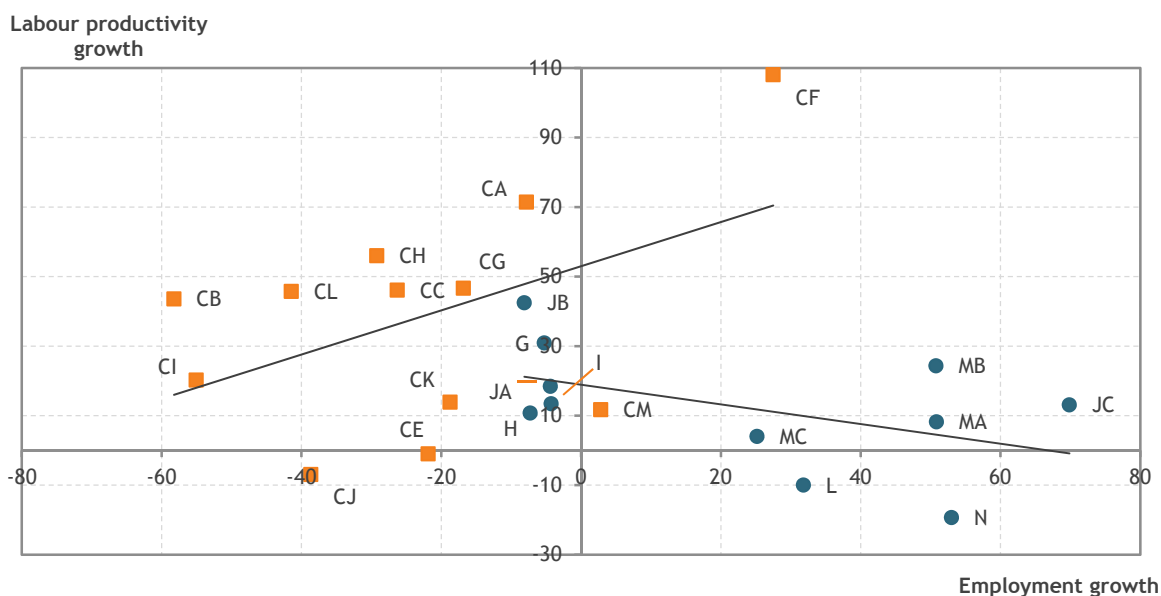
Note: Own calculations based on National Accounts data. Employment is measured in total hours worked and labour productivity is value added per hour worked. The square markers represent manufacturing industries (excluding coke and refined petroleum products), circle markers represent market services (excluding financial and insurance activities). A description of industry codes is provided in Table A.1 in Annex.

Borio et al. (2016) point at Construction (F) and Real estate activities (L) as examples of industries with low productivity that tend to expand during credit booms. In Belgium, Real estate activities witnessed strong employment growth over the period 2000-2014, but it was also one of the few industries that experienced negative productivity growth[8].

For Administrative and support service activities (N), a 'productivity sacrifice' seems to apply because of labour market measures introduced to raise the employment rate of low-skilled persons. In 2003, the Belgian federal government introduced service vouchers which consist in a wage cost subsidy for labour-intensive, low-skilled domestic work. The system, which aims to create new jobs for low-skilled workers, but also transform previously undeclared work to regular jobs, is extremely popular and explains a substantial part of the strong employment growth in Administrative and support service activities (N)[9]. Over the period 2000-2014, Administrative and support service activities was the market service industry with the second highest employment growth – after Computer programming, consultancy, and information service activities (J62_J63) – hereby increasing its share in total hours worked in the Belgian economy from 5% in 2000 to almost 8% in 2014. It was, however, also the industry that witnessed the strongest decrease in productivity growth.

Graph 8 shows the link between employment growth and productivity growth based on industry aggregates. Aggregate productivity can change because productivity of individual industries changes but also because of the shifting weight of industries within the economy. A shift of weight in favour of

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[8]   Employment growth between 2000 and 2014 in Construction (F) was rather modest whereas productivity growth was positive and relatively high.

[9]   According to the European Commission's database of labour market practices, some 150 000 people (96 000 full-time equivalent) were employed through service vouchers in 2011 in Belgium.

service industries, as witnessed in Belgium, will have a negative impact on economy-wide productivity, since these industries have productivity levels below those of manufacturing industries, the weight of which decreased, as underlined by the shift-share analysis. In Section 3.3, firm-level data are used to investigate the correlation between employment growth and productivity growth within industries. This allows us to investigate whether, within each industry, market shares shift in favour of the most productive firms or firms with the highest productivity growth (allocative efficiency).

As shown in this section, since 2000 aggregate productivity increases at a slower pace in Belgium than in its three neighbouring countries. This is largely explained by low productivity growth in market services and negative productivity growth in other activities (including non-market activities). OECD (2016) points out that the measurement of the volume of output, needed to calculate productivity, is particularly challenging for services, for which price indices that can capture changes in quality are often not available. For non-market activities, the measurement of productivity is even more challenging due to the lack of market prices and the difficulties of measuring the output volume of health, education and public administration services (OECD 2016: p. 32). Although the low growth in labour productivity in Belgium causes concern, in the most recent OECD ranking of labour productivity levels[10], Belgium still holds the third position, after Luxembourg and Norway but before the USA (OECD 2016: p. 45).

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[10]   GDP per hour worked, total economy, US dollars, current prices and current PPPs in 2014.

3. Analysis of industry dynamics based on firm-level data

Bartelsman, Haltiwanger and Scarpetta (2009) point out the relevance, as well as the limitations, of cross-country comparisons based on firm-level data. These analyses provide insight into the extent to which resources are allocated to the most efficient firms within industries and its impact on the aggregate dynamics in output, employment and productivity. Firm-level data also permit to investigate the role of entry and exit of firms in industry dynamics. As such, studies based on firm-level data complement the analysis at a more aggregate level (industry-level or whole economy). However, studies based on firm- level data, especially when used for cross-country comparison, are hampered by definition and measurement problems (for example, differences across countries in coverage, the observation unit, industry classification, accounting and fiscal rules and the overall reliability of data). To acknowledge these limitations, most recent efforts in cross-country analysis based on firm-level data opt for what Bartelsman, Haltiwanger and Scarpetta (2009) label as distributed micro-data analysis. The general idea is that researchers from different countries follow a common methodology to harmonize firm-level data as much as possible across countries. An additional advantage of this approach is that researchers can use their national data that are not readily available to researchers in other countries for reasons of confidentiality. The recent OECD projects based on firm-level data, *Dynemp* and *Multiprod*, adopt this distributed micro-data approach to investigate employment and productivity dynamics respecteively across participating countries (see http://www.oecd.org/sti/dynemp.htm for details and results of both projects).

In Section 3.1, we describe the data that have been used for Belgium in recent firm-level studies. We point out some of the limitations in the current data and some caveats that need to be taken into consideration when interpreting the results. Section 3.2 considers the results of recent analyses of employment dynamics based on firm-level data, with a focus on the results of the OECD project *Dynemp*. Section 3.3 reports some results of recent studies on productivity dynamics and the apparent trade-off between employment and productivity growth.

3.1. Firm-level data

Data on employment in Belgian firms are provided by the National Social Security Office (NSSO), which collects information on salaried employment in Belgium. Most studies analyse market industries (excluding public services). For reasons of confidentiality, data on self-employed are not available (see previous section on their importance). In some market industries, associations without lucrative purpose have a relatively large number of employees. However, the reporting on employment by these associations appears to be less reliable than for private firms and they are therefore not considered in the analysis. Given specific data requirements and confidentiality, financial firms are also disregarded, as in most studies. The *Dynemp* results cover the period 2001-2011. Graph 9 compares total employment in the Belgian economy, in manufacturing industries and market services (excluding financial firms), both based on National Accounts data, to employment in those firms that are considered for analysis in *Dynemp*, based on NSSO data. Employment for the total economy includes employment in all industries (including the public sector) as well as all self-employed and employment by associations without lucrative purpose.

Graph 9   Belgian employment (head count) Dynemp relative to National Accounts (2001-2011)
In 1000 employees

Source: Institute for National Accounts and National Social Security Office.
Note: The graph compares the total number of employees in the total Belgian economy, in manufacturing industries and market services (except financial firms)
             and the total employment of firms considered in the *Dynemp* project (for example, excluding associations without lucrative purpose).

Total employment of non-financial corporations shows employment in the National Accounts institutional sector S11 that comprises all private and public corporate enterprises that produce goods or provide non-financial services to the market. Employment considered for the Belgian contribution to the recent OECD microdata projects considers employment in manufacturing industries, construction and market services (excluding Agriculture, Residential care activities and social work activities without accommodation and Human health activities).

Most countries only have firm-level information on the total number of employees (head count) of firms and not on the full-time equivalent (FTE) number of employees or the total number of hours worked. For the estimation of technical efficiency or productivity, the latter measure is to be preferred but is often not available. The NSSO data for Belgium contain information on both the head count and the FTE number of employees. This allows us to show the limitation of the use of a head count, especially in view of the focus in this paper on firm age. Graph 10 shows the ratio of the FTE number of employees compared to the total number of employees (head count) for four age groups of firms over the period 2001-2011 in Belgium. For all four age groups the data indicate a decreasing (increasing) share of full-time (part-time) employees. Except for firms between 6 and 10 years old, this was already apparent before the Great Recession (data from the Belgian National Social Security Office over the period 1977-2014 show a structural decrease in the ratio of the FTE number of employees to the total number of employees, from 83% in 1997 to 76% in 2014)[11]. The most striking result in Graph 10 however is that the share of full-time employees is positively linked to firm age.

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[11]   Between 2009 and 2011, the Belgian federal government introduced a number of measures to dampen the impact of the crisis on the labour market, extending the system of temporary unemployment, which already existed for blue-collar workers, to all workers. A 'crisis time credit' scheme allows for individual and temporary reduction in work commitments for a fixed period and the measure 'temporary adjustment to working time in a crisis' provides for a fall in working time applied to all workers or a specific group of workers (see De Mulder and Druant 2011).

Graph 10   Ratio of full-time equivalent number of employees to the total number of employees (head count) by age group in Belgium (2001-2011)
FTE/Head count

Source: Own calculations based on the National Social Security Office.
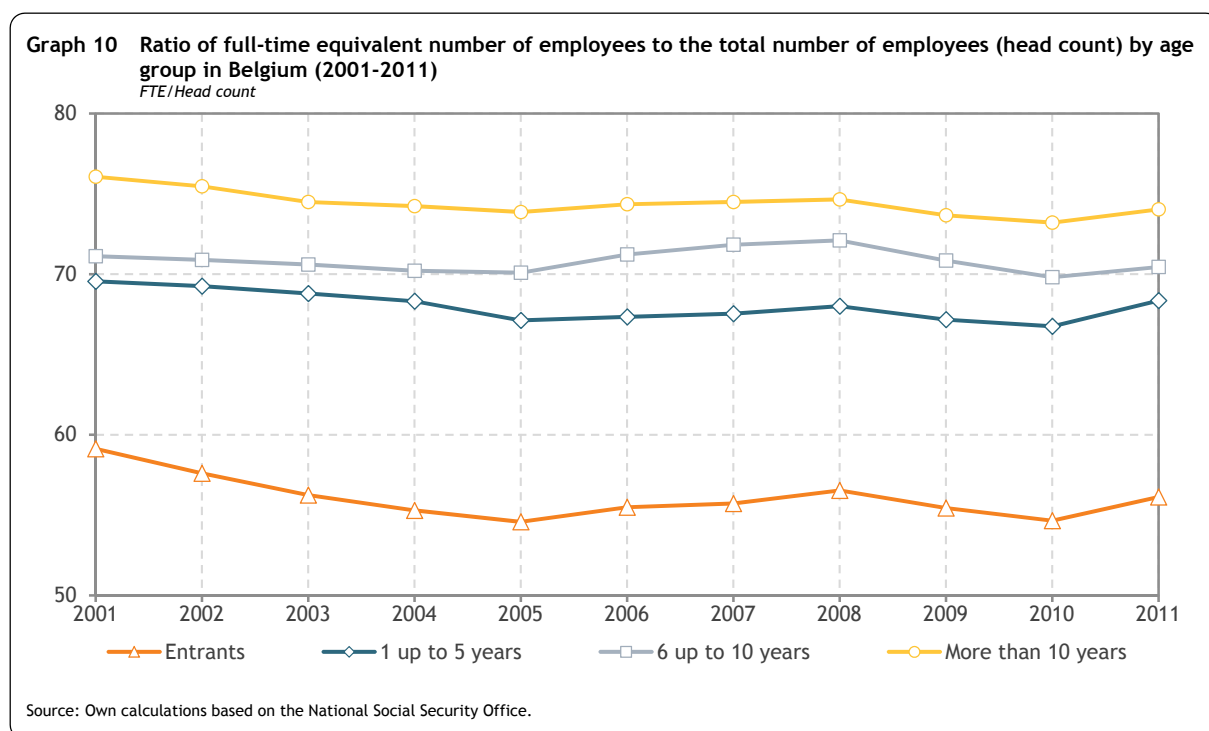
Entrants use substantially more part-time employees than older firms, but young firms also have a FTE ratio of three up to six percent lower than firms that have been active for more than 10 years.

The differences between age groups in the share of FTE employees, as shown in Graph 10, suggest that the contribution of entrants and young firms to job creation (productivity) may be overestimated (underestimated) if employment is measured by head count rather than by the FTE number of employees.

Data on the age of firms as well as other firm-level variables (value added, capital) are retrieved from Belfirst, provided by Bureau Van Dijk. This database contains firm-level data from the annual accounts that Belgian firms are obliged to deposit. The industry classification of firms is determined following the official register of the National Bank of Belgium.

The age of a firm is determined by the date of incorporation. It may take some time after incorporation before a firm actually starts its activities. The year of entry is therefore considered as the year in which the firm has at least one employee. The identification of entry and exit of firms and consequently of the age of firms merely based on the date of incorporation is not without limitation. A unique enterprise number (for example VAT number) identifies firms. In Belgium, all businesses are provided with a unique enterprise number upon obligatory registration at the commercial court register. The Crossroads Bank for Enterprises contains identification data on all businesses and establishments. However, as pointed out by Dunne, Roberts and Samuelson (1988) and Baldwin and Gorecki (1989), the unique identifier of a firm may be cancelled because the firm actually stops its activities but also because of purely administrative changes (mergers, acquisitions reorganization or consolidation or even a change in name). If the latter changes in firm identifier are not accounted for, both entry and exit will be overestimated. Moreover, an analysis with a breakdown by firm age will also be biased as some start-ups will actually be the continuation of (parts of) the activities of a mature firm. Geurts (2015) reports on a recent assessment of employment dynamics in Belgium over the period 2003-2012 that discards spurious entry

and exit of firms. Matched employer-employee data are used to identify firms for which the identifier changes although activities (stock of employees) appear to continue. Results suggest that job creation and job destruction, of entrants and exiting firms, is overestimated by more than 80 percent. This is explained by the fact that almost all large entrants are considered as 'spurious', in fact all real entrants are small. As some continuing firms are misclassified as exiting firms, the performance of incumbents is underestimated. The cleaned data also indicate that large incumbents contribute substantially more to employment growth than small incumbents. The additional information required to identify 'spurious' entry and exit was not available for the entire period covered in the *Dynemp* project. The issue of misclassification of entry and exit should however be kept in mind when interpreting the results that are reported in this paper. The most worrisome conclusion appears to be the suggestion that the entry of new firms in Belgium is actually overestimated, given the very low position of Belgium in all international rankings of start-up rates.

Most firm-level data do not provide a breakdown of variables, such as employment or output, for firms with activities that span different industries. Firms are therefore commonly assigned to a single industry. In most analyses, this is done on the basis of the main activity of a firm in the largest number of years over the period under consideration. Shifts of a firm from one industry to another are not considered. This may cause the analysis to be biased if for example an incumbent firm enters an industry in which it had not been active before or if the firm expands its activities in an industry that is not its industry of main activity, although towards the end of the period that industry may have become its industry of main activity.

3.2. Employment dynamics[12]

The OECD Directorate for Science, Technology and Innovation launched the project *DynEmp* to investigate the employment dynamics of countries, based on national firm-level data. The aim is to provide cross-country evidence that can underpin policies in support of employment and economic growth. Given the confidentiality of micro data in most countries, the general thrust of *Dynemp* is that the secretariat of the Directorate for Science, Technology and Innovation develops statistical procedures, which the teams of participating countries apply on national firm- or establishment-level data. The statistical procedures generate a detailed set of aggregated results.[13] As the results provide a breakdown by age, size and sector, country-specific confidentiality rules can be applied. The national teams send their non-confidential aggregated results to the *Dynemp* team for cross-country comparison and analysis.

For Belgium, the Federal Planning Bureau participates in the *Dynemp* project using the firm-level data as described in Section 3.1. The results of the first procedure, *Dynemp Express*, which cover 18 countries[14] over the period 2001-2011, are reported by Criscuolo, Gal and Menon (2014 a). *Dynemp Express* considers three main sectors: *Manufacturing*, *Market services* and *Construction*. It aims to provide evidence of the

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12 This section draws substantially on Criscuolo, Gal and Menon (2014 a, b) and Calvino, Criscuolo and Menon (2015). More details on the *Dynemp* project and the current results can be found on the project website:
      (http://www.oecd.org/sti/dynemp.htm).
13 Cricuolo, Gal and Menon (2014 c) provide a detailed description of the STATA procedure that is used for *Dynemp*.
14 Austria, Belgium, Brazil, Canada, Finland, Italy, France, Hungary, Luxembourg, Japan, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, the United Kingdom and the United States.

importance of young firms for job creation and of the potential impact of the 'Great Recession' on employment dynamics in participating countries.

Criscuolo, Gal and Menon (2014 a) point out that using harmonised micro-aggregated panel data makes it possible to split net job creation into gross job creation and gross job destruction and to distinguish between the extensive margin of job creation – through entry and exit – and the intensive margin, resulting from employment growth of surviving firms (incumbents). It also makes it possible to investigate and compare the role of the age and size of firms in employment dynamics, across countries and industries.

Although caution is warranted in the interpretation of results – due to the differences across countries in the identification of entry and exit of firms in business registers and time consistency of the data – some conclusions appear rather robust across countries and industries and over time (Criscuolo, Gal and Menon 2014 a):

- Not all small firms are job creators. Only young firms, which are predominantly small, create a disproportionate number of jobs.

- The entry of new firms explains most of the net job creation of young firms, followed by employment growth of firms that are less than three years old.

- The net job creation of entry and young firms decreased substantially during the 'Great Recession' although it generally remained positive.

- Most countries witnessed a decline in the start-up rate over the period 2001-2011.

- Young firms face 'up or out' dynamics.[15] In fact, whereas a very small number of start-ups witness high growth, a much larger share do not survive. The probability of exit peaks within two to three years after entry. The strong dynamism of young firms is also reflected in the fact that their positive net job creation results from strong gross job creation as well as substantial gross job destruction of surviving entrants.

The results show, in line with previous studies, that a breakdown of firms by age in different size classes provides more insight than an analysis that is only based on a breakdown by firm size.

In the *Dynemp* project, the job creation rate is defined following Davis, Haltiwanger and Schuh (1996):

$$JCR = \frac{E_t - E_{t-1}}{\frac{1}{2}(E_t + E_{t-1})}$$

E_t (E_{t-1}) denotes the total number of employees in year t (t-1)[16]. By using the average over t and t-1, the job creation rate falls, by definition,-within a range between -2 and +2. Davis et al. (2007) argue that this

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[15] This finding is in line with previous studies (e.g. Dunne, Roberts and Samuelson 1988; Bartelsman, Scarpetta and Schivardi 2003; Haltiwanger, Jarmin and Miranda 2013).

[16] As the number of full-time equivalent (FTE) employees, or the number of hours worked, is not known for most countries, employment dynamics is based on head counts.

definition of job growth has become standard in empirical work on employment dynamics given its advantage of symmetry, integrated assessment of incumbents, entrants and exiting firms. It also lends itself to consistent aggregation, compared to log changes and growth rates calculated on initial employment. Foote (2007) and Hölzl (2014) however question this indicator for specific types of analyses. Foote (2007) points out that this indicator may result in a strong impact of the entry and exit of small firms on the evolution of cross-sectional dispersion over time.

Associations without lucrative purpose were originally included in the data but since reporting on employment for these associations appears to be erratic, they were dropped from the Belgian employment data, in consultation with the *Dynemp* team. Some analyses of *Dynemp* and especially *Dynemp v.2* have been revised for Belgium using the corrected data.

Graph 11 shows the contribution to total employment, gross job creation and gross job destruction of four groups of firms, classified by age-size.[17] The graph shows the average contribution across all available years and countries (see Criscuolo, Gal and Menon (2014 a) for more details). Young small firms (active for less than 5 years with less than 250 employees) represent 17 % of total employment but 21 % of gross job destruction and 41 % of gross job creation. Small old firms, on the other hand, with a share of 47 % in total employment, have a disproportionately high share in total gross job destruction (53 %) and a disproportionately low share in total gross job creation (33 %). The graph reveals the important distinction between young and small firms. Whereas young firms are mostly small firms, the majority of small firms is old and they have a substantially negative impact on net job creation. Although the net job creation of large old firms is also negative, this contribution is far less disproportionate. Across all countries, the share of young small firms to gross job creation ranges from 27 % in Finland to 61 % in Brazil. For Belgium, the share amount to 39 %.

Graph 12 shows that the average net job creation of young firms (active for five years or less) across all countries was positive throughout the entire period, despite a substantial drop during the Great Recession. For old firms (active for more than five years) gross job destruction exceeds gross job creation over the whole period. The graph also reveals the strong contribution of downsizing by old firms, to aggregate job destruction during the crisis. The correlation between gross job creation and gross job destruction is statistically significant and positive across countries, years, classes of firm age and firm size and macro sectors (manufacturing, market services and construction). This positive correlation between creation and destruction seems indicative of a Schumpeterian process of creative destruction in which entrants replace less innovative and less efficient incumbents (Criscuolo, Gal and Menon 2014 a: p. 43).

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[17]   As clearly stated in the *Dynemp* reports, due to methodological differences, figures may deviate from officially published national statistics.

Graph 11   Employment, job creation and job destruction by firm age
In %
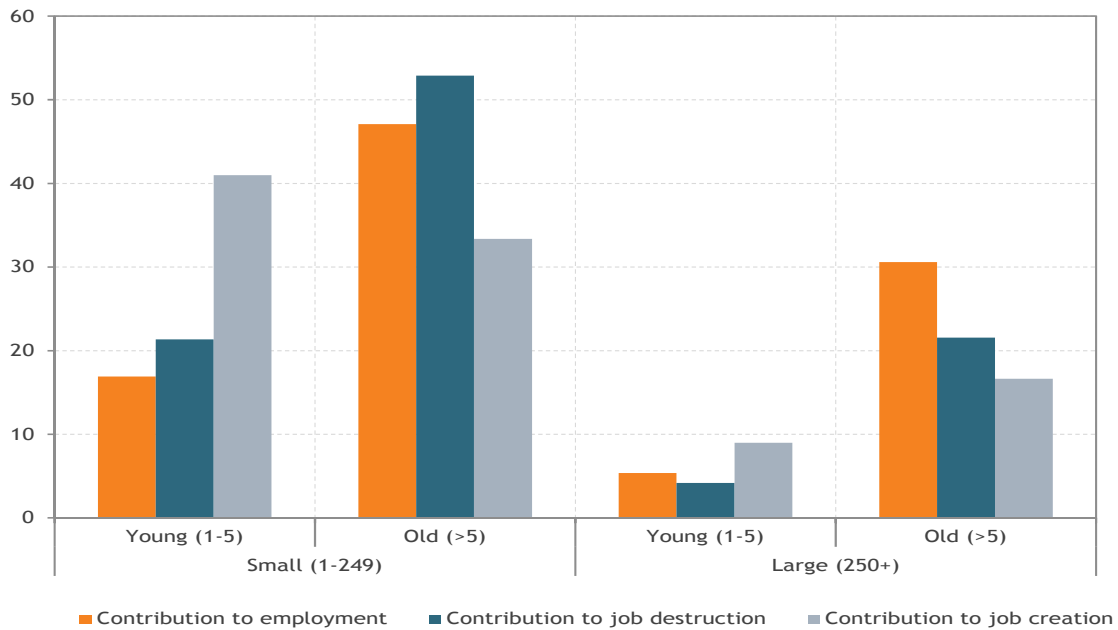
Source: Criscuolo, Gal and Menon (2014 a: Figure 15, p. 38).
Note: The graph shows the average contribution – across years and countries – to total employment, gross job creation and job destruction by firms in four age-
           size groups. Countries considered are Austria, Belgium, Brazil, Canada, Finland, France, Hungary, Italy, Japan, Luxembourg, the Netherlands, New Zea-
           land, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States. The period covered differs between countries because of data avail-
           ability.

Graph 12   Contribution to aggregate net job creation by firm age
In %
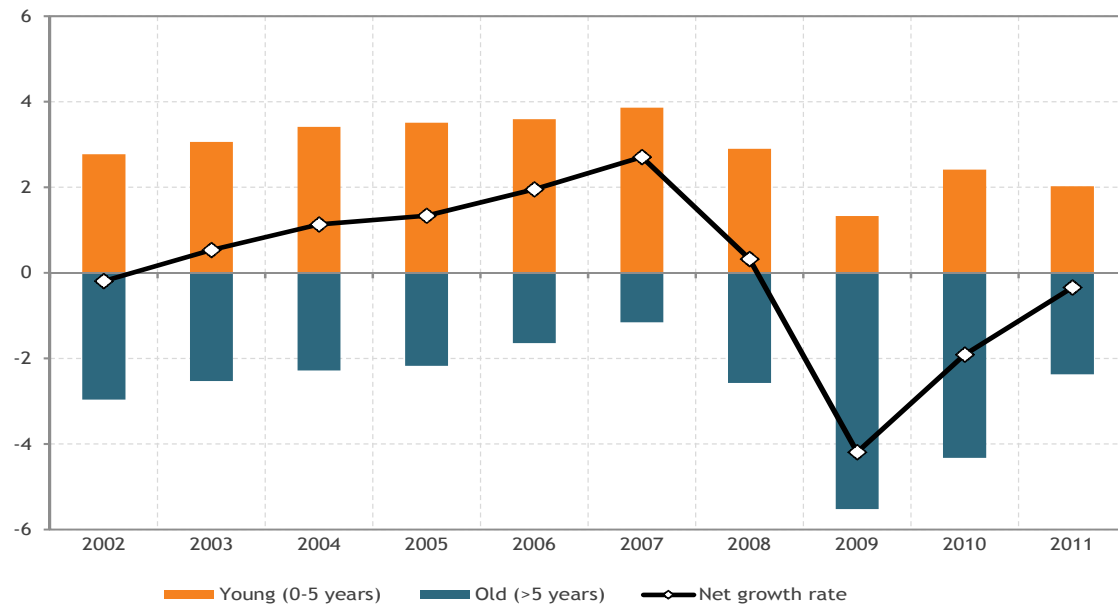
Source: Criscuolo, Gal and Menon (2014 a: Figure 21, p. 46).
Note: The graph shows the net job creation by age group (average over all countries). Countries considered are Austria, Belgium, Brazil, Canada, Finland,
           France, Hungary, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States.
           The period covered differs between countries because of data availability.

Graph 13   Contribution to aggregate net job creation by firm age in Belgium (head count)
In % of total number of employees

Old large firms (> 5 years and >= 250 employees)   Old small firms (> 5 years and < 250 employees)
Young firms (1-5 years)   Entrants
Net growth rate

Source: Own calculations based on corrected data for Belgium.
Note: Employment is denoted by the total number of employees (head count). The graph shows the contribution to aggregate net job creation for young firms (less than five years old), old small firms (more than five years old and less than 250 employees) and old small firms (more than five years old and more than 250 employees). As the firm-level, data considered for analysis do not cover total industry-level employment the results may deviate from National Accounts statistics.

Graph 14   Contribution to aggregate net job creation by firm age in Belgium (Full-time equivalent)
In % of Full-time equivalent number of employees
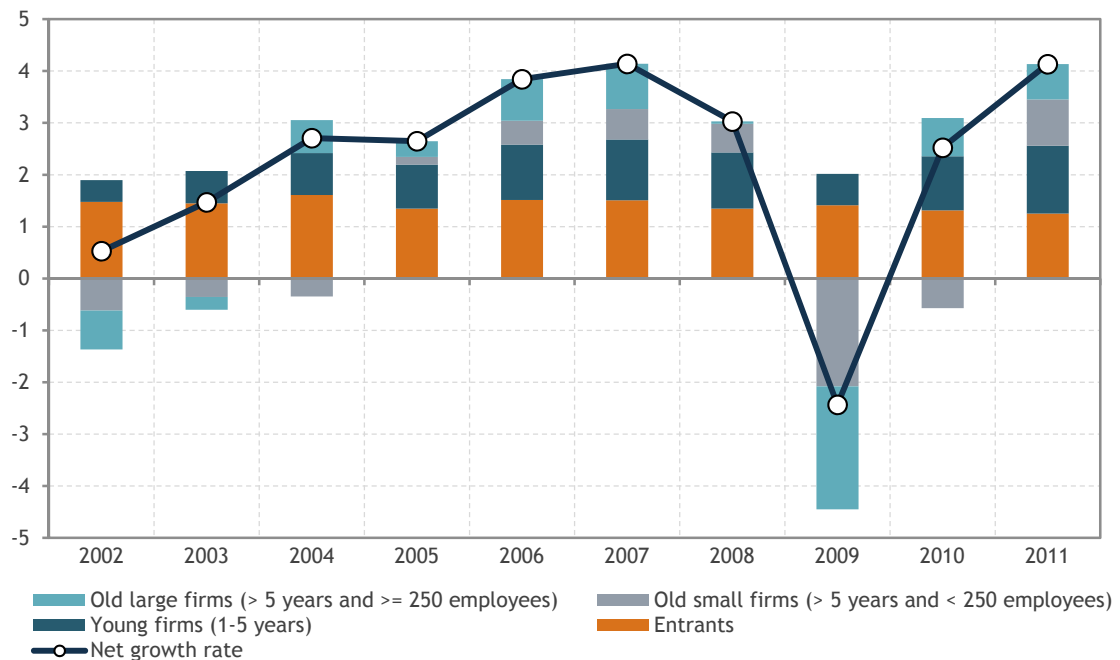
Old large firms (> 5 years and >= 250 employees)   Old small firms (> 5 years and < 250 employees)
Young firms (1-5 years)   Entrants
Net growth rate

Source: Own calculations based on corrected data for Belgium.
Note: Employment is denoted by the total number of full-time equivalent employees. The graph shows the contribution to aggregate net job creation for young firms (less than five years old), old small firms (more than five years old and less than 250 employees) and old small firms (more than five years old and more than 250 employees). As the firm-level data considered for analysis do not cover total industry-level employment the results may deviate from National Accounts statistics.

As shown in Graph 10, the ratio of the FTE number of employees, to the total number of employees, increases with age. Entering firms in particular appear to rely relatively heavily on part-time employees. Graph 13 shows employment dynamics expressed in the total number of employees, compared to Graph 14, which shows employment dynamics denoted in the FTE number of employees. Both graphs consider the contribution of entrants, young firms (1-5 years old), old small firms (more than 5 years old and less than 250 employees) and old large firms (more than 5 years old and 250 or more employees) to aggregate net job creation in Belgium.

In four (head count) and five years (FTE) out of the ten years considered, the net job creation of old small firms was negative in Belgium. In the years that it was positive, it provided the smallest contribution of the four firm groups. For old large firms, net job creation was negative for two years (head count) and three years (FTE). The average net job creation of old small firms is negative over the period 2001-2011, both in head count and FTE whereas the average net job creation by old large firms is positive for both measures. As indicated by Graph 14, the contribution of entrants to net job creation measured in FTE is on average 76 % of the contribution measured in the total number of employees. When the total number of employees is considered, FTE job creation by entrants, at least for Belgium, is overestimated. For young firms (1-5 years old), job creation measured in the total number of employees actually appears to underestimate FTE job creation by some 7 %, whereas net job creation by old – small and large – firms appears to be overestimated by using the head count rather than the FTE number of employees.

As Graph 10 shows that, on average, young firms have a lower share of FTE employees than mature firms. This result suggests that there are substantial differences within age groups in the FTE share between firms that contribute to net job creation. Overall, net job creation is some 20% smaller when jobs are expressed in FTE number of employees than in the total number of employees (head count).

Graph 15 shows the average contribution to net job creation, over all industries and all countries that participate in *Dynemp*. Using the results of *Dynemp v.2*, with the corrected data for Belgium, the graph shows average net job creation over the period 2001-2011, by two-digit industry in Belgium (the industry codes are described in table A.1 in Annex). In line with Graph 11, the graph provides a breakdown of old incumbents into small and large firms. The job destruction by exiting firms, which for most industries and years is not very substantial, is not considered in the graph. Moreover, as shown in Graph 9, the group of firms considered for analysis in *Dynemp* does not cover total employment. The results in Graph 15 may therefore deviate from the pattern depicted by National Accounts data. In line with the general pattern pointed out in Section 2, employment growth over the period 2001-2011 was positive, in most market services industries, with the noticeable exception of *Telecommunications* (JB). Except for *Pharmaceuticals* (CF) and *Food and Beverages* (CA)[18] manufacturing industries witnessed stable or declining employment. *Textiles* (CB), *Transport equipment* (CL) and *Computer, electronic and optical products* (CI) accounted for the most negative job creation between 2001 and 2011 in Belgium.

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[18]   National Accounts data show a slight decrease in employment between 2001 and 2011 for *Food and Beverages*.

Graph 15   Contribution to aggregate net job creation by two-digit industry in Belgium
In %
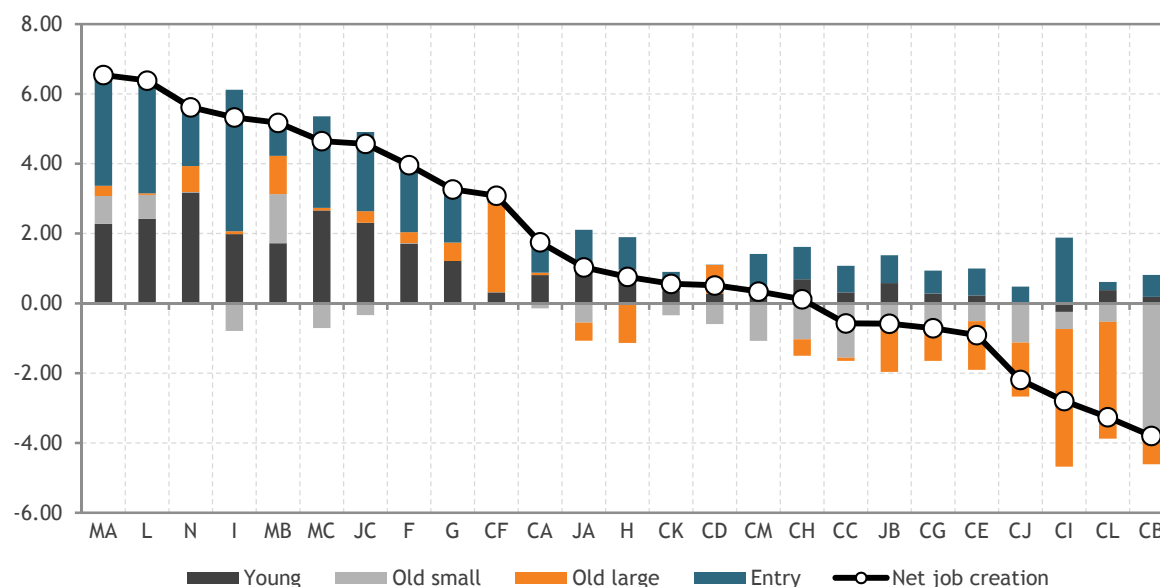
Source: Own calculations based on corrected data for Belgium.
Note: Employment is denoted by the total number of employees (head count). The graph shows the contribution to aggregate net job creation for young firms
(less than five years old), old small firms (more than five years old and less than 250 employees) and old small firms (more than five years old and more
than 250 employees). As the firm-level data considered for analysis do not cover total industry-level employment and job destruction by exiting firms is
not considered, the results deviate from the industry-level statistics reported in Section 2. A description of industry codes is provided in Table A.1 in
Annex.

In those industries with the highest positive net job creation, all four components are positive, except for the contribution of old small firms, which is on average negative in three industries that witnessed substantial employment growth: *Accommodation and food service activities* (I); *Advertising and market research* (MC) and *IT and other information services* (JC). The average net job creation of old small firms is negative in 17 out of 25 industries. The contribution of old large firms is negative in 10 out of 25 industries. Especially in *Transport equipment* (CL) and *Computer, electronic and optical products* (CI), old large firms had a substantial negative impact on employment growth, which can be explained by the closure of some large plants of multinationals. By definition, entry contributes positively to employment growth in all industries. The contribution is important in market services industries with strong employment growth but also in manufacturing industry *Computer, electronic and optical products* (CI). The contribution of young firms to net job creation is positive in almost all industries, but is only considerable in industries with strong employment growth.

The vast majority of firms in all countries have less than 10 employees, as can be seen in Graph 16. The share of these micro firms ranges from 74 % in Norway to 90 % in Italy. Based on the sample of firms considered for analysis in *Dynemp*, Belgium has the third smallest share of micro firms (76 %) but with 20 % has the third largest share of small firms (between 10 and 49 employees). Large companies (250 employees or more) account for less than 1% of firms in all countries. With a share of 0.72 %, Belgium has the largest share of large firms, after France and Austria.[19] By definition, large firms have a much larger share in employment than in the number of firms.

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[19]   Statistics based on the total population of firms provides a larger share, and a higher ranking, for micro enterprises in Belgium
(OECD 2015a).

Graph 16   Share of firms grouped by size
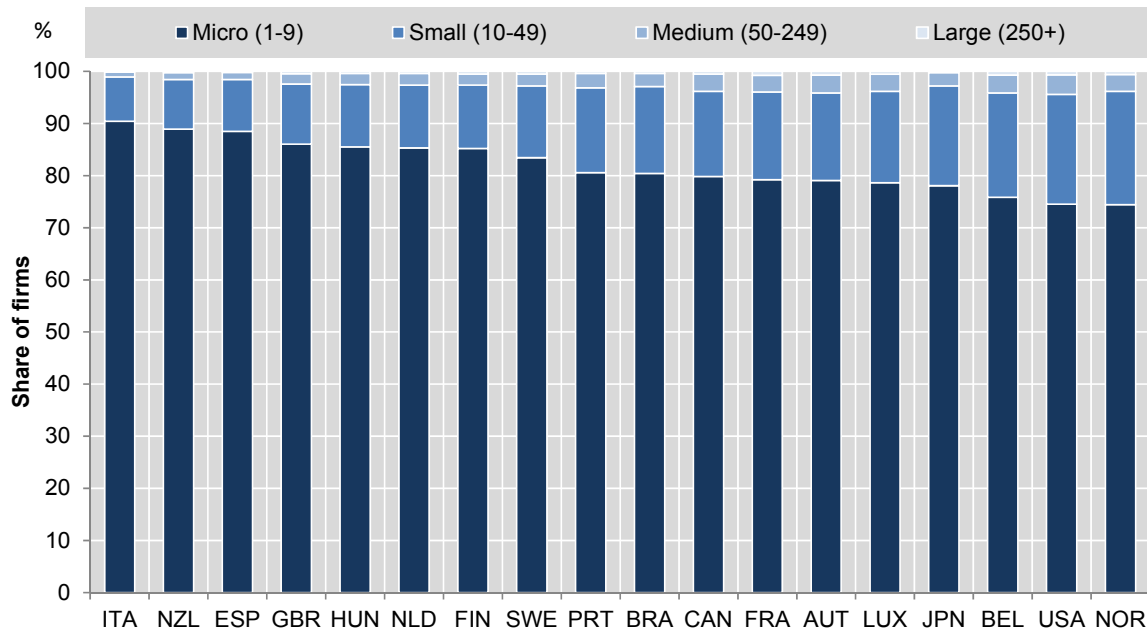
Source: Criscuolo, Gal and Menon (2014 a: Figure 2, p. 26). The graph shows the average share by firm size over all available years.

Over the period considered, large firms accounted for 42 % of employment in Belgium, which is the fourth largest share, after the USA, Great Britain and France. Micro firms account for 15 % of total employment, which is the smallest share of all countries except for the USA. In Belgium, small firms account for 24 % (8th place) and medium-sized firms for 19 % of employment (10th place).

Graph 17   Age composition of small businesses
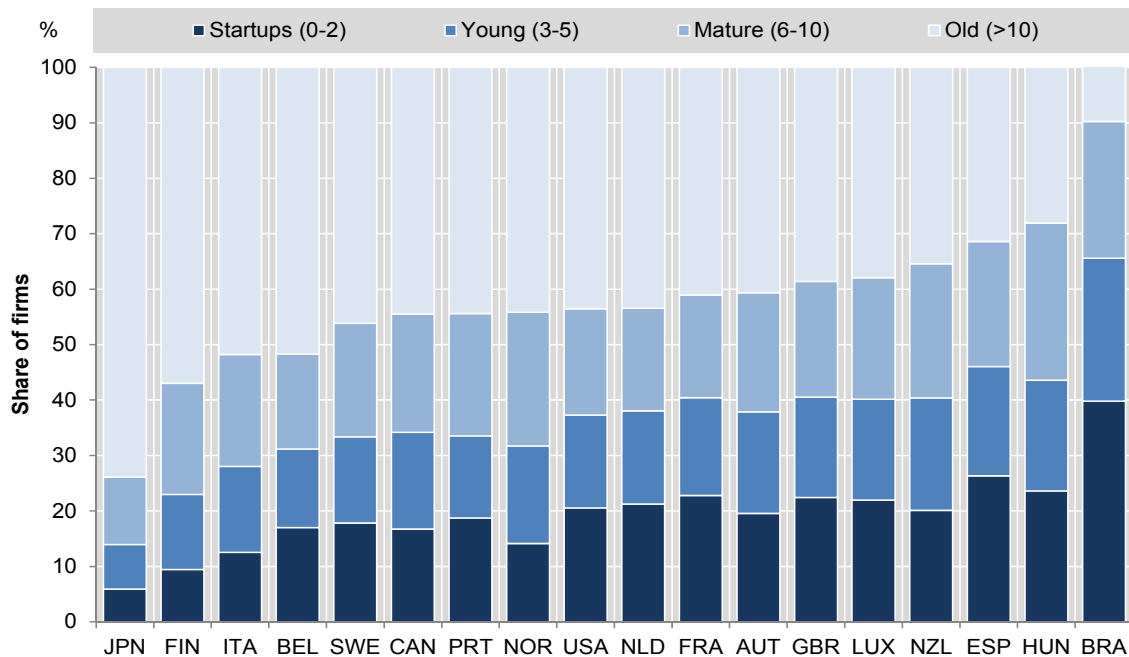
Source: Criscuolo, Gal and Menon (2014 a: Figure 6, p. 29). The graph shows the age composition of firms with less than 50 employees over all available years.

As Graph 17 shows, the age composition of small companies differs substantially across countries. In Belgium, start-ups and young firms account for only 31 % of small companies and old firms for 52 %, which is the fourth largest share of the countries considered.

The sectoral composition partly explains the cross-country differences, in the age composition of small companies, but only to a limited extent. In *Manufacturing*, the share of young small firms in Belgium is the third smallest of all countries, in *Services* the fifth smallest and in *Construction* the seventh smallest. The small share of young small firms in Belgium is explained by a low start-up rate rather than by a low survival rate.

The low start-up rate for Belgium is corroborated by the penultimate position in Table 4, which shows the ranking of EU Member States, based on Eurostat data, in terms of the number of entering firms in a given year compared to the total number of firms that are active in that year.

Table 4   **Average start-up rate in the Business Economy in EU countries (2008-2013)**

Country	Birth rate (Number of births of enterprises over number of active enterprises)
Lithuania	21.25
Latvia	16.40
Bulgaria	13.85
Romania	13.38
Slovakia	13.33
Portugal	13.00
Poland	12.70
Estonia	12.39
United Kingdom	11.93
The Netherlands	11.39
Slovenia	11.15
France	11.02
Denmark	10.78
Luxembourg	9.62
Hungary	9.35
Croatia	9.17
Finland	8.99
Czech Republic	8.90
Germany	8.38
Spain	7.84
Austria	7.82
Sweden	7.30
Italy	6.94
Ireland	6.32
Malta	5.71
Belgium	**4.84**
Cyprus	4.39

Source: Business demography statistics, Eurostat.
Note: The table shows the average, over the period 2008-2013, of the ratio of new enterprises to the total number of active firms in a given year, in the Business Economy (excluding holding companies).

The reported numbers denote the average over the period 2008-2013, for the Business Economy (excluding holding companies). In 2012, Belgium also brings up the rear in the ranking of OECD countries in terms of the birth rate of enterprises with at least one employee, reported in (OECD 2015a).

Results of *Dynemp v.2* indicate that the low start-up rate in Belgium, compared to other countries participating in the project, is common to most two-digit industries (e.g. Calvino, Criscuolo and Menon 2015: 52-53).

Graph 18 shows the share of start-ups with less than 10 employees that increase their employment above 10 employees, within three years, and the share of these firms in net job creation by all start-ups. For Belgium, 6 % of start-ups succeed in raising employment above 10 employees within three years. They account for 43 % of job creation by all start-ups. These results indicate that, whereas Belgium has a very low start-up rate compared to other countries, a relatively large share shows substantial growth after entry.

Graph 18   Percentage growing start-ups and their contribution to start-up net job variation (2001-2010)
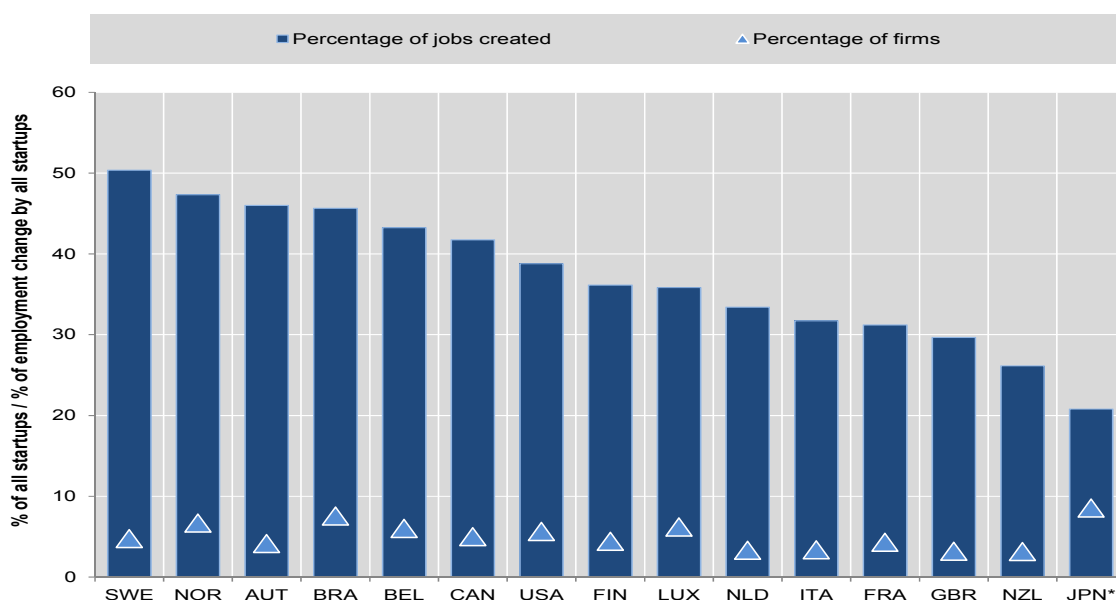
Source: Criscuolo, Gal and Menon (2014 a: Figure 12, p. 26). The graph shows the share of start-ups (0-2 years old) with less than 10 employees that surpass the level of 10 employees within 3 years and their share in net job creation by all start-ups.

DynEmp v.2 implements extensions to *Dynemp Express*, such as additional countries (e.g. Germany) and indicators of employment dynamics, a more detailed industry-level analysis and a more disaggregated investigation of transition dynamics and a cohort analysis (follow-up of entrants after three, five and seven years). Calvino, Criscuolo and Menon (2015) report the first results of *DynEmp v.2*, which cover 16 countries over the period 2002-2011. The importance of young firms for net job creation is confirmed. The probability of survival shows the 'up or out' dynamics of entrants. On average, the survival rate is slightly higher than 60 % after three years, about 50 % after five years and 40 % after seven years. A rather robust finding, across the countries considered, is that the probability that an entrant will exit is

highest at an age of two to three years and then decreases linearly as the firm grows older. The disproportionate contribution to job creation of a small number of start-ups is confirmed. On average, across countries, a mere 3 % of start-ups create between 21 % up to 52 % of jobs.

The *DynEmp v.2* procedure has been rerun with the corrected data for Belgium (excluding associations without lucrative purpose). In the following graphs, the results that are reported for Belgium are based on these corrected data, which differ from the results in Calvino, Criscuolo and Menon (2015).

Graph 19 shows net job creation rates of entrants that exist for at least three years for 15 countries (cf. Figure 2 Calvino, Criscuolo and Menon 2015) with corrected Belgian data. The reported rates denote the average for 2001, 2004 and 2007 of net job creation of surviving entrants (gross job creation minus gross job destruction) compared to total country employment.

Graph 19   Net job creation by surviving entrants compared to total employment
In %

Note: The graph shows (cf. Figure 2 in Calvino, Criscuolo and Menon 2015) the ratio between employment at time t + 3 of surviving entrants and overall country employment at time t (average for t = 2001, 2004 and 2007). The reported rate for Belgium results from running *Dynemp v.2* with the corrected data.

Confirming the original results for Belgium, reported by Calvino, Criscuolo and Menon (2015), net job creation of surviving entrants is rather low in Belgium, compared to other countries in the *Dynemp* project.

The aggregate numbers in Graph 19 mask substantial differences across industries, in the contribution of entrants to net job creation. Using the corrected data for Belgium, Graph 20 shows a breakdown, by two-digit industry, of net job creation of entrants that survive, for at least three years, compared to total industry employment in the initial year. The graph again shows the average for 2001, 2004 and 2007. A description of the industry codes is provided in Table A.1 in Annex.

The five industries with a net job creation rate above 2 are all service industries: *Accommodation and food service activities* (I), *IT and other information services* (JC), *Administrative and support service activities* (N), *Scientific research and development* (MB) and *Advertising and market research; other professional, scientific and*

technical activities; veterinary activities (MC). *Administrative and support service activities* is the industry with the second largest share in total employment (see Section 2), after *Wholesale and retail trade, repair of motor vehicles and motorcycles* (G).

Graph 20   Net job creation by surviving entrants, compared to industry employment, by two-digit industry in Belgium
In %

Note: The graph shows a breakdown for Belgium, by two-digit industry, of the ratio of employment at time t + 3 of surviving entrants to total industry employment at time t (average for t=2001, 2004 and 2007). The graph is based on results from running *Dynemp v.2* with the corrected data for Belgium. A description of the industry codes is provided in Table A.1 in Annex.

Most industries with a low contribution of entrants to net job creation are manufacturing industries: *Computer, electronic and optical products* (CI), *Electrical equipment* (CJ), *Basic pharmaceutical products and pharmaceutical preparations* (CF), *Machinery and equipment* (CK). Market services industry *Telecommunications* (JB) has the second lowest net job creation rate, just before *Coke and refined petroleum products* (CD).

To provide more insight into the underlying factors and the cross-country differences in the contribution of surviving entrants to net job creation, Calvino, Criscuolo and Menon (2015, p.12) decompose net job creation into four components:

– Start-up ratio (number of entrants compared to the country's total employment), considered as a measure of the relative weight of entrepreneurship in the economy.

– Survival share (number of units that survive until or beyond the third year compared to the total number of entrants), which reflects the extent to which the selection process of entrants is strong in an economy.

– Average size at entry (average number of employees for entrants), which may be linked to entry barriers and the level of competition.

– Average post-entry growth (ratio of final to initial employment, for surviving entrants), which reflects the scale-up potential and the growth performance of surviving start-ups.

Graph 21 up to Graph 24 show the four components (cf. panels A-D of Figure 4 in Calvino, Criscuolo and Menon 2015) with the corrected data for Belgium. The four graphs reveal that the low net job creation of surviving entrants in Belgium is entirely explained by a very low start-up ratio.

Graph 21   Start-up ratio
Number of entering units/employment (in thousands)
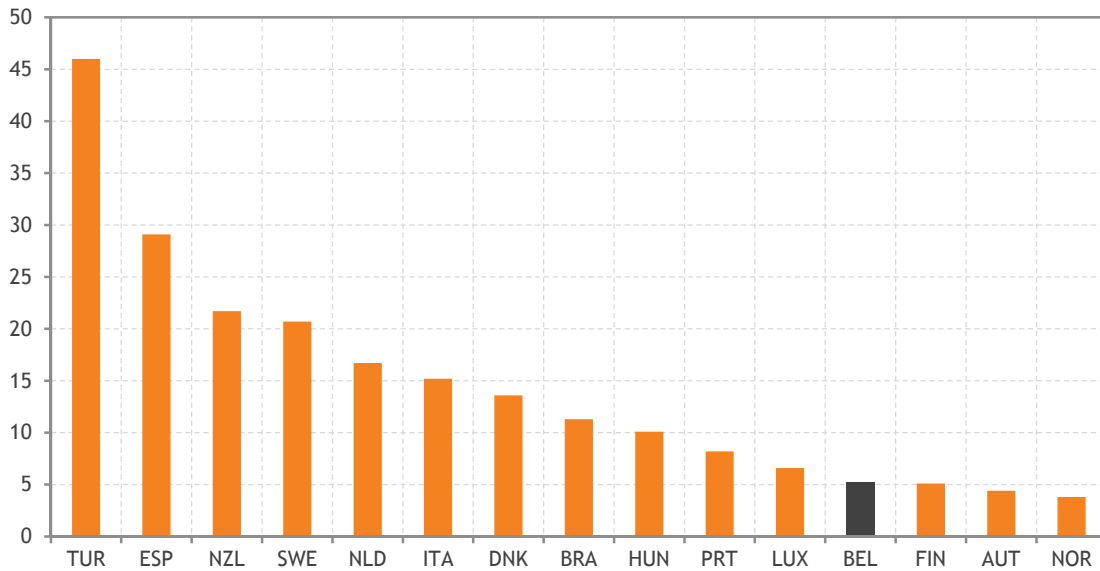
Note: The graph shows the start-up ratio (cf. Figure 2 – Panel A in Calvino, Criscuolo and Menon 2015), defined as the number of entering units over total employment (in thousands), with corrected data for Belgium.

Graph 22   Survival share of entrants (after 3 years)
In %
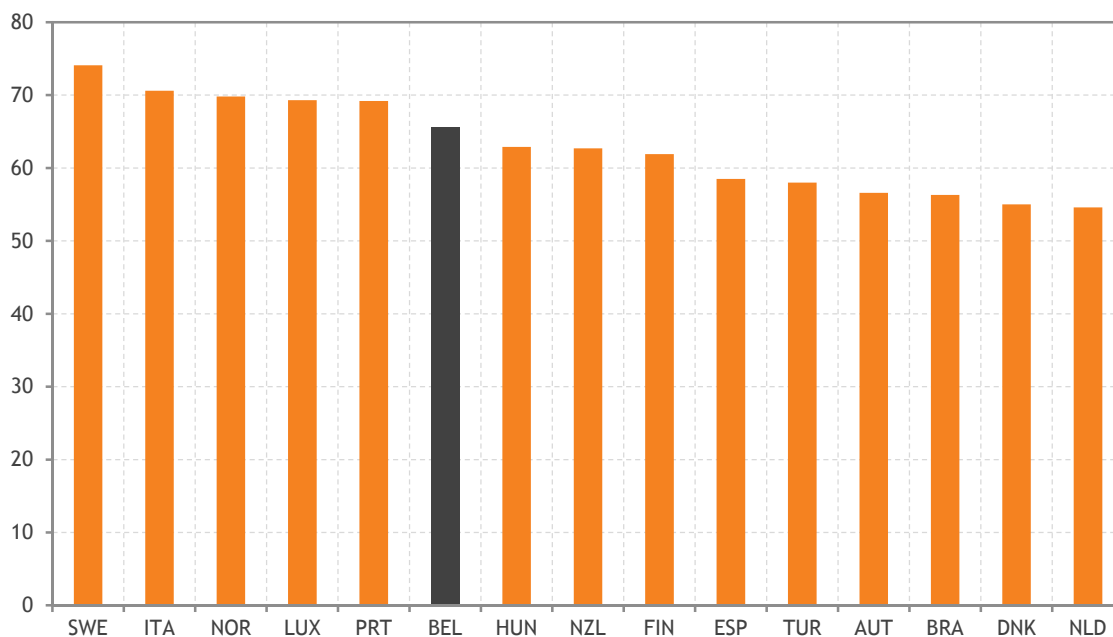
Note: The graph shows the survival share of entrants (cf. Figure 2 – Panel B in Calvino, Criscuolo and Menon 2015), defined as the number of entering firms surviving for at least 3 years over the total number of entrants (in %), with corrected data for Belgium.

Graph 23   Average size at entry
Number of employees (head count)
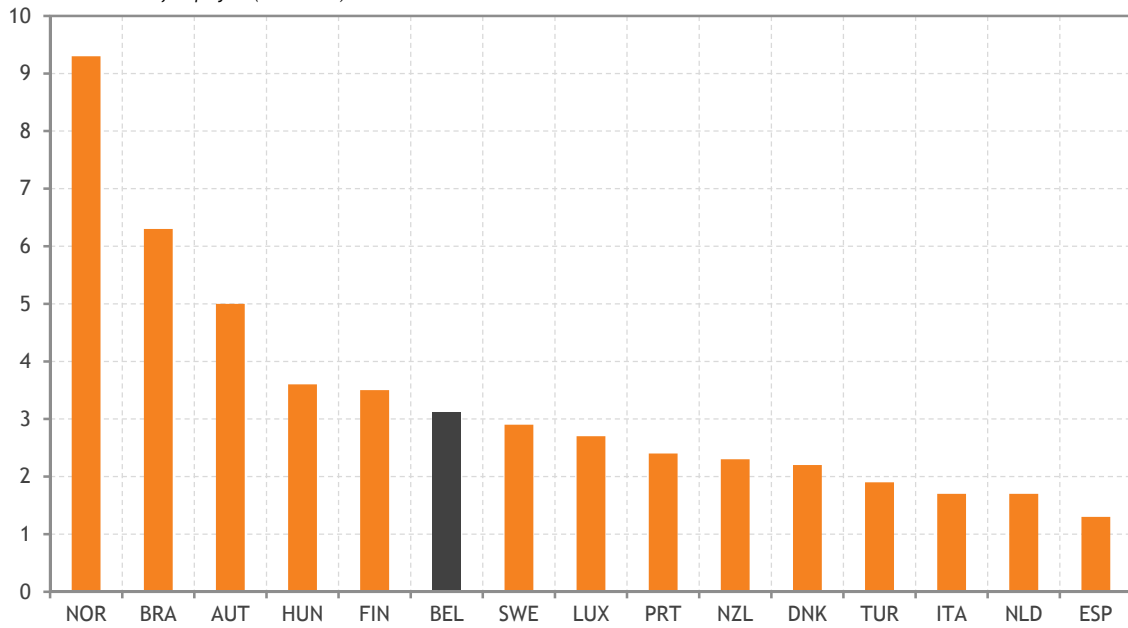
Note: The graph shows the average size of entering firms (cf. Figure 2 – Panel C in Calvino, Criscuolo and Menon 2015), defined as the number of employees of surviving entrants (t+3) over the number of surviving entrants, with corrected data for Belgium.

Graph 24   Average post-entry growth
In %
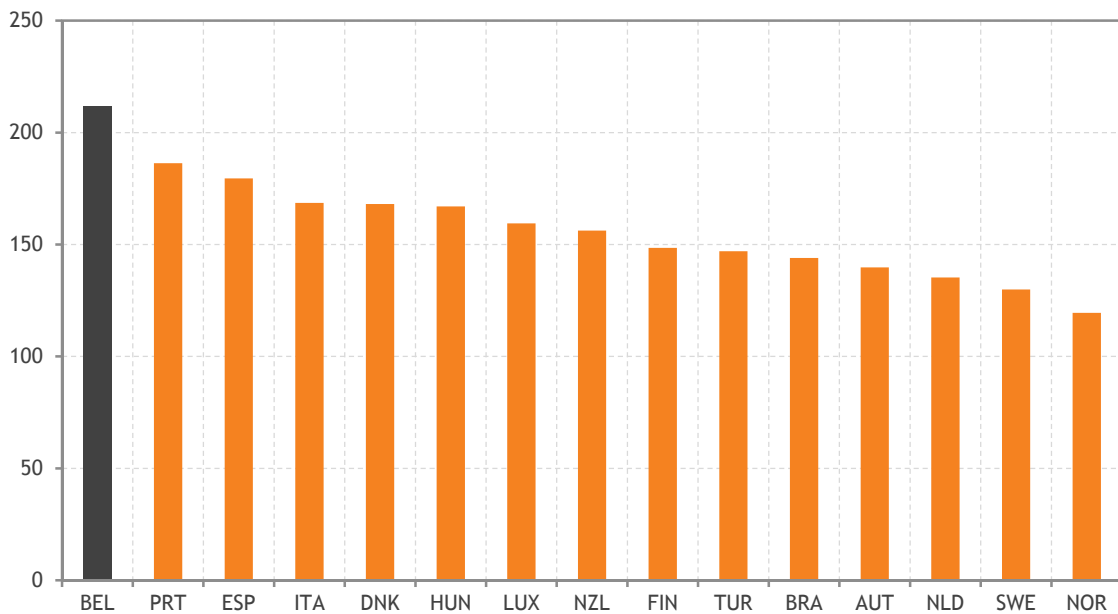
Note: The graph shows the average post-entry growth (cf. Figure 2 – Panel D in Calvino, Criscuolo and Menon 2015), defined as the ratio of total employment at t + 3 to total initial employment of surviving entrants (in %), with corrected data for Belgium.

With respect to the survival rate and average entry size, Belgium actually ranks sixth and with respect to post-entry growth even comes first. Across countries, the start-up ratio correlates negatively (-0.50) with the average size of entering firms and the latter correlates negatively (-0.49) with post-entry growth. The other correlations between the four components of net job creation of entrants are not statistically significant. Net job creation of surviving entering firms is predominantly explained by the start-up ratio, with a correlation of +0.78 whereas the three other components correlate negatively, though correlation is not statistically significant, with the net job creation rate of entrants.

As pointed out before, the net job creation by surviving entering firms is, to a very large extent, explained by the start-up ratio. The low net job creation by entrants in Belgium is due to the low number of starting firms. Graph 20 reveals strong differences in the net job creation of entering firms, across industries in Belgium. Graph 25 shows that these differences are mostly explained by differences in the start-up ratio (correlation: +0.72).

Graph 25   Start-up ratio by two-digit industry in Belgium (2001-2011)
Number of entering units/employment (in thousands)

Note: The graph shows the start-up ratio (cf. Graph 21) by two-digit industry, with corrected data for Belgium. The start-up ratio is defined as the number of entering units over total employment (in thousands). A description of the industry codes is provided in Table A.1 in Annex.

In line with evidence for the USA[20], start-up rates appear to decline in most countries that participate in *Dynemp* (Calvino, Criscuolo and Menon 2015: p. 18). Graph 26 shows – on the basis of the corrected data – that the share of start-ups in the total number of active firms, decreased in Belgium from 8 % in 2002 to 6 % in 2011. What is of more concern is the fact that the share of start-ups in gross job creation decreased more substantially, from 24 % in 2002 to 15 % in 2011. The share of start-ups in total employment fell from 1.8 % to 1.2 % over the same period. The declining contribution of start-ups is clearly structural as it started before the beginning of the Great Recession.

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[20]   The 2016 Economic Report to the President documents a structural and considerable decline in the entry of new firms in the US over the period 1977-2013.

Graph 26   The role of start-ups in Belgium over the period 2001-2011
In %

Note: The graph shows three-year moving averages of the share of the number of start-ups in the total number of firms, the share of start-ups in total employ-
ment and their share in gross job creation for Belgium, cf. Figure 6 in Calvino, Criscuolo and Menon (2015), with corrected data. The figures reflect
aggregates over manufacturing industries, construction and non-financial business services

The cross-country differences in the aggregate indicator of net job creation of start-ups and the four components may, to some extent, reflect differences between countries in industry composition. Calvino, Criscuolo and Menon (2015: p. 21) find that start-up rates of countries would not differ much if the same sectoral composition is imposed on all countries. The start-up rate in Belgium would be higher – but only slightly – if the sectoral composition in Belgium were to mirror the average composition across countries. For the average size of entrants, sectoral composition appears to be somewhat more consequential. For four countries with an entry size above average – Austria, Belgium, Brazil and Norway – the average size of entrants would actually be even higher if the sectoral composition of these countries equalled the average country composition (Calvino, Criscuolo and Menon 2015: p. 23).

Studies on business demographics reveal the high probability that entrants will exit within a couple of years after entry. Graph 27 shows, on the basis of corrected data, the probability that a start-up in Belgium will exit in one up to nine years after entry. The probabilities result from a country-specific regression in the *Dynemp v.2* procedure (see Calvino, Criscuolo and Menon (2015) for more details on the estimation). A dummy that equals 1 for recession years 2008 and 2009 and 0 for the other years allows for an assessment of the impact of the Great Recession on the exit probability of start-ups. As in all countries, there is a substantial probability that start-ups in Belgium will exit in the early years after entry, with the exit probability gradually decreasing as firms mature. The exit probability increases considerably in the recession years 2008 and 2009, for all ages, although especially for the youngest firms (up to five years after entry). A rather strong and positive correlation between the entry of new firms and the rate at which firms exit is a robust finding in firm-level studies (Geroski 1995, Caves 1998, Bartelsman and Doms 2000, Manjólin-Antolín 2010).

Graph 27   Relative probability of start-ups to exit by age
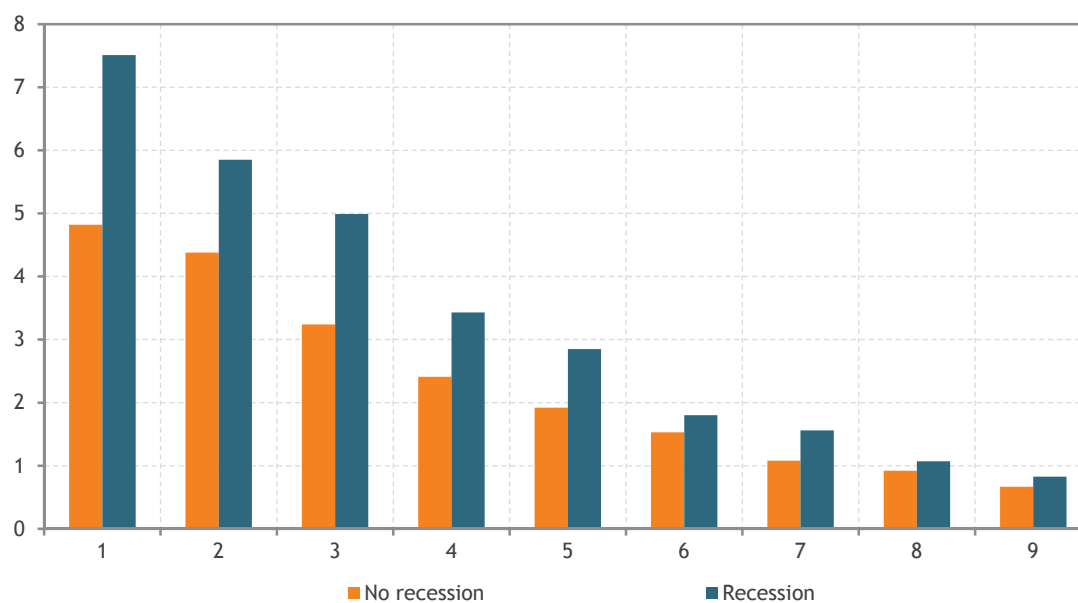
Note: The graph shows the probability that a start-up in Belgium will exit in one up to nine years after entry, cf. Figure 10 in Calvino, Criscuolo and Menon (2015) but with corrected data. The probabilities show the age coefficient from a distributed regression. The impact of recession years is estimated through a recession dummy that equals one for 2008 and 2009 and zero for other years. See Calvino, Criscuolo and Menon (2015) for more details on the estimation.

Graph 28 shows the average entry and exit rate for EU countries over the period 2008-2013, based on Eurostat Business Demography statistics. Across countries, the correlation between the entry rate and the exit rate is 0.68. In line with its low start-up rate, as reported in Table 4, Belgium has the lowest average exit rate of the countries considered. With noticeable exceptions such as Portugal, Hungary, Croatia, Ireland and Spain, the entry rate tends to exceed the exit rate, which implies that the number of active firms increases structurally. Although Belgium has one of the lowest start-up rates, the growth rate, between 2008 and 2013, of the total number of active firms in Belgium was higher than that of Poland, Estonia, Austria, Finland, Germany, the United Kingdom, Italy, Spain, Cyprus, Hungary and Portugal. Using the corrected Belgian data for *Dynemp*, the correlation between the entry rate and the exit rate (expressed in the share in total employment), of two-digit manufacturing industries, is 0.63[21] and 0.83 for two-digit market services industries.

Manjón-Antolín (2010) considers possible explanations for the strong correlation between entry and exit. Industries may be subject to specific barriers that affect entry as well as exit, such as the high level of investment required. The substantial sunk costs that result from this investment could deter potential entrants but may also be a disincentive for incumbents to exit. A more popular explanation is that the correlation reflects a Schumpeterian process of creative destruction, in which potentially efficient entrants cause less efficient incumbents to exit. The exit of the latter may attract other potential entrants. Evidence for Spanish manufacturing firms, seems to confirm the hypothesis of a Schumpeterian mechanism but also indicates the need to account for heterogeneity across firm size as well as unobserved heterogeneity.

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[21]   This is coincidentally exactly the same as the correlation reported by Manjón-Antolín (2010) for Spanish manufacturing industries over the period 1994-2001.

Graph 28   Entry and exit rates in EU countries (2008-2013) (per hundred active firms)
In %
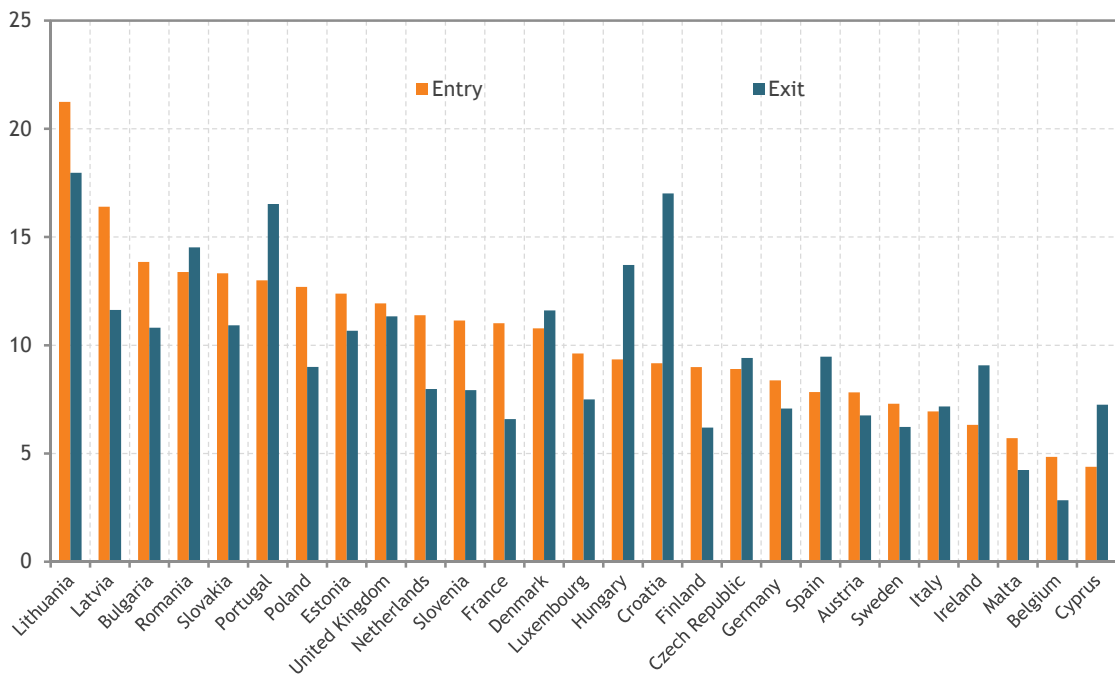
Source: Eurostat Business demography statistics
Note: The graph shows the average, over the period 2008-2013, of the ratio of the number of entering (exiting) firms to the total number of active firms (per hundred) in the Business Economy (excluding holding companies).

Graph 29 shows the share of four different age groups of firms in the total number of active firms in Belgium, for each year over the period 2001-2011.

Graph 29   Share of different age groups in the total number of active firms in Belgium (2001-2011)
In %
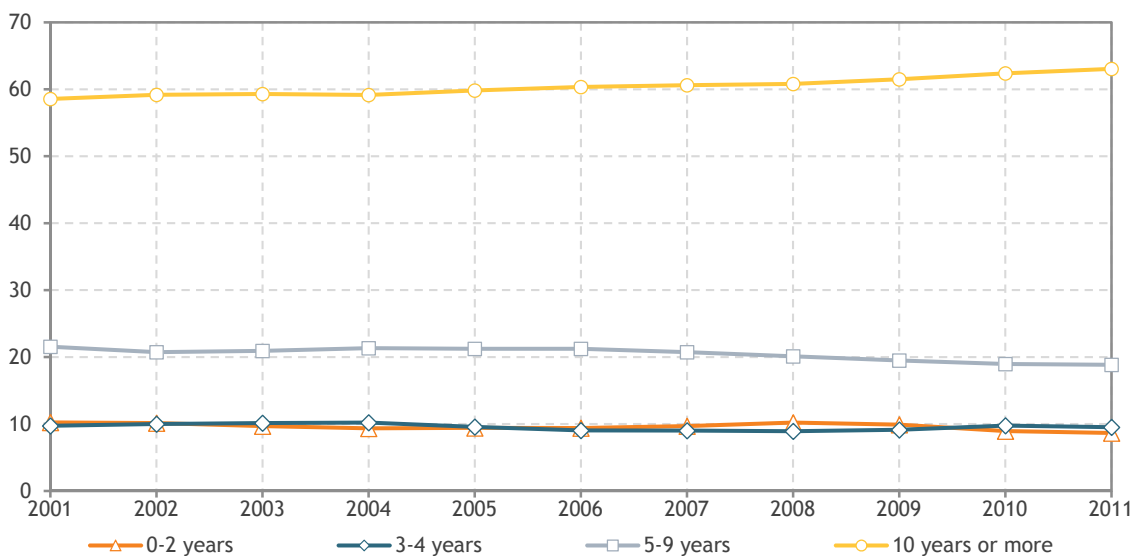
Note: Own calculations based on corrected Belgian data used for *Dynemp v.2*.

The share of firms active for 10 years or more has increased continuously from 58 % in 2001 to 63 % in 2011 whereas the share of firms active for five up to nine years decreased from 22 % to 19 %. The shares of the two groups of youngest firms show a slowly decreasing trend. Decker et al. (2016: p.8) find that the shift towards older firms (declining share of young firms) in the USA accounts for 26 % of the decline in job reallocation although this is offset by a 13 % increase in job reallocation due to a shift away from manufacturing industries towards more volatile industries such as retail trade and services.

Empirical studies indicate that the distribution of firm growth, rather than being Gaussian (normal), is generally tent-shaped (Laplace distribution), in which the spread of growth rates decreases far more rapidly than in a normal distribution, for observations that deviate from the mean (Stanley et al. 1996; Bottazzi and Secchi 2006; Coad, Daunfeldt and Halvarsson 2015). Graph 30 shows the distribution of employment growth for four age groups. Following the *Dynemp* definition, job creation ranges from -2 to +2. The y-axis is log-scaled.

Graph 30   Employment growth distribution by firm age (2002-2011)

Note: The graph shows the distribution of employment growth across age groups, based on own calculations with the corrected Belgian data used for *Dynemp v.2*. The y axis is log-scaled
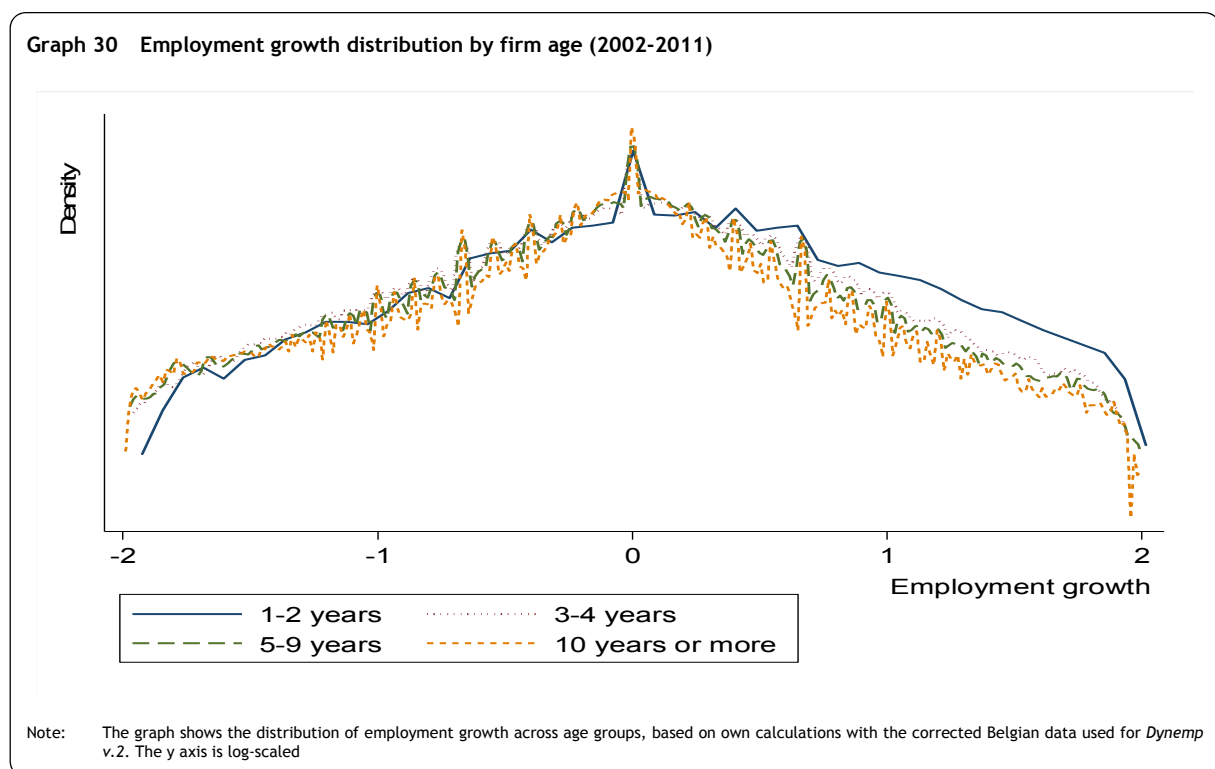
Except for a small area towards the lower left tail (high level of job destruction), the distribution of employment growth of the four age groups is rather similar for negative growth rates. The main difference between the age groups lies on the right side of the distribution. A substantially larger share of firms that are active for one up to two years witnesses higher employment growth than firms in other age groups. Whereas for young firms the right side exceeds the left side of the distribution, the distribution becomes more symmetrical with firm age. This result is in line with Decker et al. (2014) who point out that the high average net job creation by young firms is explained by the positive skewness of the growth distribution of young firms compared to other age groups. As can be seen in Graph 30, the difference in average growth performance is explained at the tails of the distribution, especially the right end tail. Most young firms have – similar to older firms – rather stable employment (growth rates close to zero).

Calvino, Criscuolo and Menon (2016) use the results from *Dynemp v.2* to investigate the link between policy variables reflecting bankruptcy regulation, contract enforcement and access to finance and the components of net job creation. The results indicate that start-ups are more affected by national policies in volatile industries, in industries with a large dispersion in growth between firms and in industries that are more dependent on financial inputs than other industries. The growth rate of surviving entrants and industry volatility in employment are correlated positively. The survival of entrants, on the other hand, correlates negatively with industry volatility. Belgium, along with Sweden and the United Kingdom, has a strong positive correlation between employment growth of surviving entrants and volatility. Start-up dynamics of countries appear to depend on the ease of access to financing, strong contract enforcement, but also on timely bankruptcy procedures. There are indications that lengthy bankruptcy procedures slow down within-industry reallocation between firms, by lowering the probability that mature incumbents will exit.

Given the importance of firms with strong positive employment growth, several studies focus on the right end tail of the growth distribution, being high-growth firms (HGF) or 'gazelles' (see Henrekson and Johansson 2010; Daunfeldt, Elert and Johansson 2014; Moreno and Coad 2015 for recent surveys on this topic). The Eurostat-OECD definition of high-growth firms considers an annualized growth rate of 20 % in employment E over a three-year period (Hölzl 2014):

$$\left(\frac{E_t}{E_{t-3}}\right)^{\frac{1}{3}} - 1 \geq 0.2 \ \ if \ E_{t-3} > 10$$

As very small firms may have high relative growth rates that do not represent a substantial increase in the absolute number of jobs that are created, firms with less than 10 employees, in the initial year of the three-year period, are not considered. Daunfeldt, Halvarsson and Johansson (2012) point out that the threshold of 10 employees excludes almost 95 % of surviving firms in Sweden and about 40 % of job creation during 2005-2008. Eurostat Business demographic statistics show that for Belgium, on average, over the period 2008-2013, only 5.6 % of firms in the Business Economy (excluding holding companies) have 10 or more employees on average. This means that, for Belgium, close to 95 % of firms are also not considered in an analysis of high-growth firms with a threshold of 10 employees. As young firms are predominantly small, a HGF analysis excludes most of the employment dynamics of young firms. Hölzl (2014) considers a modified Birch index that combines relative with absolute growth (threshold of 8 employees) to define high-impact firms (HIF):

$$(E_t - E_{t-3})\left(\frac{E_t}{E_{t-3}}\right) \geq 25.15968 \ \ if \ E_{t-3} > 8$$

In a recent ranking, shown in Table 5, of EU countries in terms of the relative contribution of high-growth firms[22], Belgium ranks 18th out of 28 countries, in terms of the HGF contribution to the total number of active firms. In terms of the HGF contribution to employment, it ranks 23rd out of 26 considered countries (Hölzl 2016: p. 250). A recent analysis by Ramboer and Sleuwaegen (2015) confirms the relatively small share of high-growth firms in Belgium.

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[22] HGF are defined based on a 10 % annualized growth rate of employment (head count) over a three-year period, considering a threshold of 10 employees in the initial year.

Table 5   The share of high-growth firms (HGF) in the number of firms and in total employment (2012)

	HGF share of firms	HGF share of employment
Slovakia	13.8	20.6
Sweden	13.6	17.5
Germany	12.1	14.2
Czech Republic	11.7	19.2
Latvia	11.7	16.3
United Kingdom	11.7	17.2
Lithuania	11.4	19.6
Denmark	10.7	13.6
Hungary	10.7	16.1
Norway	10.5	12
Bulgaria	10.4	17.7
France	10.4	14.7
Finland	10.4	-
The Netherlands	10	12.3
Malta	9.9	8.7
Luxembourg	9.6	9.4
Poland	8.9	16
Belgium	**8.6**	**8.2**
Spain	8	10.3
Portugal	7.9	12.9
Slovenia	7.9	9.6
Estonia	7.1	12.7
Austria	7	8.6
Ireland	6.9	-
Cyprus	6.4	6.7
Italy	5.8	9.7
Croatia	3.4	6
Romania	2.4	6

Source: Figure II-7-2 in Hölzl (2016).

Note: High-growth firms are defined as firms with more than 10 employees at the beginning of a three-year period that witness an annualised growth rate of at least 10% over the three-year period.

Over the period 2008-2011, the HGF share of the Brussels-Capital Region was higher than the average, for a group of 59 European NUTS 1 regions, whereas the HGF share of the Flemish Region and even more of the Walloon Region was below the average.

Considering the definitions above, Table 6 shows the share of high-growth firms (HGF) and high-impact firms (HIF) for two-digit industries in Belgium, over the period 2000-2014.

Table 6   Share of high-growth (HGF) and high-impact (HIF) firms, by two-digit industry in Belgium (2001-2011)

HGF	HIF	Industry
0.19	0.35	Employment activities
0.16	0.26	Residential care activities
0.14	0.25	Security and investigation activities
0.14	0.24	Scientific research and development
0.12	0.20	Telecommunications
0.12	0.16	Computer programming, consultancy and related activities
0.12	0.16	Services to buildings and landscape activities
0.10	0.11	Motion picture, video and television programme production, sound recording and music publishing activities
0.09	0.12	Activities of head offices; management consultancy activities
0.08	0.11	Office administrative, office support and other business support activities
0.07	0.09	Advertising and market research
0.07	0.12	Warehousing and support activities for transportation
0.07	0.11	Information service activities
0.07	0.10	Architectural and engineering activities; technical testing and analysis
0.06	0.15	Manufacture of computer, electronic and optical products
0.06	0.15	Programming and broadcasting activities
0.05	0.08	Repair and installation of machinery and equipment
0.05	0.07	Rental and leasing activities
0.05	0.12	Air transport
0.05	0.07	Publishing activities
0.05	0.16	Manufacture of motor vehicles, trailers and semi-trailers
0.05	0.07	Travel agency, tour operator and other reservation service and related activities
0.04	0.27	Manufacture of basic pharmaceutical products and pharmaceutical preparations
0.04	0.08	Civil engineering
0.04	0.05	Land transport and transport via pipelines
0.04	0.09	Manufacture of electrical equipment
0.04	0.08	Manufacture of food products
0.04	0.04	Legal and accounting activities
0.04	0.05	Retail trade, except of motor vehicles and motorcycles
0.03	0.04	Other professional, scientific and technical activities
0.03	0.04	Wholesale trade, except of motor vehicles and motorcycles
0.03	0.03	Food and beverage service activities
0.03	0.03	Specialised construction activities
0.03	0.03	Repair of computers and personal and household goods
0.03	0.07	Manufacture of rubber and plastic products
0.03	0.04	Accommodation
0.03	0.05	Construction of buildings
0.03	0.11	Manufacture of basic metals
0.03	0.06	Manufacture of other non-metallic mineral products
0.03	0.05	Other manufacturing
0.03	0.04	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
0.03	0.07	Manufacture of machinery and equipment n.e.c.

0.03	0.03	Wholesale and retail trade and repair of motor vehicles and motorcycles
0.03	0.06	Manufacture of textiles
0.03	0.12	Manufacture of tobacco products
0.02	0.03	Real estate activities
0.02	0.10	Manufacture of chemicals and chemical products
0.02	0.09	Manufacture of beverages
0.02	0.03	Printing and reproduction of recorded media
0.02	0.04	Manufacture of fabricated metal products, except machinery and equipment
0.02	0.03	Water transport
0.02	0.13	Manufacture of other transport equipment
0.02	0.06	Manufacture of paper and paper products
0.02	0.20	Manufacture of coke and refined petroleum products
0.02	0.02	Manufacture of furniture
0.01	0.01	Manufacture of wearing apparel
0.00	0.01	Manufacture of leather and related products
0.00	0.00	Veterinary activities

Note: Own calculations based on employment data from the National Social Security Office. High-growth and high-impact firms are identified following the definitions in the text.

In line with the overall evidence for the EU (Hölzl 2016), HGF are well represented in knowledge intensive services. In a number of manufacturing industries, the share of high-impact firms by far exceeds the share of high-growth firms (for example *Manufacture of motor vehicles, trailers and semi-trailers*; *Manufacture of basic pharmaceutical products and pharmaceutical preparations*; *Manufacture of basic metals*; *Manufacture of chemicals and chemical products*). This indicates the need to take into account growth in absolute terms, as cross-industry differences in average firm size may explain part of the difference between firms in average relative growth.

In their survey on high-growth firms, Moreno and Coad (2015) conclude that high-growth firms constitute a minority of active firms that account for a very large part of job creation, that they are likely to be young and that they are not limited to specific industries. As growth rates of firms appear to be the product of random events, it proves rather difficult to predict which firms will witness high growth (random processes can produce cases of sustained above-average performance over time). Some of the sustained persistence can be due to the heterogeneity of resources of firms in the earlier stages of the firm. High growth does not seem very sustainable. After witnessing strong growth over a relatively short period, employment in these firms tends to stabilize or even decline. Some studies suggest that HGF underperform after their high-growth phase. Innovation and internal strategies seem to have a positive impact on growth and HGF are more likely to become active in international markets. The role of innovation and other strategies is however still not well understood and appears to depend on the period under consideration. Moreno and Coad (2015) argue that empirical evidence suggests that policy makers should be cautious in focusing too much on high-growth firms in economic policies. If HGF are temporary 'black swans', targeting specific firms is not likely to provide much productive results if there are no clear determinants for HGF, as empirical evidence seems to indicate so far.

3.3. Technical efficiency

Section 3.2 considers the role of firm age in employment dynamics, which is the focus of most recent firm-level studies. A relatively small number of studies investigate the role of young firms in industry-level productivity dynamics. *Multiprod*, the distributed micro-data project coordinated by the OECD Directorate for Science, Technology and Innovation that aims to investigate how firm-level productivity patterns translate into aggregate productivity, is still ongoing. So far, no cross-country results are available that relate productivity growth to firm age. As firm age is the focus of this paper, this section assesses the role of firm age in industry-level productivity growth, based on a study of EU countries, as reported by Verschelde et al. (2014, 2016) and Dumont et al. (2016).
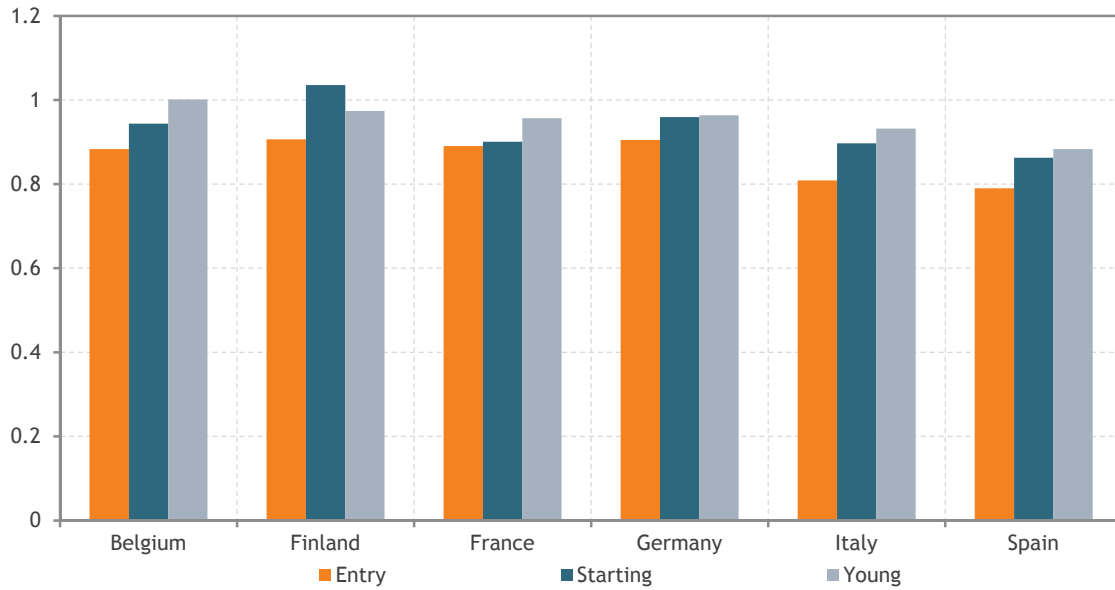
Verschelde et al. (2014, 2016) use firm-level data from AMADEUS on 10 manufacturing industries in seven EU countries (Belgium, Finland, France, Germany, Italy, Spain and the UK) to estimate meta-frontier efficiency, a measure of productivity. The estimated meta-frontier shows the highest value added that can be generated for a given level of inputs (labour and capital) for firms across all countries considered. Country frontiers, which show the optimal efficiency for firms in a given country, are estimated. The technical efficiency of individual firms can be related to the country frontier as well as to the meta-frontier, both estimated at the two-digit industry level.

The estimations show substantial and persistent differences in technical efficiency of firms across the six countries.[23] Belgium and Germany appear to be the benchmark countries, constituting the meta-frontier in most industries, whereas Spanish firms tend to lag behind. There are few indications of convergence over the period considered (2002-2009) and smaller firms have, on average, a larger gap with respect to the meta-frontier. Details on the non-parametric method used to estimate meta-frontier efficiency and a discussion of the results are provided in Verschelde et al. (2014, 2016). In this section, we discuss the results of the decomposition of meta-frontier efficiency growth with a breakdown by firm age as reported in Dumont et al. (2016). This decomposition allows us to distinguish between the positive contribution of young firms – as they increase their efficiency through organizational learning – and the potentially positive contribution due to market selection, which comes down to the reallocation of market shares towards the most efficient firms or the exit of less efficient firms.

Graph 31 shows the average meta-frontier efficiency – compared to the average efficiency of mature firms (active for more than ten years) – of entering firms, start-ups (active for one up to five years) and young firms (active for six up to ten years) for six EU countries. In all six countries, entrants tend to be less efficient than mature firms, a result that is in line with previous studies (Baldwin and Rafiquzzaman 1995, Jensen et al. 2001, Scarpetta et al. 2002, Hyytinen and Maliranta 2013). The average efficiency of firms, compared to mature firms, increases with firm age, in all countries, although there are some differences across countries in the pace and extent of catch-up. Starting firms are more efficient than entrants, in all six countries, and average efficiency of young firms is higher than that of starting firms in all countries, except Finland, where starting firms already have higher average efficiency than mature firms. In Italy and especially in Spain – in contrast with other countries – firms do not seem to be able to catch up with mature firms in terms of technical efficiency, even within a period of ten years after entry.

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[23]   Due to insufficient information on firm age, UK firms could not be considered in the analysis with a breakdown by firm age.

Graph 31   Average relative technical efficiency of entrants, start-ups and young firms (2002-2009)
Efficiency of entrants, starting firms and young firms compared to mature firms - average efficiency of mature firms set at 1

Given the relatively high efficiency of young firms in Belgium, the decrease in the share of firms of these age groups (see Graph 29) seems particularly worrisome.

Graph 32   Distribution of technical efficiency of entrants, start-ups, young firms and mature firms in Belgium
Density of technical efficiency (2002-2009)

As mentioned above, average firm performance can blur substantial heterogeneity across firms. Graph 32 shows the distribution of meta-frontier efficiency of firms for, respectively, the group of entrants, starting firms and young firms. Although the average efficiency of entering firms, starting firms and young firms is lower than the average efficiency of mature firms, the right tail of the productivity distribution of these firms lies to the right of the right tail of mature firms. This implies that a relatively small number of firms younger than ten years are actually among the most efficient firms within their industry. The fact that the average for these groups of firms is lower than the average for mature firms is explained by the larger number of entrants, start-ups and young firms with relatively low efficiency (left tail of the distribution).

The increase, in relative efficiency, with firm age may result from increases in firm-level efficiency, reflecting the process of organizational learning (Bahk and Gort 1993, Geroski 1995, Huergo and Jaumandreu 2004), but also from market 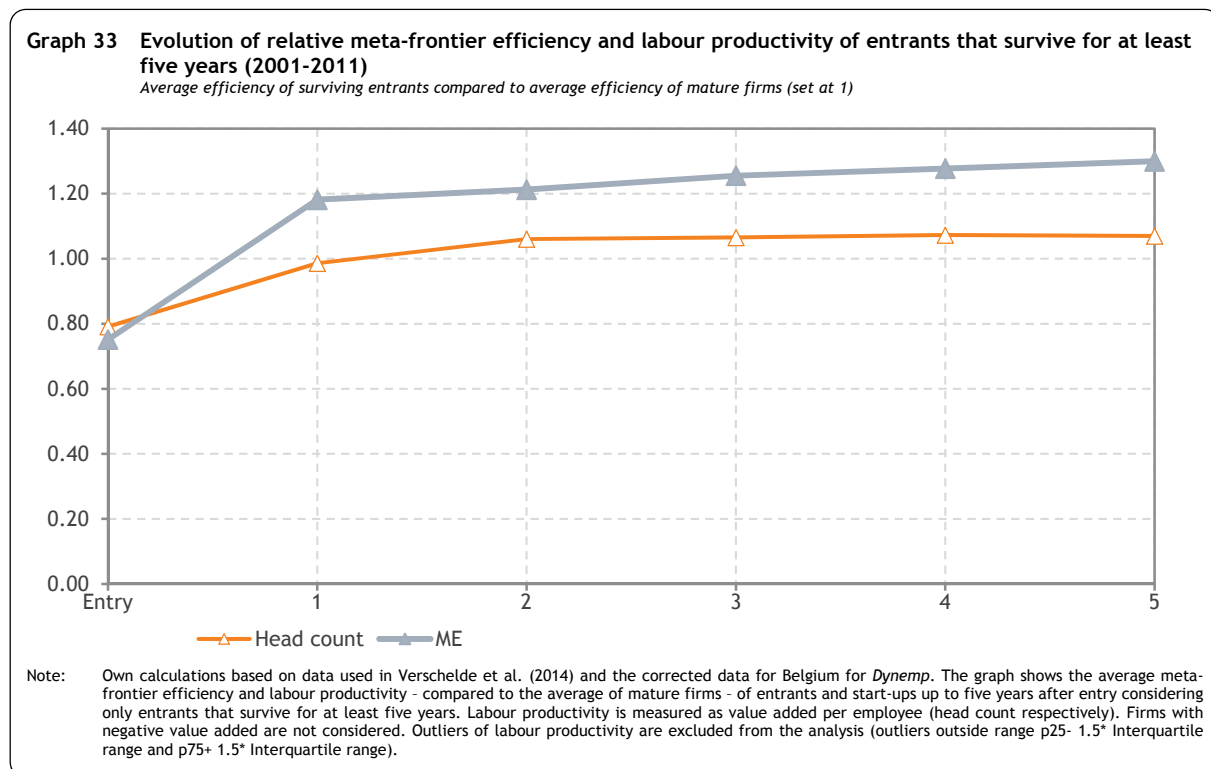selection. As mentioned above, almost 50 % of entrants are no longer active five years after entry. If the least efficient firms drop out, average efficiency will increase. To distinguish the impact of learning on productivity from the impact on market selection, Graph 33 shows the evolution of meta-frontier efficiency and labour productivity (value added per employee) of entrants, compared to mature firms, from the year of entry up to five years after entry but only for those entrants that survive for at least five years.[24]

Graph 33 Evolution of relative meta-frontier efficiency and labour productivity of entrants that survive for at least five years (2001-2011)
Average efficiency of surviving entrants compared to average efficiency of mature firms (set at 1)

Note: Own calculations based on data used in Verschelde et al. (2014) and the corrected data for Belgium for *Dynemp*. The graph shows the average meta-frontier efficiency and labour productivity – compared to the average of mature firms – of entrants and start-ups up to five years after entry considering only entrants that survive for at least five years. Labour productivity is measured as value added per employee (head count respectively). Firms with negative value added are not considered. Outliers of labour productivity are excluded from the analysis (outliers outside range p25- 1.5* Interquartile range and p75+ 1.5* Interquartile range).

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[24]   Meta-frontier efficiency is a measure similar to total factor productivity, which is considered as an indicator of technical efficiency. Labour productivity is often used as a proxy as it is easier to calculate. The limitation of labour productivity is that it only relates output to labour and not to other input factors such as capital, for which data are not always available. Differences in labour productivity may therefore be explained by differences in capital intensity rather than differences in technical efficiency.

Surviving entrants are, just as the entire group of entrants, on average less productive in the year of entry but the gap is smaller. Graph 33 shows indications of learning by entrants that survive for at least five years but the learning process appears to be rather swift. Already in the first year after entry, surviving entrants catch up with mature firms, for both productivity measures, and from the second year after entry, they are even more efficient. Productivity of surviving entrants increases further, especially when denoted in terms of meta-frontier efficiency. The decomposition of industry-level productivity growth with a breakdown by age can provide some insight into the importance of learning and market selection.

As with employment dynamics, a number of data limitations need to be acknowledged in analysing productivity dynamics. Before discussing the results of the decomposition analysis, we point out the main caveats regarding firm-level data on productivity.

Graph 10 in Section 3.2 reveals important differences, across age groups, in the reliance on full-time employees. Especially entering firms have a large share of part-time employees. In order to assess the impact on estimates of firm-level productivity, available information on the total number of employees as well as the total full-time equivalent (FTE) number of employees, both from the Belgian National Social Security Office, is used. Graph 34 shows average labour productivity for entering firms, starting firms (1-5 years) and young firms (6-10 years) compared to average labour productivity of mature firms (more than 10 years), using value added over the total number of employees (head count) and the total number of FTE employees respectively. As for meta-frontier efficiency, average relative efficiency increases with age for both employment measures but using head counts underestimates productivity of young firms, with the largest discrepancy for entrants.

Graph 34   Average relative labour productivity of entrants, start-ups and young firms (2001-2011)
Average labour productivity of entrants, starting firms and young firms compared to mature firms (productivity of mature firms set at 1)
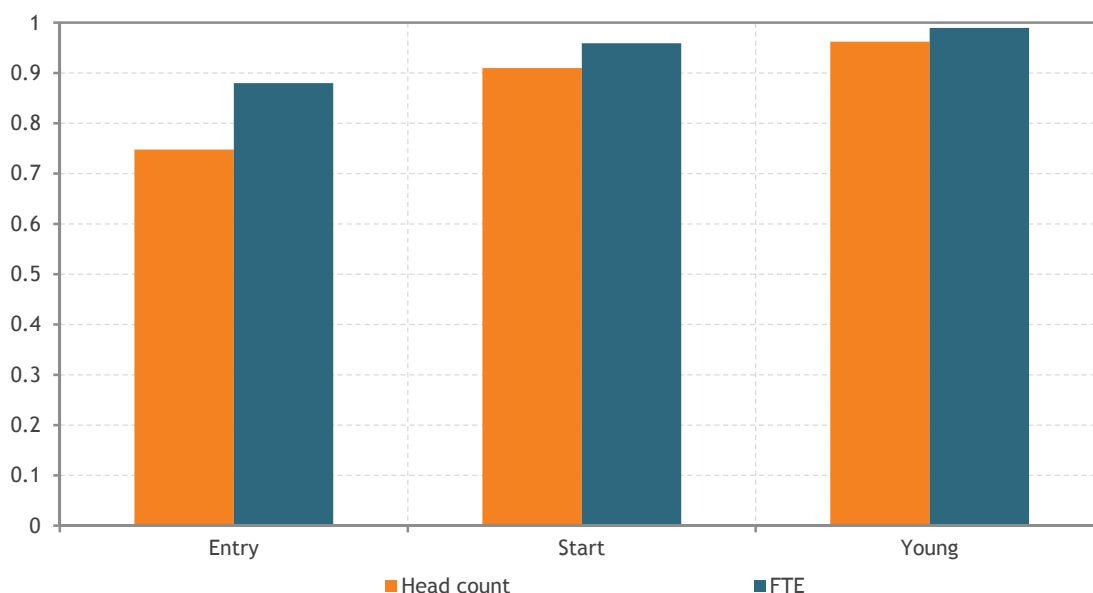
Note: Own calculations based on corrected data for Belgium. The graph shows the average labour productivity of entrants, start-ups (1-5 years) and young firms (6-10 years) compared to average labour productivity of mature firms (more than 10 years), Labour productivity is measured as value added per employee (head count) and value added per FTE employee respectively. Firms with negative value added are not considered. Given the differences in the sample, the period covered and the productivity indicator, the results in this graph caution is warranted in comparing these results with the results in Graph 18. Outliers of labour productivity are excluded from the analysis (outliers outside range p25- 1.5* Interquartile range and p75+ 1.5* Interquartile range).

A measurement issue that is specific to indicators of productivity relates to the way in which output (value added or turnover) is deflated. In order to reflect the technical efficiency of the production process, a productivity indicator should preferably relate the quantity of output to the quantity of input(s). For the input factor labour, data on some quantity indicator is generally available (head count, full-time equivalent number of employees or total hours worked). Turnover or value added is, however, provided in nominal value. The most common approach in productivity measurement to obtain an indicator of output quantity is to deflate the value of turnover or value added using an appropriate deflator. For the estimation of total factor productivity, the issue of an appropriate price deflator also applies to some input factors such as capital or intermediate inputs for which data tend to be only available in nominal value terms.

Most firm-level studies on productivity consider industry-level deflators, since these are readily available. Marschak and Andrews (1944) already argued that the assumption that all firms in the same industry are identical is rather implausible. They showed the bias in estimates of productivity based on firm-level data deflated by industry-level price indices if prices differ across firms in the same industry due to imperfect market competition. More recently, Foster, Haltiwanger and Syverson (2008) report evidence, for US manufacturing industries, that deflating the output of all firms in a given industry, by the same industry-level deflator, results in the underestimation of the productivity of young firms as the latter appear to charge lower prices than more established incumbents. Foster, Haltiwanger and Syverson (2016) argue that the lower prices charged by young firms may result from the fact that the initial demand for their products and services is low due to informational and reputational frictions. If demand for the products and services of young firms is sufficiently robust to allow them to survive, young firms will gradually hurdle the initial frictions and be able to grow and increase their productivity. Foster, Haltiwanger and Syverson (2016) argue that when price heterogeneity between firms in the same industry is not accounted for, productivity measures will not only reflect differences in technical efficiency but also differences in the demand for products and services.

In order to assess the impact of using industry-level price indices to deflate firm-level output, firm-level price data are required. However, if reliable firm-level prices were available there would be no need to use industry-level prices in the first place. Unfortunately, data on firm-level prices are not readily available. A possible information source is provided by the Community survey of industrial production, PRODCOM, which provides statistics on the production of manufactured goods in EU Member States. In Belgium, Statistics Belgium is in charge of the PRODCOM survey. Verschelde et al. (2014) used PRODCOM data for Belgium to assess whether meta-frontier efficiency estimates are robust when firm-level prices, rather than industry-level prices, are used to deflate firm-level output. Participation in the PRODCOM survey is obligatory for firms or plants with at least 20 employees or annual sales of at least 3.5 million euros. Firms are asked to provide, for each product on the PRODCOM list, the volume as well as the value of production that was sold during the survey period. Until 2007, participation in the survey was obligatory for firms with at least 10 employees or 2.5 million euros in sales. As mentioned above, even a threshold of 10 employees excludes the majority of firms in manufacturing industries (some 80 % of manufacturing firms have less than 10 employees). For the estimation of meta-frontier efficiency, PRODCOM provides data on a sufficient number of firms for only four industries at the two-digit NACE level (*Food and beverages*, *Chemicals*, *Other non-metallic mineral products* and *Fabricated metal products*). Given the revision of the NACE-BEL classification in 2008, the robustness test was restricted

to 2002-2007 (excluding 2008 and 2009). Estimates for the four manufacturing industries for which sufficient data is available, confirm the results of Foster, Haltiwanger and Syverson (2008) that the use of industry-level price indices, to deflate firm-level output, results in the underestimation of the technical efficiency of young firms.

Hyytinen and Maliranta (2013) argue that if an industry-level capital price index is used to deflate firm-level capital stocks, the technical efficiency of young firms may actually be overestimated if young firms use more recent – more efficient – vintages of capital goods and if the quality differences between vintages are not entirely reflected in the capital price index. As firm-level prices of capital goods are even scarcer than firm-level output prices, it is difficult to test this assumption. The authors posit that in the absence of reliable capital price deflators, analyses based on labour productivity, for which capital is not considered, may be more trustworthy than an assessment based on total factor productivity.

Keeping in mind the limitations involved in a productivity analysis based on firm-level data[25], Table 7 shows the main results of the decomposition of industry-level meta-frontier efficiency growth, with a breakdown by firm age, following the decomposition procedure proposed by Hyytinen and Maliranta (2013).

Table 7   Average relative contribution to industry-level meta-frontier efficiency growth
2003-2009

	Belgium	Finland	France	Germany	Italy	Spain
Firm-level growth						
Start-ups	0.03	0.04	-0.04	0.01	0.01	-0.05
Young	-0.10	-0.05	0.02	-0.04	0.00	-0.01
Mature	-0.32	-0.40	-0.11	-0.36	-0.21	-0.35
Reallocation						
Start-ups	-0.03	-0.02	0.03	-0.01	0.00	-0.02
Young	0.00	0.01	0.01	0.00	0.00	-0.01
Mature	0.03	0.00	0.00	-0.01	0.11	0.04
Exit						
Start-ups	0.02	0.00	0.03	0.03	0.04	0.03
Young	0.01	0.02	-0.07	0.05	0.04	0.01
Mature	0.12	0.11	-0.12	0.11	-0.01	0.01
Entry	-0.03	-0.06	-0.01	-0.06	-0.10	-0.04

Note: The table shows the average, over all industries and years, of the relative components of a decomposition in which incumbents are divided into three groups: starting (after entry but younger than 5 years), young (between 6 and 10 years old) and mature (more than 10 years old). To reduce the bias due to a small number of extreme values, components outside the range of three times the standard deviation from the country mean for that component, are excluded. See Dumont et al. (2016) for details on the decomposition procedure and Verschelde et al. (2014, 2016) for a description of the estimation of meta-frontier efficiency.

Firm-level growth (within component) shows, for each of the three age groups, the contribution to industry-level efficiency growth resulting from the meta-frontier efficiency growth of firms in a given age group, where the share of firms in total industry value added is kept constant. The reallocation (between)

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[25]   Verschelde et al. (2014, 2016) point out additional caveats in cross-country analyses based on firm-level data.

component shows the extent to which industry-level efficiency growth increases (decreases) because market shares shift towards above-average efficient (less than average efficient) firms (see Dumont et al. (2016) for details on the decomposition).

The entry and exit components reflect the contribution to industry-level efficiency growth of entering firms and exiting firms. A firm that enters raises industry-level efficiency if its efficiency, in the year of entry, exceeds the average efficiency of incumbent firms. Exiting firms, on the other hand, will contribute positively to industry-level efficiency growth if their efficiency lies below the industry average. In fact, the exit of less efficient firms raises industry-level efficiency growth. The entry of new firms may have an indirect positive impact on industry-level productivity growth if it induces incumbents to innovate more to escape competition from entrants. The results reported in the Quarterly Report on the Euro Area (Volume 16 No 1) suggest that a 1-percentage point increase in the start-up rate of new firms is associated with a 0.1-percentage point increase in total factor productivity growth. The exit rate also appears to correlate positively with productivity growth, especially for countries with a high productivity level. This seems to be confirmed by the high positive exit component for mature firms in Belgium, Germany and Finland, which have the highest efficiency level in most manufacturing industries.

A common finding, for all six countries, is the dominance of the within component. Industry-level efficiency growth is mainly explained by efficiency growth of individual firms (within component). In the industry-level shift-share analysis, as reported in Section 2, the within component also dominates the other components. Over the period 2003-2009, the within component is negative in all countries. Although this can be, to some extent, explained by the impact of the crisis years 2008 and 2009, the contribution was already negative in most industries before 2008, reflecting the productivity slowdown witnessed by most OECD countries, since the mid-1990s and early 2000s (OECD 2015b, 2016). Since mature firms have a large share in the total number of firms, negative industry-level efficiency growth over the period 2003-2009 is largely explained by the decrease in their technical efficiency.

In line with increasing efficiency due to learning and market selection, efficiency growth of start-ups contributes, on average, positively to industry-level efficiency growth in Belgium, Finland, Germany and Italy. For these four countries, the relative contribution of firm-level efficiency growth decreases as firms mature. On the other hand, the older firms become, the more market shares appear to shift away from less efficient firms towards more efficient firms. This is reflected in the reallocation component, although the pattern across countries of this component is less clear than that of the within component.

Estimates of total factor productivity often contain a business cycle component. As Basu, Fernald and Kimball (2006) point out, the apparent pro-cyclical pattern may stem from pro-cyclical effects that outweigh counter-cyclical effects. The main pro-cyclical effect results from the difficulty to fully account for the variation in the utilization of the capital stock over business cycles, which will lead to the overestimation of real input and therefore underestimation of technical efficiency in recession years. According to Basu, Fernald and Kimball (2006), real effects related to technological change tend to be countercyclical. Caballero and Hammour (1994) argue that recessions can have a positive impact on industry-level productivity if it forces mature firms with outdated production technology to exit. Whereas empirical studies tend to confirm the existence of 'cleansing' in recessions, Foster, Grim and Haltiwanger (2016) report evidence for the US that during the Great Recession the intensity of reallocation decreased

and contributed less to productivity growth than in prior recessions. Dumont et al. (2016) assess the impact of the Great Recession on the components of industry-level efficiency growth, for the group of six EU countries, by comparing the relative contribution of the components in 2008-2009 to the average over the period 2003-2007. The overall negative impact on industry-level efficiency growth is largely explained by a negative impact on the within component. For Belgium, the impact of the Great Recession on firm-level efficiency growth is negative for start-ups and mature firms but negligible for young firms. Reallocation was affected negatively in the crisis years for all age groups in Belgium, for young firms in particular. The Great Recession had a strong positive impact on the entry component in Belgium and Finland, which indicates that the crisis raised the entry barrier of technical efficiency. For Belgium, the impact of the Great Recession on the exit component is positive for all three age groups, especially for young firms, which indicates that the crisis forced less efficient firms to exit even more so than in the years before the crisis.

A breakdown of age groups into firms that witness an increase in their market share (expanding) and firms that witness a decrease in their market share (shrinking) reveals that the net job creation for each age group results from often opposite gross effects that are multiples of the net effect. The negative reallocation component for start-ups, in four countries, is explained by the fact that expanding start-ups, as all start-ups, tend to have an efficiency level below the industry average. However, the breakdown also indicates that market shares do appear to shift towards those start-ups that succeed in raising their technical efficiency. The fact that the reallocation component becomes more positive for young firms is especially explained by firms with efficiency below the industry average that witness falling market shares, which has a positive impact on the reallocation component.

As noted at the end of Section 2, there are indications of a trade-off between employment and productivity growth at the industry level. Table 8 shows the correlation between employment growth and growth in meta-frontier efficiency for ten manufacturing industries in six EU countries, with growth rates considered over one year and three years respectively. Industry and year effects as well as firm age are controlled for, in the estimation of the correlation.

Table 8   Correlation between employment growth and growth in meta-frontier efficiency (2003-2009)

	Belgium	Finland	France	Germany	Italy	Spain
One-year growth rates	-0,05	-0,13**	-0,31***	-0,24***	-0,25***	-0,11**
Three-year growth rates	-0,16**	-0,20***	-0,10***	-0,13*	-0,06***	-0,11**

Note: Own calculations based on data used in Verschelde et al. (2014, 2016). The table shows the correlation between the growth rate of employment and the growth rate of meta-frontier efficiency over one year and three years respectively, controlling for year and two-digit industry effects (ten manufacturing industries) as well as firm age and size. Statistical significance of the correlation at 10 %, 5 % and 1 % is denoted by *, ** and *** respectively.

Both for one year and three years, the correlation is negative and mostly statistically significant, suggesting that there also appears to be a trade-off between employment growth and productivity growth at the firm level, in all six countries.

Meta-frontier efficiency is only estimated for firms in manufacturing industries. In order to assess the correlation between employment growth and productivity growth in market services as well, Table 9

shows the correlation between employment growth and labour productivity growth using the corrected Belgian data for *Dynemp v.2*. The correlation is computed using the total number of employees (head count) and the total number of full-time equivalent employees respectively. Correlations are again considered for one-year as well as three-year growth rates and computed separately for manufacturing industries and market services.

Table 9   Correlation between employment growth and labour productivity growth in Belgium (2001-2011)

	Manufacturing industries		Market services	
	Head count	Full-time equivalent	Head count	Full-time equivalent
One-year growth	-0.38***	-0.41***	-0.46***	-0.51***
Three-year growth	-0.23***	-0.27***	-0.31***	-0.36***

Note: Own calculations based on corrected Belgian data used for *Dynemp v.2*. The table shows the correlation between the growth rate of employment and the growth rate of labour productivity (value added per employee) with employees denoted by the total number of employees (head count) and the full-time equivalent number of employees respectively. The year and two-digit industry effects as well as firm age are controlled for. Statistical significance of the correlation at 10 %, 5 % and 1 % is denoted by *, ** and *** respectively.

All correlations are statistically significant and negative, which indicates a trade-off between employment growth and labour productivity growth in manufacturing industries as well as in market services.

Table 10 shows the correlation between employment growth and labour productivity growth for manufacturing industries and market services, with a breakdown by firm age. The correlation is negative for all four age groups. Start-ups (active for one to two years) have the least negative correlation and the correlation becomes more negative for older firms up to mature firms (10 years or more) for which the correlation decreases slightly.

Table 10   Correlation between employment growth and labour productivity growth, by firm age (2001-2011)

	Manufacturing industries	Market services
1-2 years	-0.31***	-0.38***
3-4 years	-0.43***	-0.50***
5-9 years	-0.45***	-0.51***
10 years or more	-0.37***	-0.48***

Note: Own calculations based on corrected Belgian data used for *Dynemp v.2*. The table shows the correlation between the one-year growth rate of employment and the one-year growth rate of labour productivity (value added per employee) for four age groups. The year and two-digit industry effects as well as firm age are controlled for. Statistical significance of the correlation at 10 %, 5 % and 1 % is denoted by *, ** and *** respectively.

Tables 8 up to 10 indicate that the trade-off between employment growth and productivity growth of firms is relatively strong and pervasive over all industries and age groups. Correlations with a breakdown by two-digit industry and firm age groups confirm the general indication of a trade-off.[26]

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[26] The correlations are not reported but available upon request.

Graph 35 shows the link between employment growth and labour productivity growth of individual firms in manufacturing industries over the period 2001-2011 and Graph 36 shows the link for market services.

Graph 35   Link between employment growth and productivity growth in manufacturing industries (2001-2011)
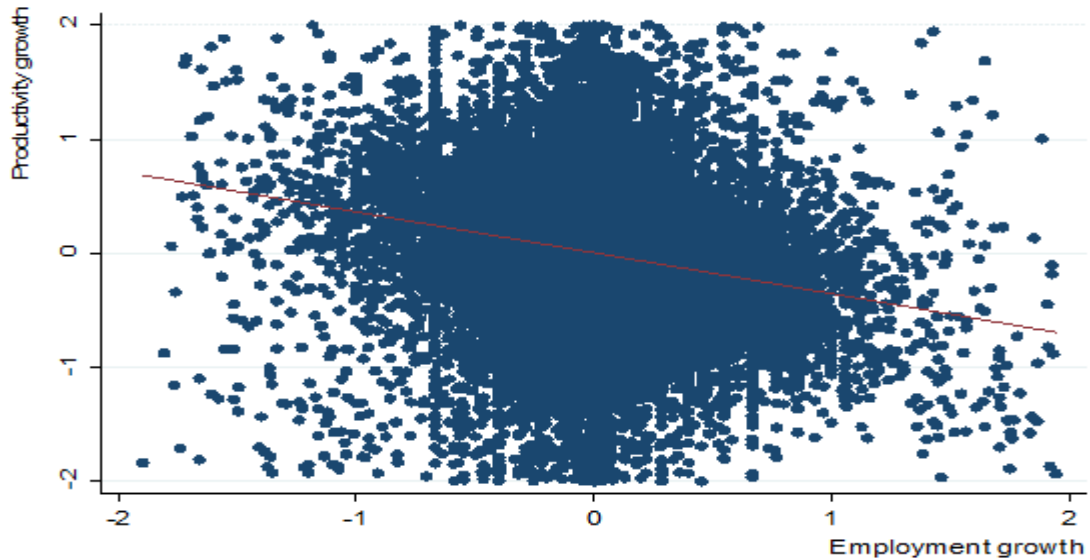
Note: Own calculations based on corrected data for Belgium. The graph shows the link between employment growth (head count) and labour productivity growth, over the period 2001-2011, for individual firms in manufacturing industries.

Graph 36   Link between employment growth and productivity growth in market services (2001-2011)
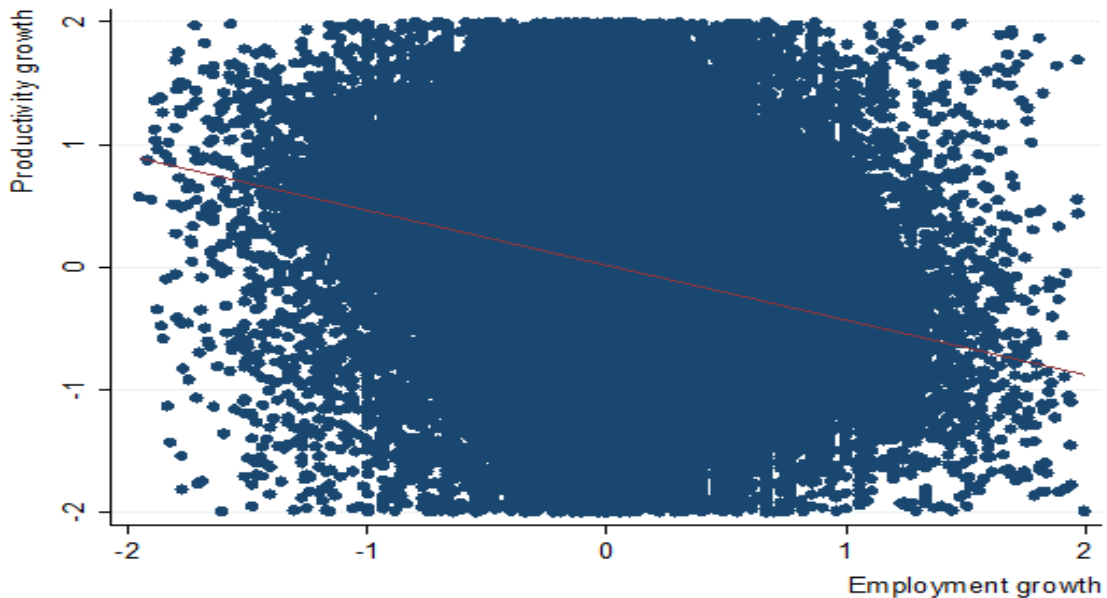
Note: Own calculations based on corrected data for Belgium. The graph shows the link between employment growth (head count) and labour productivity growth, over the period 2001-2011, for individual firms in market services.

Some 40 % of firms[27] experienced a decrease in employment and positive productivity growth (upper left quadrant). The second largest group (26 %) are firms with increased employment but negative productivity growth (lower right quadrant). These two groups explain the overall negative correlation. Some 20 % of firms in manufacturing experienced increased employment as well as productivity (upper right quadrant) and the smallest group of firms witnessed decreasing employment as well as productivity.

A similar pattern can be observed for market services (Graph 36). The group of firms with falling employment but increasing productivity (upper left quadrant) accounts for 43 % of all firms and 28 % experience growing employment but falling labour productivity. The group of firms that witness both falling employment and a decrease in productivity is even smaller in manufacturing industries (11 %). Graphs 35 and 36 reveal substantial heterogeneity across firms with a considerable number of firms that succeed in simultaneously raising employment and productivity.

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[27] The dots in Graph 35 and 36 represent annual observations for individual firms of employment growth and productivity growth.

4. Policy implications

As the analysis in this paper shows, Belgium performed rather well in terms of job creation since 2000 – even during the crisis – but at the same time, labour productivity growth was relatively weak. Industry-level data reveal that the weakness in productivity growth is mainly due to falling labour productivity growth at the industry level rather than to reallocation of labour in favour of low-productivity industries although this effect also played a role over the period 2000-2007. Micro-data analysis underlines the important contribution of young firms to job creation and productivity growth and the reallocation of market shares in favour of the most efficient firms for older companies. Analyses based on firm-level data are consistent with analyses based on industry-level data in that they both point to the decrease in efficiency growth of firms and industries as the main explanation for subdued productivity growth. In view of the positive contribution of young firms to productivity growth, the low and decreasing rate of starts-up, and consequently of young firms, therefore partly explains decreasing productivity growth in Belgium.

Considering the empirical evidence that the competitiveness of economies relies substantially on a relatively small number of highly productive firms, analyses based on firm-level data are increasingly considered to be essential in complementing macro-economic indicators, to inform policy-making that aims at raising economic growth and international competitiveness.

In investigating industry dynamics based on firm-level data, recent studies shift the focus from firm size towards firm age. Andrews et al. (2015) argue that given that young firms – and not small firms in general – account for a considerable share of net job creation, policies should focus on entrants and start-ups rather than on small and medium-sized firms. There is growing concern that falling start-up rates may go some way towards explaining the decrease in productivity growth, witnessed in many OECD countries. With regard to EU countries, the productivity gap vis-à-vis the USA is often attributed to the greater level of experimentation and 'learning by doing' in the USA (Andrews et al. 2015, p. 207) although Decker et al. (2014) report evidence of declining start-up rates and a diminished role of young firms in the US economy as well. According to Haltiwanger, Jarmin and Miranda (2013), policy intervention that only aims at small firms, but ignores firm age, will probably not be very effective in spurring job creation. Policy should instead consider how to correct potential market failures that hamper the entrance of new firms and the post-entry growth performance of start-ups. IMF (2016) is in favour of placing the focus on young rather than on small firms and points out that size-based tax preferences may create disincentives for firms to grow beyond present size thresholds, resulting in a small business trap. According to the IMF, growth would be achieved more efficiently by targeting tax support to young firms instead of relying on size-contingent tax benefits. As an example, IMF (2016) shows the positive correlation among OECD countries, between start-up rates over the period 2010-2013 and the threshold for firms to register for Value Added Tax (VAT). Belgium, among the countries with the lowest start-up rate is also one of the countries with the lowest VAT registration threshold. Some studies suggest that tax incentives for R&D activities may protect incumbents at the cost of entrants and young firms (Acemoglu et al. 2013; Bravo-Biosca, Criscuolo and Menon 2013; Koski and Pajarinen 2015). Andrews and Criscuolo (2013) argue that R&D tax incentives can be effective at raising R&D but the schemes should be designed so as to minimise the budgetary cost and the tendency to favour less dynamic incumbents at the expense of dynamic young firms. As young firms tend to have little profit in

the early years after entry, tax incentives that are refundable and contain carry-over provisions are preferred. The scheme for young innovative companies that consists in the partial exemption of payment of the withholding tax on the wages of R&D personnel, introduced in Belgium in 2006, seems to be good practice in targeting tax incentives on young firms (see, for example, the survey on R&D tax incentives by Straathof et al. 2014).

All available data sources confirm that Belgium stands out unfavourably from other OECD countries in its very low start-up rate. European Commission (2016) points out that the low start-up rate of Belgium can probably not be explained by the environment for SMEs, which it labels as "generally welcoming" nor by the relative ease to start a company[28]. On the other hand, the "fear to fail" appears to be considerably higher in Belgium than in the rest of the EU and some tax aspects are considered to inhibit firm dynamics.[29] World Bank (2016) ranks Belgium 43th out of 189 countries in terms of ease of doing business. This overall indicator results from substantially different positions on sub-indicators. Belgium actually ranks first place when it comes to the indicator on trading across borders (for example, cost and time to import or export) and also performs relatively well in terms of resolving insolvency (10th position) and starting a business (20th position). On the other hand, Belgium ranks only 132nd in terms of registering property (for example, number of procedures) and 97th for getting credit (for example, the strength of legal rights and the depth of credit information). World Economic Forum (2015) ranks Belgium rather high in terms of availability and affordability of financial services but 36th concerning the ease of access to loans and only 65th in terms of soundness of banks, which results from responses to the World Economic Forum Executive Opinion Survey as to the assessed soundness of banks. With venture capital for seed, start-up and early-stage investment representing 0.02% of GDP, Belgium ranks 16th out of 32 countries considered (OECD 2015a: p. 103). This median position of Belgium suggests some potential for improvement given that countries with better-developed venture capital markets appear to be more effective at channelling resources to young innovative firms (Andrews and Criscuolo 2013).

The Belgian Federal Public Service of Economy, SMEs, Self-employed and Energy carried out a survey on the financing of SMEs in Belgium. In 2014, 68.2 % of Belgian start-ups (firms that are active for less than four years) applied for a bank loan for investment or for operational purposes. Mature firms (four years or older) depend less on bank finance than start-ups. Start-ups faced a rejection rate of 66.2 % of their demands for bank loans, compared to only 16.6% for older firms. Banks motivated their rejection mainly by a lack of collateral or insufficient equity (FOD Economie 2015: p. 51). In Belgium, in addition to bank finance, start-ups also rely more on alternative financing than older firms, for example capital contributions from new or existing partners; loans from friends and family; subordinated loans and financing by business angels. Older firms depend substantially more on internal financing through retained earnings (FOD Economie 2015: p. 53). Some 60 % of start-ups state that they face (many) problems in obtaining financing from banks, compared to only 14.9 % for older firms. Obtaining alternative financing appears to be less problematic for start-ups, although this is still more difficult than for older

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[28] European Commission (2016) refers to the World Bank's Doing Business 2016, which ranks Belgium in the seventh position among EU countries as to the ease of starting a company although there appears to be potential for simplification in online procedures and capital requirements for SMEs are considered to be relatively demanding.

[29] According to OECD (2015a), Belgium ranks 25th out of 41 countries as to the percentage of persons aged between 18 and 64 who see good opportunities to start a business in the area where they live. Belgium ranks only 38th concerning the percentage of the same age group who believe to have the required skills and knowledge to start a business. In terms of those with positive perceived opportunities, who indicate that fear of failure would prevent them from setting up a business, Belgium ranks 5th.

firms. (FOD Economie 2015: p. 54). FOD Economie (2015) concludes that the results of the survey indicate that start-ups face vital problems in obtaining financing from banks in Belgium. A 2012 questionnaire answered by 32 OECD countries indicates that young innovative companies face difficulties in obtaining financing and that these difficulties increased over the period 2007-2012 because banks became more hesitant about providing loans to start-ups following the financial crisis. Venture capital firms have apparently also become more risk-averse and focus more on later-stage financing. As a result, governments in OECD countries introduced measures to support seed and early-stage financing but also in support of incubators, business angels and matchmaking services (Wilson and Silva 2013). Ferrando and Griesshaber (2011) find that younger firms are more likely to experience problems in the access to financing whereas firm size does not appear to be a robust predictor of the probability that a firm faces credit constraints. Cincera, Ravet and Veugelers (2014) advocate the integration of the currently highly fragmented EU equity markets, to improve access to external funds for young leading innovators, since R&D investment by young innovators is more sensitive to cash flow in the EU than in the USA.

In 2015, the Belgian federal government initiated a Start-up Plan that aims to encourage the creation of new businesses in innovative sectors. The plan consists in improving access to financing by start-ups. A tax shelter for start-ups provides, as of July 2015, a tax reduction of 45 % in personal income tax for new shares in start-ups and a tax reduction of 30 % for new shares issues by newly formed SMEs. Crowdfunding will become more attractive because of tax reductions in the personal income tax for grants and loans and an exemption of the withholding tax on the interest on loans provided through regulated crowdfunding platforms. During the first four years, start-ups are exempted partially from payment of the withholding tax on the wages of employees. The rate of exemption amounts to 20 % for micro enterprises and 10 % for SMEs (more details on the Start-up Plan can be found on the website http://www.startups.be/).

Calvino et al. (2016) point out that the cross-country evidence of the *Dynemp* project reveals the key role of bankruptcy regulation and strong contract enforcement as well as access to financing for start-up dynamics. As mentioned before, according to World Bank (2016), Belgium performs rather well in terms of solving insolvency. Concerning the enforcement of contracts, the 53rd position indicates room for improvement. The different indicators previously mentioned, and the ranking of Belgium, suggest that access to finance is the major barrier for entrants and young firms. Calvino et al. (2016) argue that policy making could be biased by 'regulatory incumbency', resulting from the lobbying power of incumbents in the policy debate, exacerbated by a lack of advocates for the position of young firms, let alone of potential entrants.

Andrews et al. (2015) point out the tendency of stringent product market regulation to reduce the entry of new firms, to postpone the exit of inefficient incumbents and to raise the costs for innovative firms to expand through the implementation and commercialization of new ideas. According to the OECD indicators, Belgium is close to the OECD mean in terms of product market regulation.

In a thought-provoking contribution, Shane (2009) argues that the belief of many policy makers that simply increasing the number of start-ups will stimulate depressed economies, generate innovation and

create many jobs, is flawed as the 'representative' start-up is not innovative, creates few jobs, and generates little value added. He argues that rather than subsidizing all start-ups, eliminating incentives for start-ups with a low probability of generating jobs and contributing to economic growth will improve the average performance of young firms. As an example of such incentives, Shane (2009) considers transfer payments, loans, subsidies, regulatory exemptions and tax benefits that encourage people to start businesses but also active labour market policies that aim to turn unemployed people into entrepreneurs. Colombelli, Krafft and Vivarelli (2016) supplement the view of Shane (2009) by stating that policies should focus on start-ups that invest in innovative activities, as these are the key source of sustainable value creation. This focus implies that attention should be paid to the network of firms, universities, science parks, incubators as well as providers of venture capital that are instrumental in generating knowledge spillovers, academic spinoffs and the formation of highly specialized human and social capital. Mason and Brown (2014) stress the importance of a more holistic policy approach that focuses on the different actors within the 'entrepreneurial ecosystem'. According to the authors, transactional support (grants and subsidies) may prove less effective than relational support such as strategic guidance, leadership development and business monitoring, especially after the start-up phase, as financial support may be necessary for start-ups. Mason and Brown (2014) state that the 'ecosystem' perspective urges not to focus on high start-up rates nor to favour small firms at the expense of large firms as large incumbents that spawn entrepreneurial managers, capable of establishing and growing businesses, are found to be key contributors to dynamic ecosystems. Naudé (2016) equally warns against overly optimistic expectations on the potential role of entrepreneurship in addressing the current dismal growth prospects in the EU. He argues that there is no statistically significant relationship between economic growth and several indicators of entrepreneurship (for example, the employment share of self-employed or start-up rates) and refers to the distinction made by Baumol (1990) between entrepreneurial activities that raise productivity and unproductive or even damaging activities such as rent seeking or organised crime. Baumol argues that the allocation of entrepreneurial resources depends on the relative incentives offered to the different activities. According to him, policy can influence the allocation between entrepreneurial activities more effectively than the supply of entrepreneurs, by changing the rules of the game. However, Naudé (2016) states that the current reward structure in the EU hampers the potential of small firms to grow and innovate as it is biased in favour of unproductive rent-seeking activities and tends to prolong the existence of inefficient incumbents with substantial lobbying power.

Given the indications of a trade-off, at both the industry level and the level of individual firms, between job creation and productivity growth, a worthwhile avenue for future research seems to lie in the investigation of whether determinants can be found that explain how some firms combine growth in employment with positive productivity growth. The analysis could be extended to those firms that succeed in surpassing the productivity threshold that appears to separate the vast majority of domestically active firms from the 'happy few' firms that are able to compete in international markets. In terms of allocation between productive and unproductive activities, it would also be interesting to assess whether institutional factors and relative incentives play a part in this. Either way, the apparent trade-off reveals the potential tension between different policies and suggests that in introducing labour market measures that aim to integrate more low-skilled persons in the economy – warranted because of the historically low employment rate in Belgium- a 'productivity sacrifice' needs to be accounted for.

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ANNEX

Table A.1 List of two-digit industries (NACE Rev. 2)

CODE	DESCRIPTION
CA	Food products, beverages and tobacco
CB	Textiles, wearing apparel, leather and related products
CC	Wood and paper products, and printing
CD	Coke and refined petroleum products
CE	Chemicals and chemical products
CF	Basic pharmaceutical products and pharmaceutical preparations
CG	Rubber and plastics products, and other non-metallic mineral products
CH	Basic metals and fabricated metal products, except machinery and equipment
CI	Computer, electronic and optical products
CJ	Electrical equipment
CK	Machinery and equipment n.e.c.
CL	Transport equipment
CM	Furniture; other manufacturing; repair and installation of machinery and equipment
F	Construction
G	Wholesale and retail trade, repair of motor vehicles and motorcycles
H	Transportation and storage
I	Accommodation and food service activities
JA	Publishing, audio-visual and broadcasting activities
JB	Telecommunications
JC	IT and other information services
L	Real estate activities
MA	Legal and accounting activities, etc.
MB	Scientific research and development
MC	Advertising and market research; other professional, scientific and technical activities; veterinary activities
N	Administrative and support service activities