Firm dynamism, productivity and the German anomaly

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Abstract

Bravo-Biosca (2011, 2016) shows that the share of strongly growing and strongly declining firms tends to be lower in Europe than in the US. He shows that this lack of firm dynamism may at least in part explain the lower productivity growth in Europe compared to the US, especially in the face of disruptive innovation. In this paper, we update and expand upon Bravo-Biosca's main results for major European countries (BE, DE, ES, FR, IT, ES, NL, PT, SE). We generally observe similar regularities in firm growth dynamics as Bravo-Biosca. However, using our whole sample, we struggle to find a significant relationship between firm dynamism and productivity growth. We show that Germany has an exceptionally high number of firms that neither grew nor declined. The share of static firms in Germany is nearly twice the national average in our sample. This pattern is consistent across sectors and firm size within Germany. Germany also has a low rate of firm exit and birth relative to other countries in the sample. When we remove Germany from the analysis, we find a relationship between productivity and firm dynamism that is largely consistent with that of Bravo-Biosca (2016). We speculate that the results suggest that there is something unique about the way innovation is transmitted throughout the German economy.

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I. Introduction

It is a widespread notion that business dynamism, i.e., the process of firm creation, growth, decline and death, and the reallocation of factors of production associated with this process, is a key to productivity growth. The typical argument is that firms, often newly born, introduce new or better business models and products, which are, due to agency problems, more difficult to generate in large established firms. Based on their performance, firms grow or eventually decline or even exit the market. The valuable but scarce resources that these firms set free become available to other, new or more productive firms, which allows them to grow. Overall, the fast and efficient reallocation of factors of production associated with business dynamism improves the match between resources and their most productive use. This in turn stimulates entrepreneurship, experimentation, innovation and ultimately productivity growth. Hence, the overall performance of an economy is related to the cross-sectional dispersion of firm productivity 'shocks' since it shapes factor reallocation and the idiosyncratic incentives for the firms to create or destroy jobs or improve productivity.

Bravo-Biosca (2011, 2016) shows that the share of strongly growing and strongly declining firms tends to be lower in Europe than in the US. He demonstrates that this lack of firm dynamism may at least in part explain the lower productivity growth in Europe compared to the US, especially in the face of disruptive innovation. In this paper, we update and expand upon Bravo-Biosca's main results for major European countries (BE, DE, ES, FR, IT, ES, NL, PT, SE). We generally observe similar regularities in firm growth dynamics as Bravo-Biosca. However, using our whole sample, we struggle to find a significant relationship between firm dynamism and productivity growth. We show that Germany has an exceptionally high number of firms that neither grew nor declined. The share of static firms in Germany is nearly twice the average of other European countries in our sample and much higher than in the US. We observe this high share of static firms in Germany across all sectors (including IT) and even among relatively small firms. Germany also has a low rate of firm exit and birth relative to other countries in the sample. All of these factors would suggest that Germany should exhibit low productivity growth, which is clearly not the case.

When we remove Germany from the analysis, we find a relationship between productivity and firm dynamism that is largely consistent with that of Bravo-Biosca (2016). We examine a number of potential explanations for what we call the German anomaly, but ultimately at this stage are unable to present an explanation. Overall, the results suggest that that there is something unique about the way innovation is transmitted throughout the German economy. Innovation in Germany takes place largely within very stable firms and firm entry and exit plays only a minor role.

Aside from the work by Bravo-Biosca (2011, 2016), this paper builds on a number of papers that focused on the relationship between entry, exit, net job creation and aggregate productivity. For example, Foster, Haltiwanger, and Krizan (2001) find that the entry and exit of plants account for 25 percent of U.S. manufacturing productivity growth. Brandt et al. (2012), using the same

methodology, find that entry and exit account for 72 percent of Chinese manufacturing productivity growth. Using data from Chile and Korea, Asturias et al. (2017) also find that a large fraction of aggregate productivity growth is due to firm entry and exit. Haltiwanger, Jarmin and Miranda (2013) and Haltiwanger et al. (2016) and Decker et al. (2014) document the disproportionate role of new businesses (i.e. start-ups) in creating new jobs and increasing aggregate productivity. Bartelsman, Haltiwanger and Scarpetta (2004) suggest that business dynamism is a signal of higher competitive pressures, which force firms to improve their performance and raise incumbent productivity growth.

Another strand of the literature analyzes what shapes business dynamism and efficient factor reallocation. The literature so far suggests that these factors likely differ across countries. In fact, institutions, the functioning of markets, competition and selection mechanisms, which are actually supposed to ensure productivity-enhancing reallocation of valuable but scarce resources based on performance differentials, are likely to differ across countries. Restuccia (2018) provide evidence that policies and institutions responsible for differences in the selection of operating producers and technologies and generating misallocation are prevalent in poor and developing countries, contributing substantially to aggregate productivity differences across countries. Bartelsman, Haltiwanger and Scarpetta (2013) show how differences in distortions across countries can shape the selection of firms in the market, the degree of churn (i.e. business dynamism), and the allocation of resources among firms. McGowan, Andrews and Millot (2017) analyze how different policies in OECD countries can create 'zombie' firms—poor performing and unprofitable firms that do not decline or exit the market, hold valuable resources (i.e., capital and labor). As to the degree to which resource are scarce, this hampers the growth of more productive firms, which ultimately results in lower aggregate productivity growth and job creation. Haltiwanger, Scarpetta and Schweiger (2014) document large differences in labor market institutions across countries and a strong and robust evidence that stringent hiring and firing regulations tend to reduce the pace of job reallocation. Similarly, Bartelsman, Gautier and De Wind (2016) argue that labor market frictions that hamper the reallocation of labor across firms generate a static factor misallocation, reduce the incentives to invest in new and risky technologies and worsen the productivity distribution contributing to large aggregate productivity losses.

The remainder of the paper is organized as follows. Section II presents the data and section III the main results. Section IV estimates the relationship between firm dynamism and productivity growth for our sample of countries. Section V examines robustness and section VI concludes the paper.

II. Data

In order to obtain firm level data, we combine the 2017 vintage of Amadeus and the most recent (2019) vintage to maximize coverage. Our sample consists of firms in 8 European countries: Belgium, Germany, Spain, France, Italy, the Netherlands, Portugal and Sweden. There are a

number of concerns with using Amadeus data to study firm dynamism: One, Amadeus suffers from survivorship bias: Any firm that does not report its financials for five consecutive years is removed from the panel. Hence, we are unable to examine longer time series and use Eurostat data to analyze firm entry and exit. Second, we are concerned with coverage. Ideally, we would need either a representative sample of all firms in a country or the universe of all firms.

Ultimately, we decided to limit our focus to firms with 10 employees or more. While micro firms may be an important source of dynamism, practical issues make their study difficult. First, our coverage of micro-firms is comparatively poor relative to our coverage of firms with 10 or more employees. Moreover, among a sample of European countries, Bravo-Biosca (2016) finds that firms with less than 10 employees make up less than 20% of employment while accounting for 80% of active firms. Including micro-firms results in the distribution of growth rates results in extreme outcomes: Most firms of only a few employees neither hire nor fire over a four-year window and those that do start from such a low base that their growth rates dwarf those of larger firms. The resulting bifurcated distribution does not lend itself to meaningful cross-country analysis, as the share of micro-firms would drive most of the variation in the distribution of growth rates.

Hence, it is important to assess the coverage of Amadeus data for the eight countries we examine. In order to do this, we compare the number of active firms with 10 or more employees in a given year of a given sector to that of Eurostat, which covers all active firms in a given year. We match sectors in Amadeus to the equivalent sectors in Eurostat for the manufacturing, information and communication, and construction sectors.

[Table 1 about here]

Table 1 displays the results of this exercise. Coverage appears to be best over the years 2013 to 2016, particularly for Germany, which has relatively poor coverage before 2013. Hence, we limit our analysis to 2013 to 2016. While France has decidedly worse coverage than other countries in our sample, we include it in order to have another large European country for comparisons with Germany. Amadeus has poor coverage of variables such as the wage bill and more generally of firms with under 10 employees (Kameli-Ozcan et al. 2015). As we are interested in the employment growth of firms with 10 or more employees, this does not pose a problem for our purposes. One important caveat remains, however: We cannot distinguish growth attributable to mergers and acquisitions from “organic” growth. Similarly, we cannot identify firm spin-offs.

[Table 2 about here]

Table 2 provides descriptive statistics with respect to firm size by country for the last year in the sample. The distribution of firm size within the 25th to 75th percentiles is similar across countries. Differences in mean values across countries appear to be mostly driven by the number and size of very large firms in each country. The median firm in our sample has approximately 20 employees.

III. Empirical Analysis

III.1. Measuring Firm Growth

Bravo-Biosca estimates firm growth rates using the following equation: $[(\frac{empl_{j,t}}{empl_{j,t-3}})^{1/3} - 1]*100$

This definition however requires the firm to exist with 10 or more employees from the start to the end of the window, potentially resulting in survivorship bias. As Amadeus has firm-year observations across the panel, we are able to take the following more flexible approach to measuring firm growth: $[(\frac{empl_{j,t}}{empl_{j,t-k}})^{1/k} - 1]*100$ where *k* is the number of years before *t* in which the firm was observed over the window and *t* is the last year in which firm *j* is observed in the window. We require that the firm have 10 or more employees at the *start* of the growth estimation window, but not at the end of the window. This means that firms that shrink to a size under ten employees by the end of the window remain in the sample.

III.2. The Distribution of Firm Growth

We start with Figure 1, which is taken directly from Bravo-Biosca (2016). The first two graphs present the same information for his sample of European and American firms over a growth window of 2002 to 2005. The second graph simply subtracts the share of firms in each growth interval in Europe from the share of firms in the corresponding growth intervals in the US. The takeaway is that Europe has a lower share of rapidly shrinking and growing firms than the US and a higher share of statics firms that neither grow nor shrink.

[Figure 1 about here]

Building on Figure 1 we first present some descriptive statistics on firm growth rates in our sample of countries in Table 3. The growth rates were calculated as discussed in the previous section over the 2013 to 2016 period. We find that the median firm did not grow at all and there is a long right tail. From below they are truncated at -100%. In Figure 2 we present a Bravo-Biosca (2016) type chart for the distribution of firm growth rates for all firm-country observations. Largely, the picture

looks similar: The mass of firms is concentrated in the middle of the growth distribution, as in Bravo-Biosca (2011, 2016). Also, the distribution of growth rates is roughly similar. One small difference between our sample and that of Bravo-Biosca is that we have a higher share of firms who essentially did not grow (those with annualized growth rates of -1% to 1%) and a lower share of firms who grew or shrunk 5 to 10%, i.e. grew or shrank relatively small amount.

[Figure 2 about here]

Figure 3 presents a breakdown of the distribution by country. All countries tend to have a higher mass of firms in the middle with relatively large tails. The clear standout is Germany, with an exceptionally high share of firms that neither grew nor shrank, i.e. those with growth rates between -1 to 1% over the four-year window. In order to visualize the differences across countries, we present the relative difference between Figure 2 and Figure 3.

[Figure 3 about here]

Figure 4 shows the results of this difference. It highlights interesting differences across European countries. A number of observations stand out: One, France and Italy show a much higher share of rapidly shrinking firms than the European average, but do not exhibit fast growing firms. For Italy, this seems to reflect conventional wisdom that the Italian economy has structural problems and very low productivity growth. In France, there is a relatively high share of moderately shrinking firms, but few rapidly shrinking firms. Second, the patterns are opposite in Spain and Portugal: a higher than average share of fast growing firms and less shrinking firms. Third, the distribution of growth rates of firms in the Netherlands and in Sweden closely matches the European average. And Fourth and perhaps most strikingly, Germany's share of static firms is dramatically higher than in all other European countries. In the following, we largely focus on examining this "German anomaly" in more detail.

[Figure 4 about here]

III.3. The Distribution of Firm Growth by Sector and Size

Germany has a comparatively large manufacturing sector consisting of many small to medium sized firms ("hidden champions"). It is possible that there is a specific sector or a certain firm

size that is prone to a high share of static firms regardless of the country. Perhaps this category of firms is more represented in Germany, explaining the anomaly. In order to examine this hypothesis, we break down the distribution of firm growth by firm size and by sector. Figure 5 presents the distribution of firm size-by-size category for the entire sample *excluding* Germany. Here, one observes that the distribution of firm growth varies little by firm size.

[Figures 5 and 6 about here]

Figure 6 presents the same break down as Figure 5 for Germany. Comparing the two figures, one observes that differences in the distribution of firm size cannot explain the high share of static firms in Germany. Depending on the size class used for comparison, the share of static firms in Germany is 43.7% to 130% larger than the share of static firm in the rest of the sample. No other individual size class in a given country in our sample comes within 5 percentage points as high of a share of static firms in the same respective size class as Germany.[2]

Figure 7 presents the distribution of firm growth broken down by sector for the whole sample excluding Germany. Comparing the different sectors, one observes that the ICT sector tends to be have a comparatively larger share of high growth firms (those with annualized growth rates greater than 20%). Still, a sizeable share of high growth firms and rapidly declining firms exist in every sector and size class, suggesting that creative destruction and competitive shakeouts are not limited to the ICT sector. This is consistent with Schumpeterian creative destruction.

[Figures 7 and 8 about here]

One also observes that the construction sector has a comparatively larger share of rapidly declining firms (those with annualized growth rates less than -20%). Looking to the country breakdown in the Appendix, this appears to be driven by southern European countries such as Spain and Italy, perhaps related to the European debt crisis.

Furthermore, there appears to be a degree of persistence in business dynamism across sectors within countries. Those countries that are more dynamic in one sector also appear to be more likely to be exhibit more dynamism in another sector, and vice versa. This may suggest that institutional frameworks allowing for more dynamism are not sector specific.

Figure 8 presents the distribution of firm growth broken down by sector for Germany. Comparing Figure 8 to Figure 7, the immediate takeaway is that the large share of static firms in Germany

[2] See Appendix A1

cannot be explained by the sectoral makeup of the German economy. In each of the four broad sectors presented, Germany has a share of static firms that is greater than 10 percentage points larger than the same sector in the rest of the sample.

III.4. Growth tails and Churn

While Germany may have a large share of static firms over the 2013 to 2016 window this does not rule out the possibility that the distribution of firm growth in Germany is more dynamic in the tail of the distribution. It is still possible that there exits a comparatively large share of very rapidly growing and declining firms in Germany. Figure 9 emphasizes that the share of high growth and rapidly declining firms in Germany is generally low compared to other countries in the sample. Figure 9 also suggests that countries with a lower share of fast declining firms also tend to have a lower share of high growth firms. As per Bravo-Biosca (2011), we examine this relationship more closely and test whether those sectors that have a high share of high growth firms also tend to be those with a high share of rapidly shrinking firms.

[Figure 9 and 10 about here]

In Figure 10, each observation corresponds to a sector-country pair in a given year. A simple univariate regression indicates that a one-percentage point increase in the share of high growth firms is associated with 0.41 percentage point increase in the share of rapidly declining firms. This empirical relationship suggests that business environments that are conducive to high growth firms also tend to be those that are conducive to the decline of firms.

Over the 2013 to 2016 window, Germany had a uniquely high share of static firms and below average share of high growth and rapidly shrinking firms. Still, Germany could potentially compensate for this lack of dynamism in firm growth through entry and exit. For example, if unproductive firms quickly exit instead of shrinking over the growth window they would not show up in the distribution of firm growth despite being reflective of a more dynamic business environment.

Using Eurostat data, we measure firm births and deaths as a share of the population of active firms by sector to calculate the churn rate, averaged over the 2013-2016 window.[3] The resulting statistics are presented in Figure 11. We observe that Germany tends to have a lower churn rate relative to other countries. This indicates that low business dynamism with respect to firm growth rates in Germany is not compensated by more dynamism at the extensive margin.

[3] We use Eurostat data as opposed to Amadeus data to avoid falsely attributing firm exit and birth to the start and end of firm reporting gaps.

[Figure 11 about here]

At a glance, it appears that countries with more dynamic firm growth patterns also tend to be those with more entry and exit. This suggests that business dynamism at the extensive margin is not a substitute for dynamism at the intensive margin. To the contrary, both churn and the distribution of firm growth appears to be capturing similar underlying dynamics.

IV. Firm Dynamics and Productivity

As argued by Bravo-Biosca (2011), a more dynamic business environment may be associated with productivity growth if disruptive innovation is more likely to be driven by firm entry as opposed to incumbent innovation. Further, greater business dynamism may also reflect a more competitive environment, creating pressure for existing firms to innovate or be forced to lose market share.

As per Bravo-Biosca (2016), we test the relationship between productivity growth and business dynamism at the industry-country level over our 2013 to 2016 window using the following specification:

$$LPgrowth_{i,j} = \beta_0 share_{ij} + \beta_1 employmentgrowth_{ij} + \beta_2 distancefrontier_{ij} + \mu_i + \tau_j + \grave{o}_{ij}$$

where i is a given industry in a given country j. The independent variable of interest *share* reflects the share of static (or growing and declining) firms in a given country's industry. Standard errors are clustered at the firm and industry level following Cameron et al. (2006).

We use Eurostat data on labor productivity, specifically gross value added in Euros per hour worked, to measure average annual productivity growth. While Bravo-Biosca uses TFP in most of his specifications, he also uses gross value added per hour worked as a robustness test, allowing for a direct comparison between our results and those of Bravo-Biosca.

Consistent with Bravo-Biosca (2016), we exclude industry-country pairs from Eurostat with productivity growth greater than two standard deviations more or less than the industry or country mean. Additionally, we define distance to frontier as the $-\ln(LP_{ij} / LP^{leader(j)})$ where $LP^{leader(j)}$ is the highest LP level for industry *j* as of 2013 for the entire Eurostat sample (given that it is within 2 standard deviations from the mean for the industry or country).

Our sample consists of 8 countries with up to 15 sector observations for a total of 115 sector-country pairs. Sectors used correspond to the narrowest sectoral definition permitted by the intersection of Eurostat value added and hours worked data.

[Table 6 about here]

Table 6 Columns 1 to 3 report the results for the whole sample. For the baseline specification with country and sector fixed effects, but no controls, the point estimate for the relationship between productivity growth and share of static firms is essentially zero. In column 2 we add employment growth to capture business cycle effects and the distance to frontier to capture convergence effects. Again, we find an insignificant relationship between productivity growth and the share of statics firms. In column 3 we replace the share of statics firms with the share of growing firms and the share of shrinking firms. Still, we do not find a significant relationship with productivity growth. These findings contradict the results in Bravo-Biosca (2011, 2016) and suggest no robust relationship between productivity growth and firm dynamism.

As Germany is such an outlier with respect to business dynamism, and did not experience productivity growth lower than the rest of the sample, we redid the analysis without Germany. The results are presented in Columns 4 – 6 of Table 6. After removing the 14 German sector observations, in Column 4 we find that a 1 p.p. increase in the share of firms which neither grow nor shrink is associated with a 0.128p.p. lower annual labor productivity growth. Controlling for distance to frontier, employment growth, and the share of growing firms, in Column 6, we see that a 1pp increase in the share of *shrinking* firms is associated with a 0.239p.p. higher annual labor productivity growth. Hence, once we exclude Germany we arrive at coefficients of comparable magnitude to Bravo-Biosca (2016). The robustness of the relationship between productivity growth and firm growth dynamics is remarkable given that we use a different sample of countries and a time period over a decade later. Perhaps even more importantly, the results provide further evidence of a German anomaly: in Germany productivity growth takes place within very stable firms.

V. Robustness

V.1. Sales growth

One possible explanation for the lack of dynamism found in Germany is that growth in the number of the employees is not suitable to capture dynamism in Germany. This may be the case if German firms are more likely to adjust employment at the intensive margin (number of hours worked) as opposed to the extensive margin (hiring and firing workers) in response to changes in demand. There is some evidence that this happened for example during the recent financial crisis, where in Germany employment did not change much in the face of a dramatic downturn in economic activity.

To investigate this explanation, we look to the dispersion of firm sales growth. Thus far, we have concentrated our attention to employment growth, largely for practical reasons: The coverage of sales in Amadeus is decidedly worse than of employment (Table 7). Moreover, coverage of sales data for German firms in our sample *declines* over the sample period, representing a potential source of survivorship bias. Sales data for the Netherlands is not available for a sufficient number of firms and we dropped the Netherlands from this exercise.

[Table 7 about here]

Table 8 provides summary statics on the growth rate of firms by sales. Unlike with respect to employment growth, the sales growth of the median firm varies by country: from 1.2% in France to 5.1% in Spain. This makes it less obvious which firms in the distribution of sales growth should be considered "static." Still, one would expect a more dynamic business environment to be characterized by firms with a higher share of firms with annualized sales growth below -20% and above 20%. A less dynamic distribution should have a higher share of firms around the countries median, ranging from 1 to 5%.

[Table 8 about here]

Using the same bracket widths as for employment growth, we calculate the gap in the share of each growth bracket relative to the sample average, presented in Figure 13. We observe that countries with more dynamic growth distributions with respect to employment also tend to have more dynamic growth distributions with respect to sales. In both sales growth and employment growth, we observe that German firms are more concentrated in the center of the growth distribution. This suggests that business dynamism is lower both in sales and employment in Germany. Our finding of the Germany anomaly is not just an artifact of employment adjustment at the intrinsic margin in Germany.

V.II. Rounding problems in German data

One major concern with the analysis is that perhaps the German anomaly is just the outcome of some data issues specific to the German data. We examined the employment and sales data more closely and indeed find evidence that this may be part of the story. In our sample, a surprisingly high share of firms have *exactly* zero growth, meaning that the firm did not increase or decrease in size by one single employee. While it is plausible that a significant share of small firms would stay the exact same size over a four year window, this should be very unusual among larger firms.

Table 10 shows the share of firms with exactly zero growth as a share of static firms, i.e. those with per annum growth rates within -1% and 1%. The first column limits the sample to firms with less than 50 employees and the second limits it to firms with 50 or more employees. We observe that of large firms, anywhere from 82% to 92% of static firms did not change at all with respect to employment over the window.

This raises concerns with respect to data quality: A high share of static firms may simply reflect firms whose employment data is not updated regularly in the Amadeus database. Depending on firm size, some 92 to 98% of German firms classified in our sample as static did not change in employment at all.

In general, we find that there is an improbable amount of clustering at "rounder" numbers of employees. For example, there are nearly as many firm-year observations with 60 employees as the sum of employees across firms with 56 to 59 employees. We do not observe this pattern for other countries, but exclusively for Germany.

The hypothesis that data quality issues could be particularly pronounced among German firms in the sample is supported by sales data (see Table 11). 46% of German firms with annualized sales growth in between -1% and 1% had exactly zero growth in sales. This means that, if the data is to be believed, approximately 8.3% of all German firms with sales data had the exact same volume of sales (in Euros) at the start and end of the four year growth window.

This problem is difficult to address. One attempt is to limit the sample limited to firms with 50+ employees; excluding firms with exactly zero growth over the 4-year window. Figure 15 shows the share of firms in each growth brackets relative to sample averages as before. This analysis, while highly suggestive would suggest that Germany is still less dynamic than the sample average, but the differences are not as dramatic as the earlier results suggested. Belgian firms indeed by this measure appear to be the 'least dynamic' based on these data.

Future drafts will use different data sources to observe whether the pronounced lack of dynamic growth in Germany is robust. Encouragingly, we find that Germany still appears to have a low share of high growth and fast shrinking firms (see Figure 9). Moreover, using Eurostat data, we also find that Germany has a churn rate below the sample average (see Figure 11).

VI. Conclusions

[to be completed]

Figures

Figure 1 Share of firms by growth rate – Europe and the United States (Bravo-Biosca, 2016)

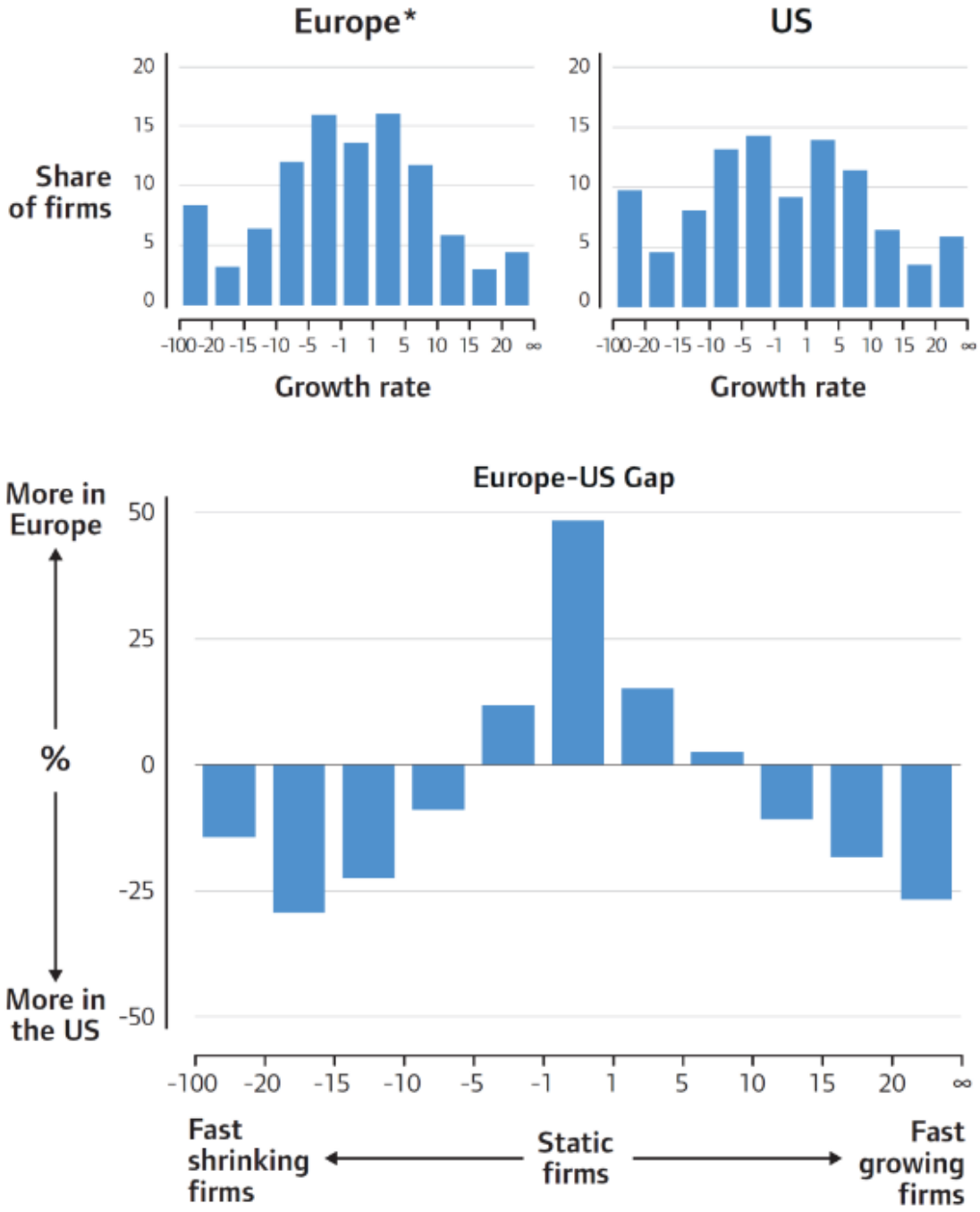


Figure 2 Mean share of firms by growth bracket

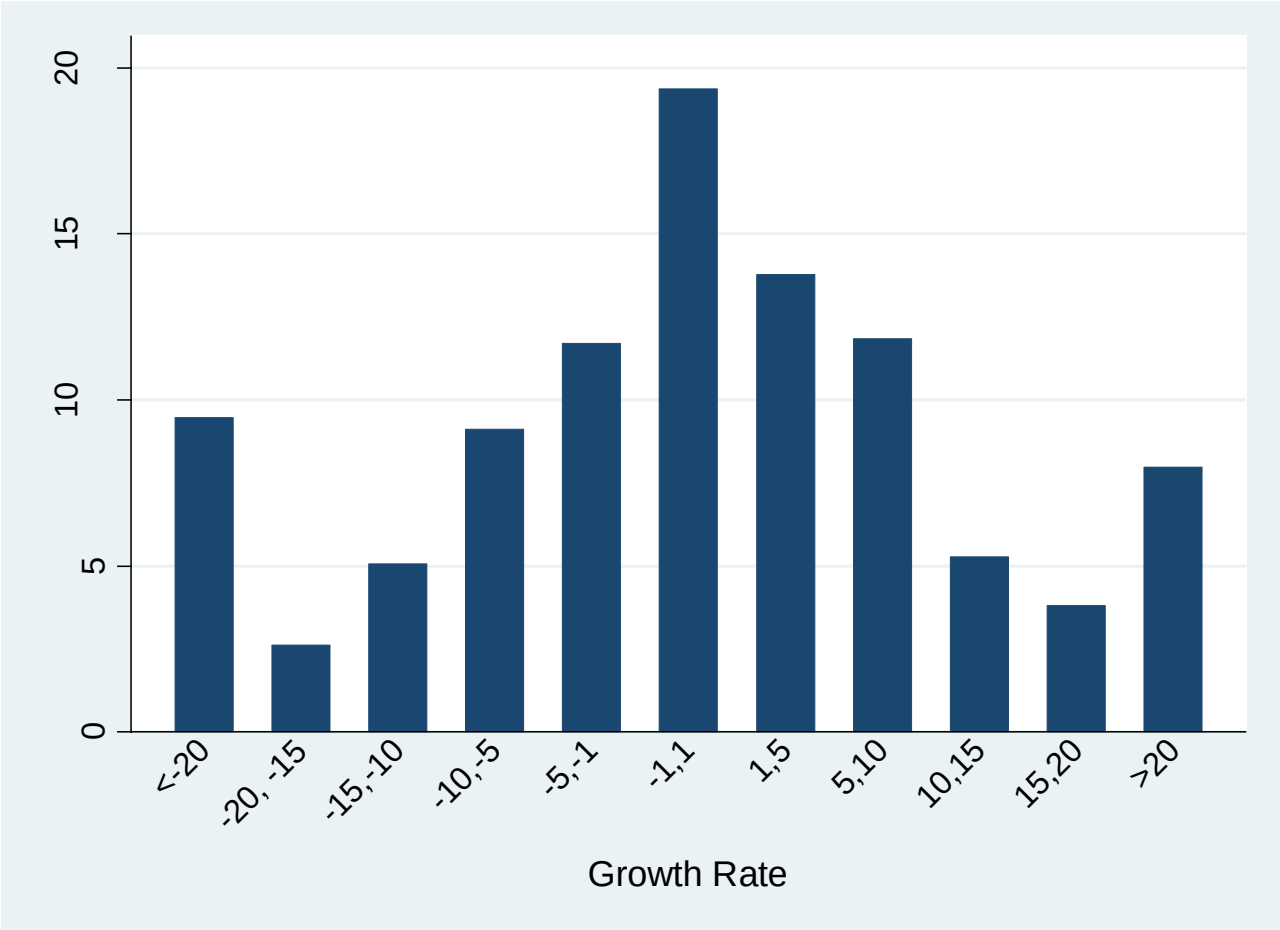


Figure 3 Cross-Country Share of Firms by Growth Rate

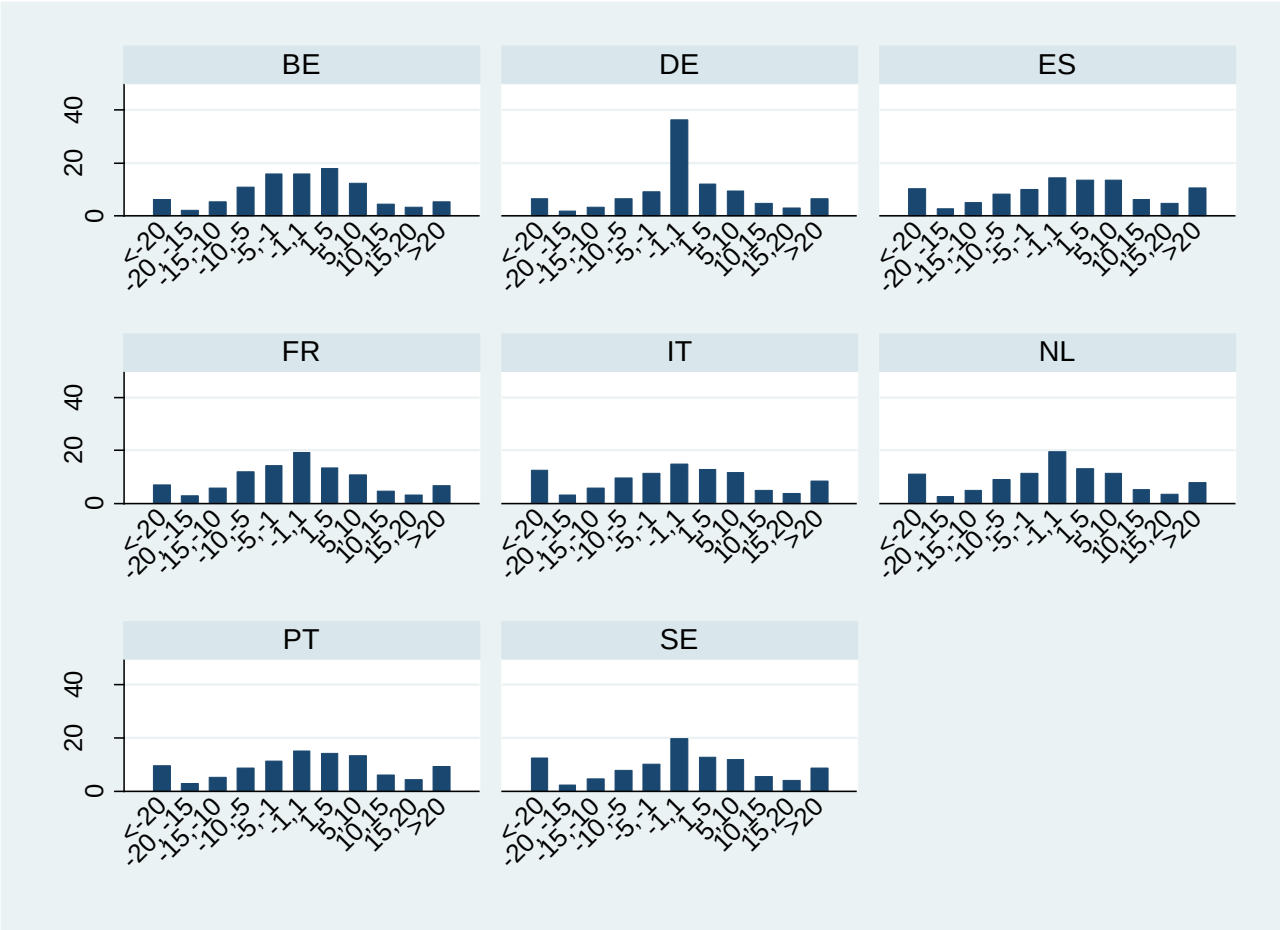
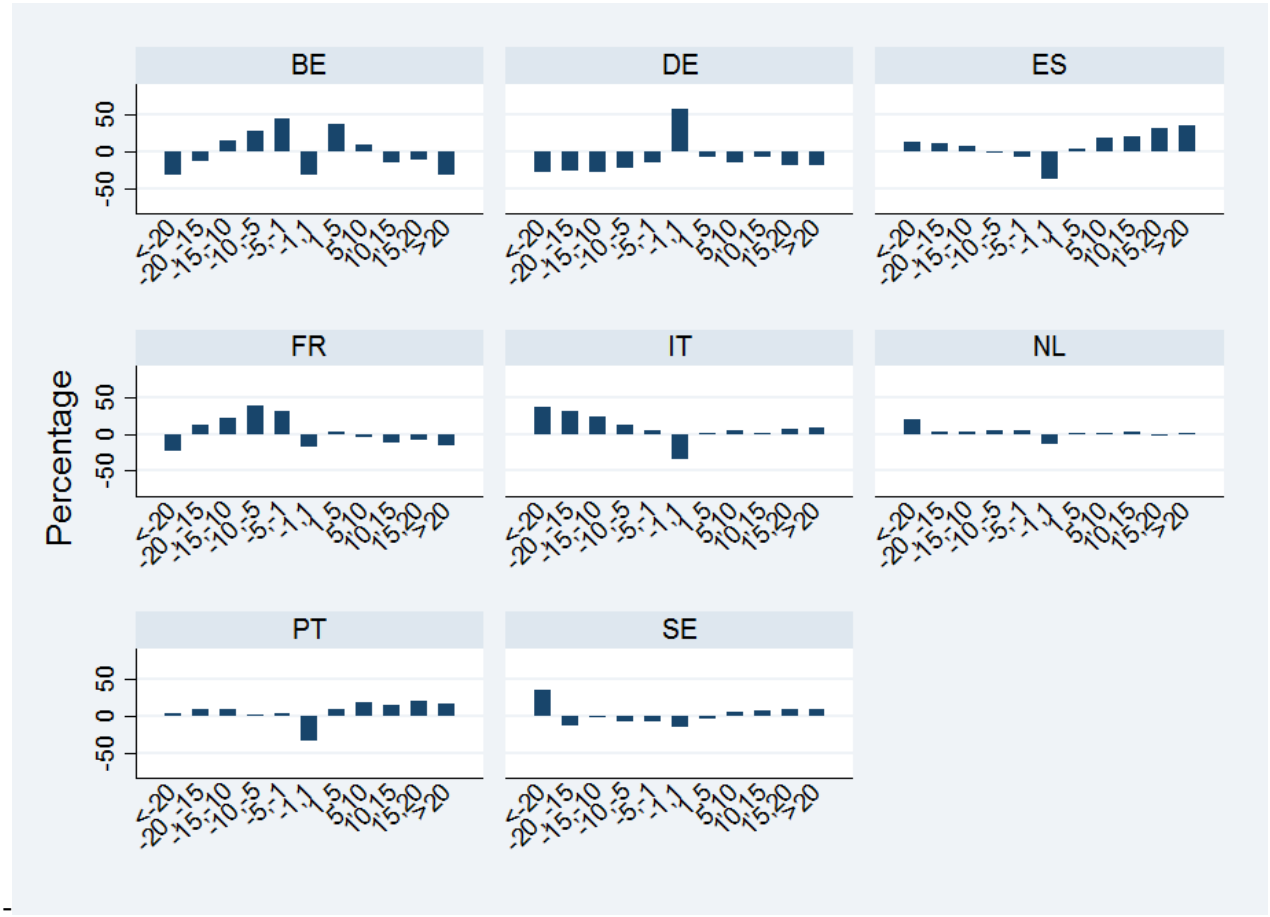
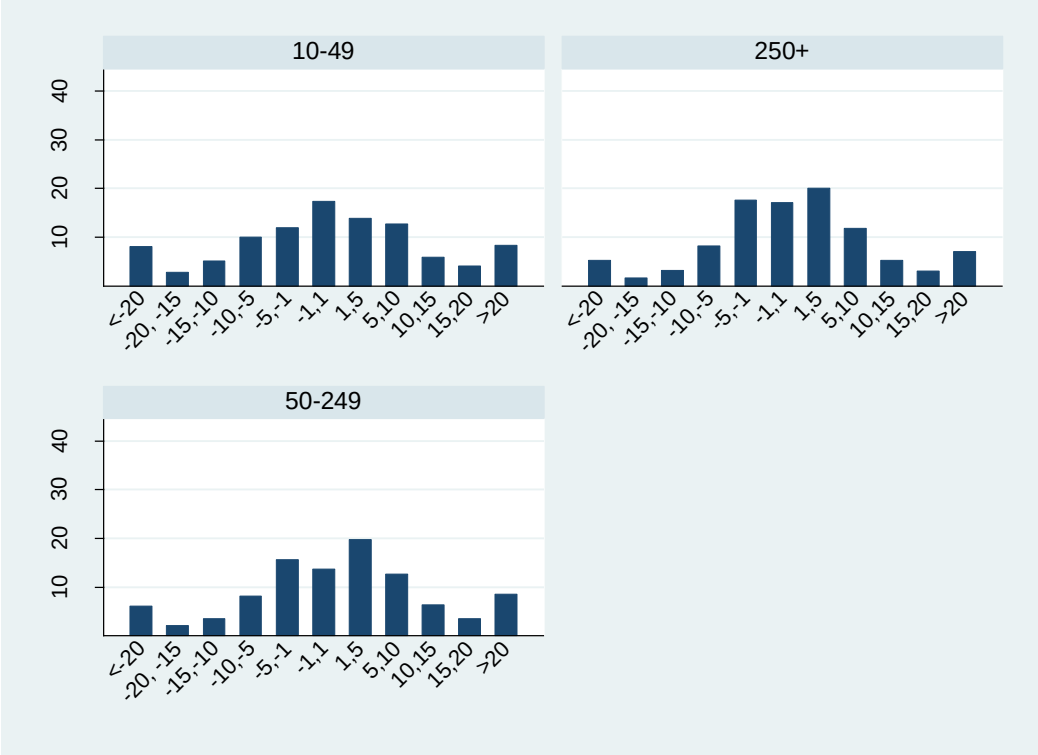


Figure 1 Firm Employment Growth: Relative Gap to Mean by Growth Bracket Share



- **Figure 5 Distribution of Firm Growth by Size Class - Excluding Germany**



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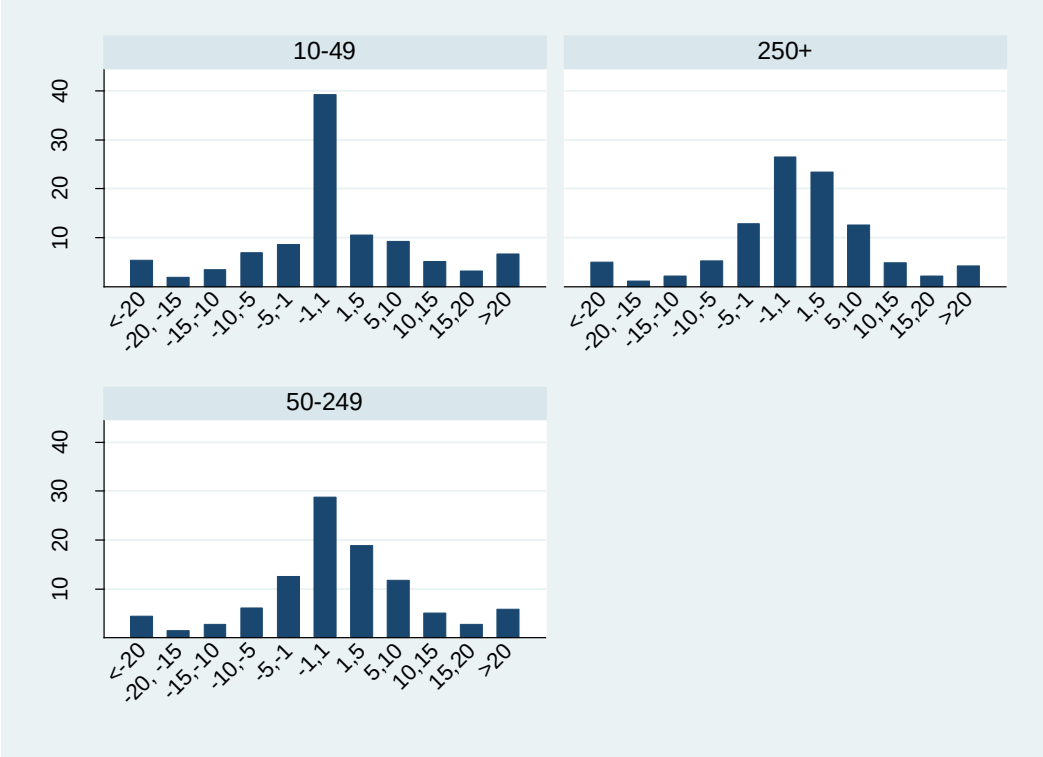
- **Figure 6 Distribution of Firm Growth by Size Class - Germany**



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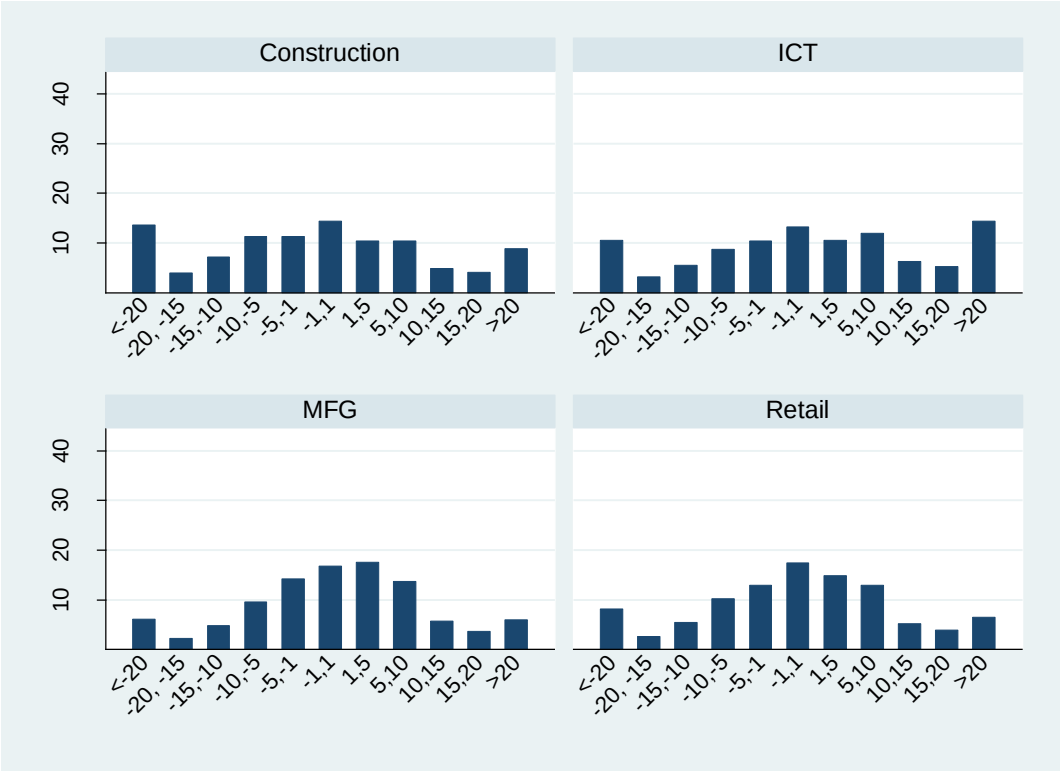
- **Figure 7 Distribution of Firm Growth by Sector - Germany Excluded**



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- **Figure 8 Distribution of Firm Growth by Sector - Germany**

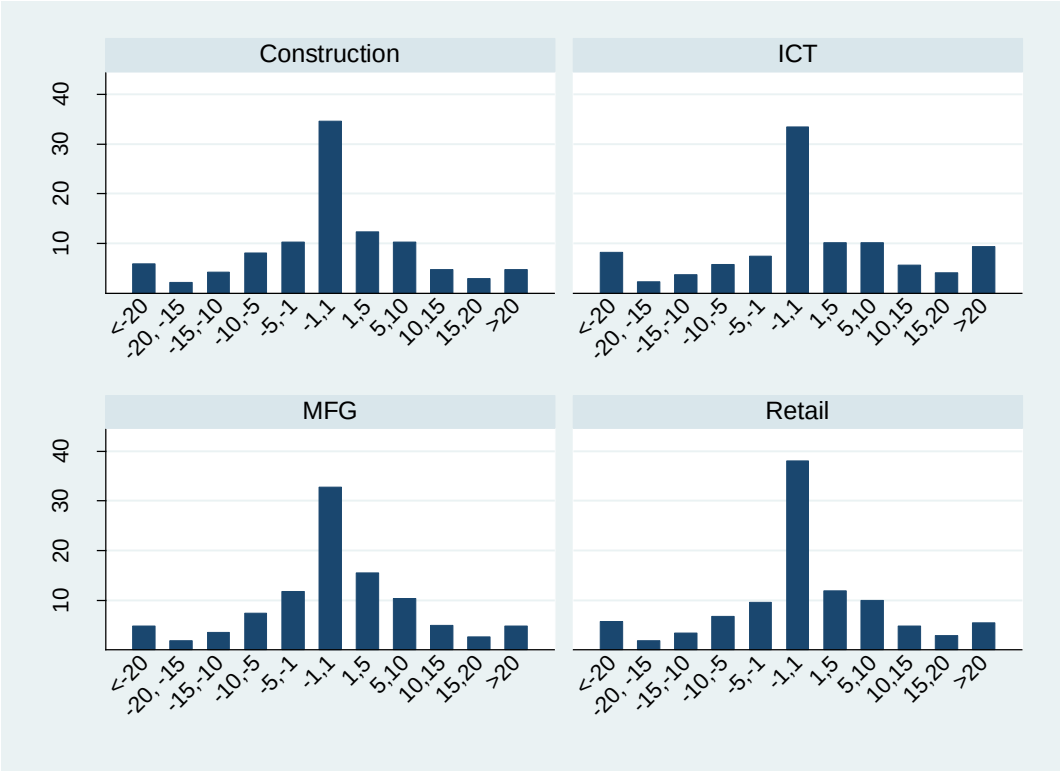

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Figure 9 Share of High Growth and Fast Shrinking Firms by Country

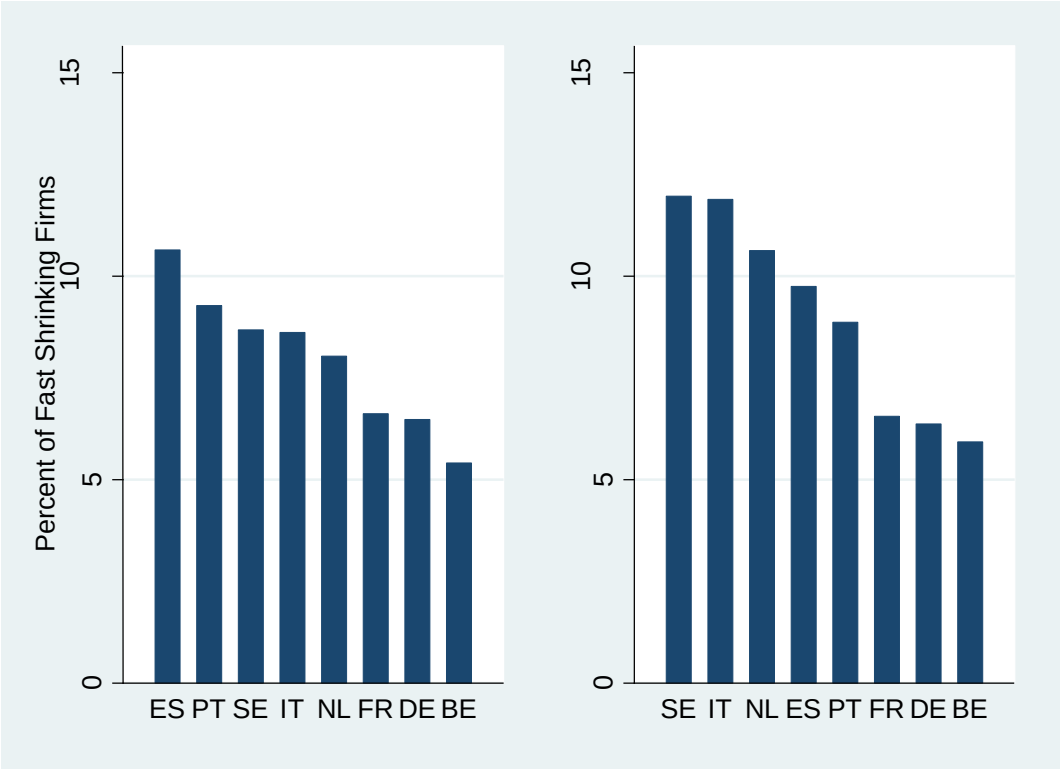

Figure 10 Share of Fast Shrinking Firms vs. Share of Fast Growth Firms: Scatterplot

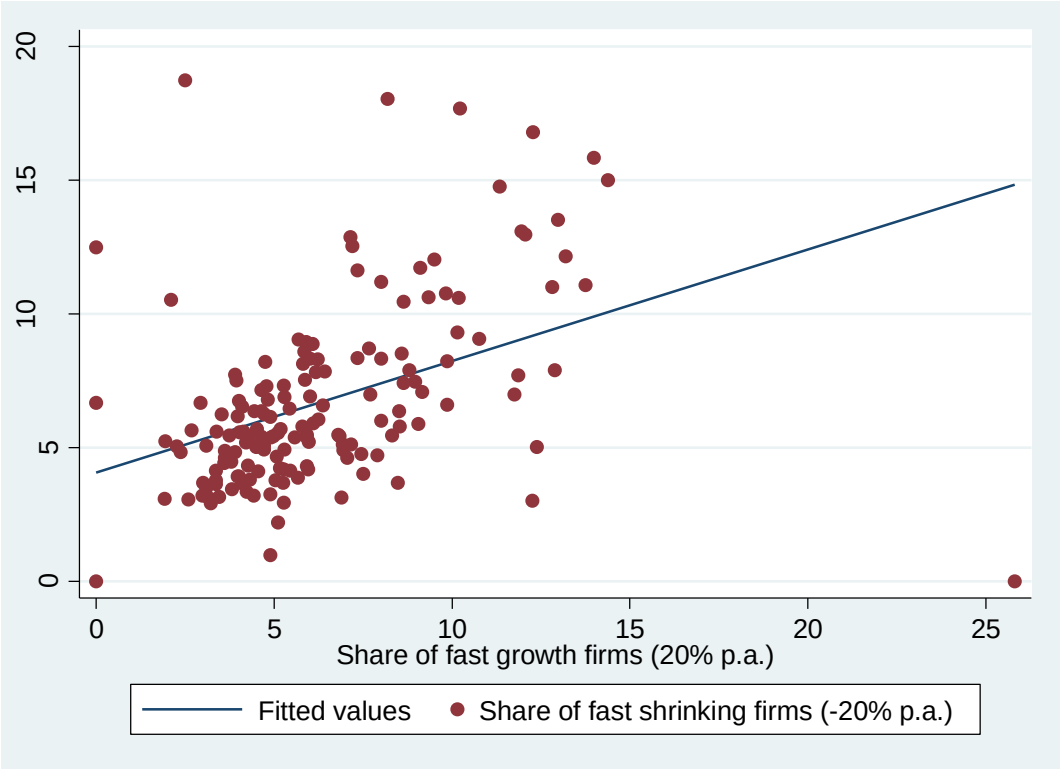

Figure 11 Churn, Birth and Death Rates by Country and Sector

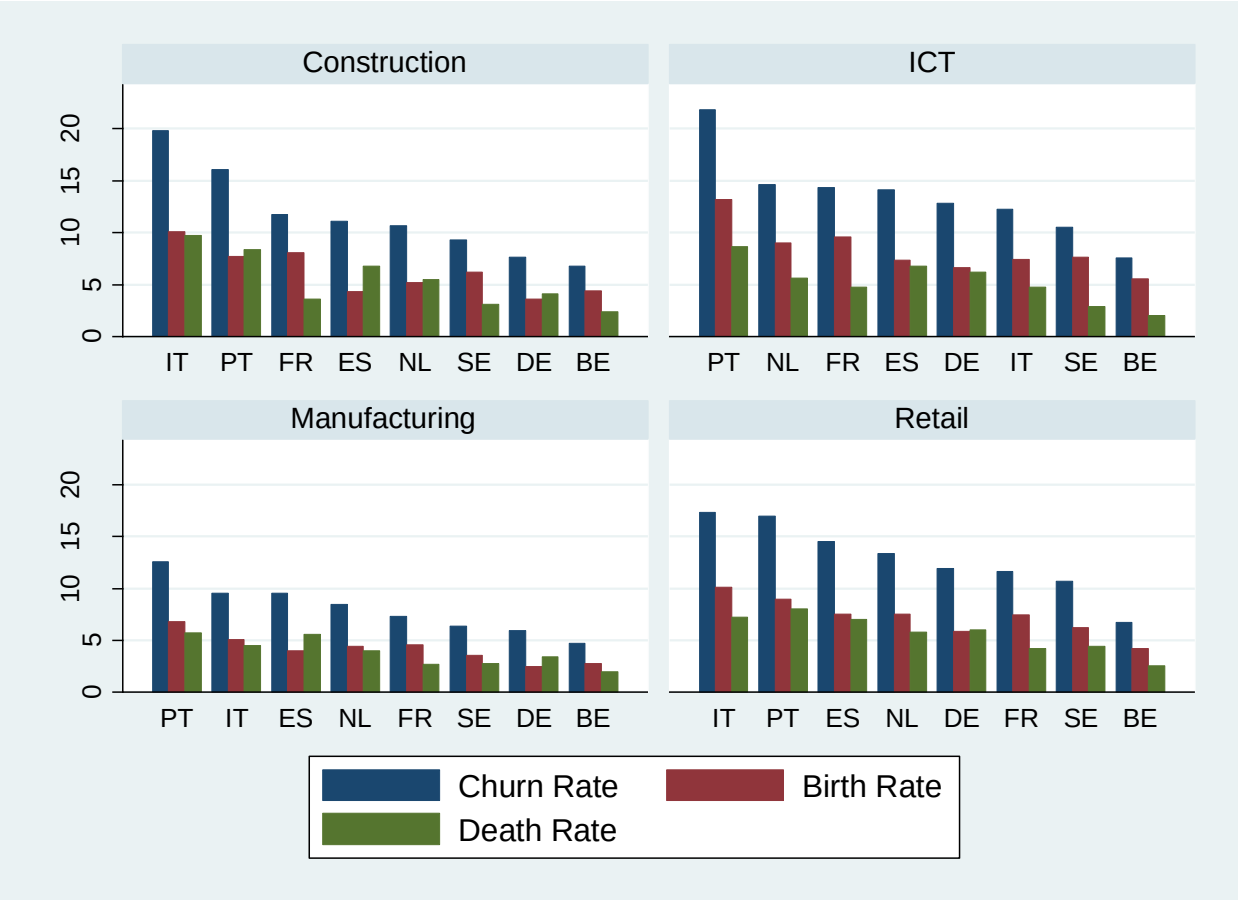

Figure 12 Growth in Sales – Sample Average Share by Growth Bracket

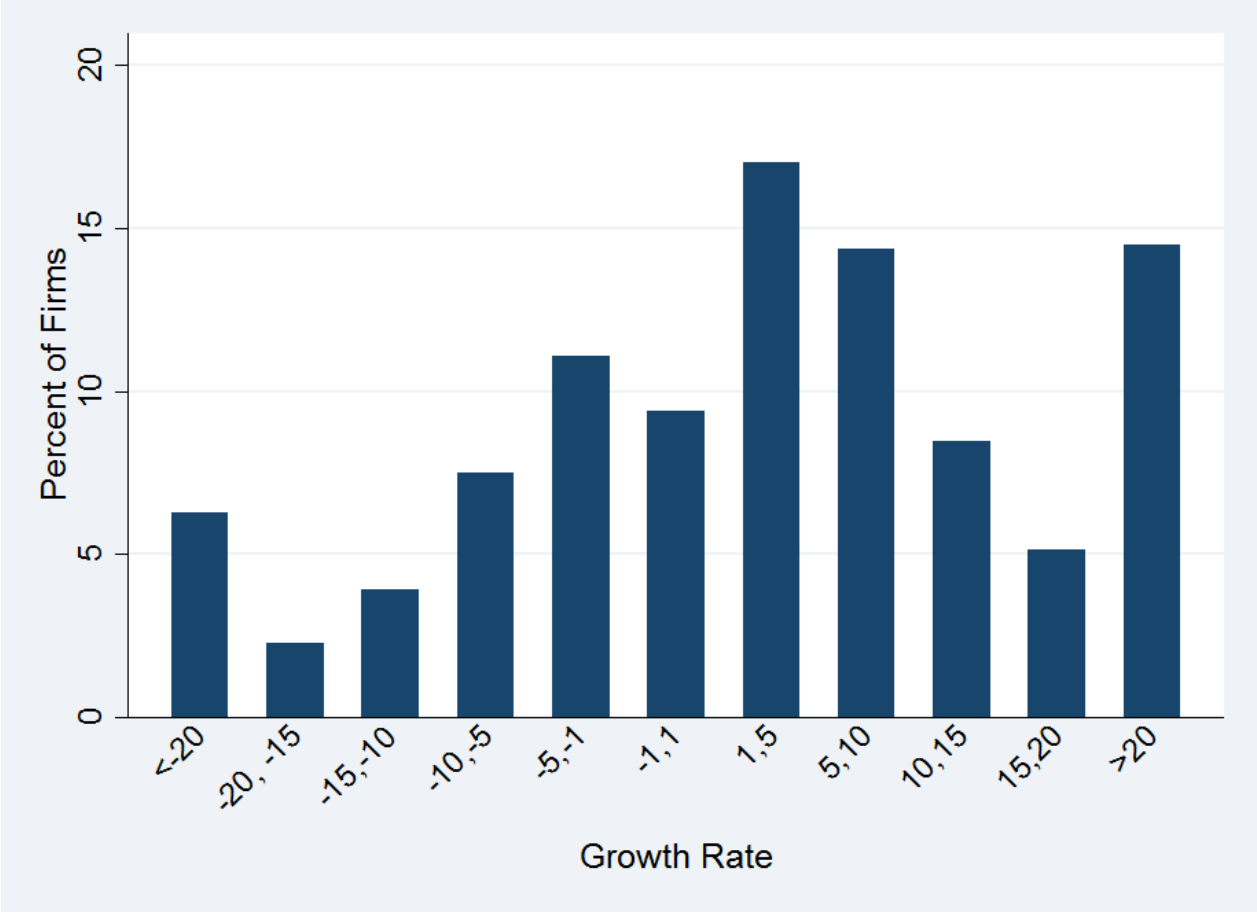

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Figure 13 Firm Sales Growth: Relative Gap to Mean by Growth Bracket Share

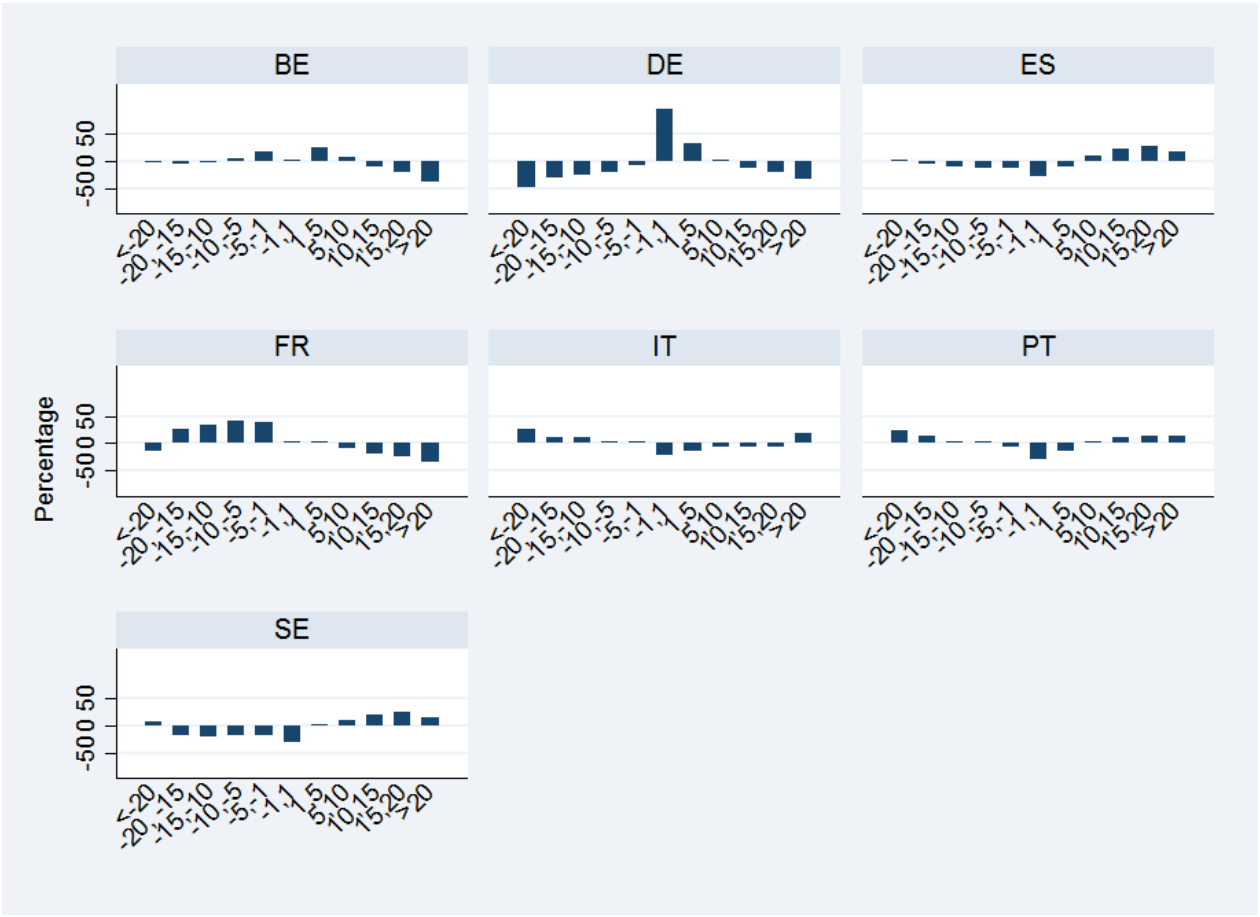

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Figure 14 Firm Sales Growth: Relative Gap to Mean by Growth Bracket Share

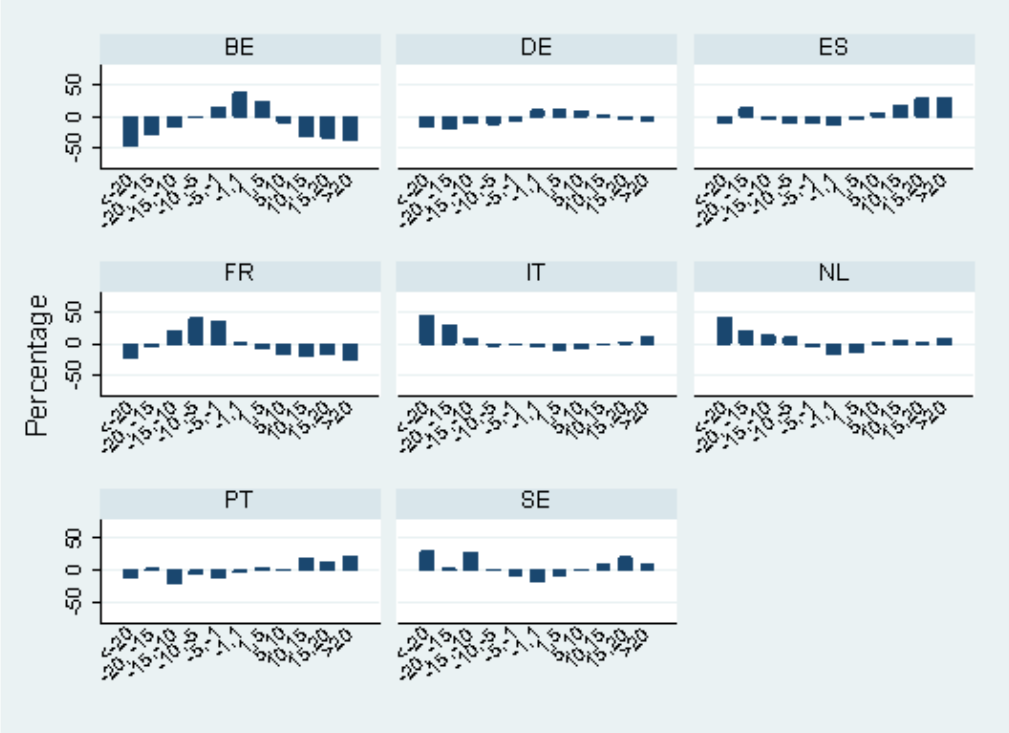
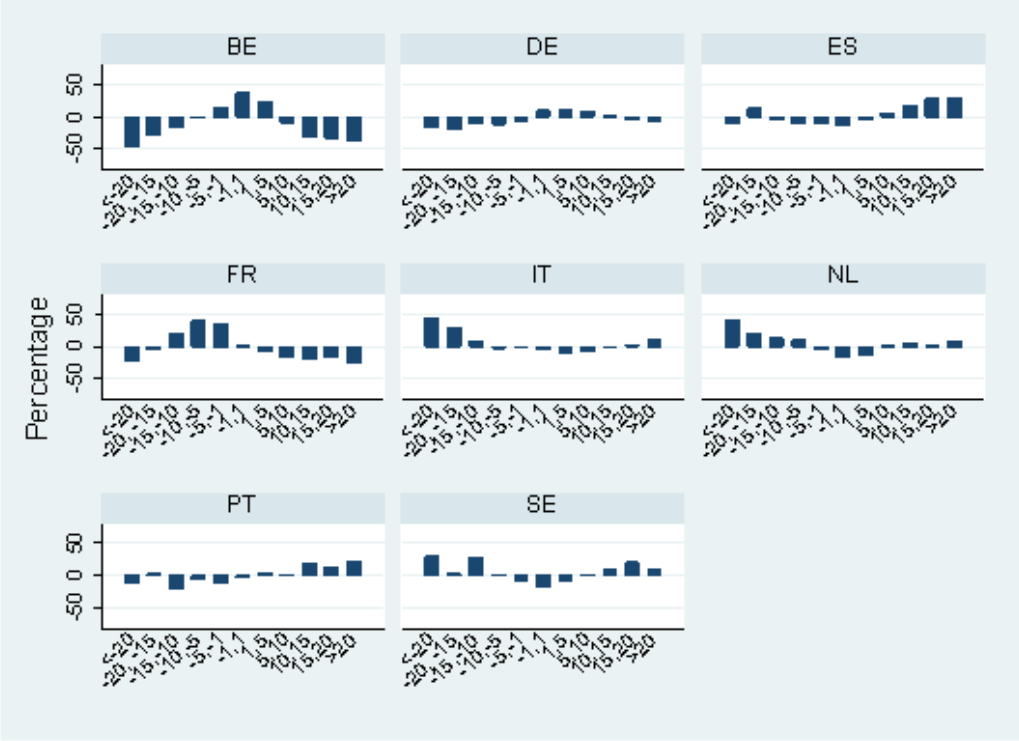


Figure 15 Gap in Growth Distribution: Firms with 50+ Employees and non-zero growth



Tables

Table 1: Percentage of Active Firms in Amadeus as a Share of Eurostat

For the Sectors Manufacturing, Information and Communication, and Construction

Country	2012	2013	2014	2015	2016
BE	89%	90%	91%	91%	91%
DE	38%	84%	79%	77%	80%
ES	81%	81%	82%	84%	82%
IT	83%	87%	91%	96%	95%
FR	31%	41%	47%	45%	44%
NL	94%	90%	91%	88%	76%
PT	91%	93%	94%	94%	94%
SE	83%	84%	86%	88%	89%

Table 2: Firm Size in Employment (2016)

	Mean	SD	Min	p1	p25	p50	p75	p99	Max	n
BE	101.53	3638.2	0	4	12	19	37	630	395530	35287
DE	93.16	1491.0	1	1	13	20	45	934	350000	292531
ES	51.03	457.8	1	2	11	16	31	524	74228	128162
FR	94.43	1131.1	1	6	14	23	49	1039	212077	85533
IT	44.14	423.4	1	2	11	16	30	423	139433	180594
NL	113.36	1290.3	1	1	12	20	43	1305	136574	67792
PT	42.94	265.5	1	2	11	16	29	417	23815	45399
SE	72.09	445.3	0	0	11	16	34	1121	20492	45610

Table 4: Annualized Country-Sector Labor Productivity Growth p.p. (2013-2016)

	Mean	SD	Min	p25	p50	p75	Max	n
BE	2.27	1.7	0.3	0.8	2.0	3.2	6.0	15
DE	3.20	2.2	-1.3	1.7	3.0	5.4	6.0	14
ES	0.73	2.1	-4.8	-0.5	1.5	1.8	3.9	15
FR	1.34	1.0	-0.3	0.6	1.2	1.9	3.8	15
IT	0.36	5.1	-16.4	0.2	1.3	1.8	7.4	15
NL	3.18	3.4	-1.7	0.8	2.1	4.7	10.0	14
PT	1.36	3.9	-1.8	-1.3	0.9	2.1	10.5	15
SE	0.67	3.5	-5.9	-0.6	1.1	2.3	6.0	12

Table 3: Annualized Employment Growth Rate (2013-2016)

	Mean	SD	Min	p1	p25	p50	p75	p99	Max	n
BE	0.43	21.3	-100.0	-59.0	-4.9	0.0	5.3	58.7	920.7	35287
DE	1.45	64.3	-100.0	-74.2	-2.1	0.0	4.6	73.1	21065.6	292531
ES	2.45	38.2	-99.9	-71.4	-5.9	0.0	9.1	95.2	5950.0	128160
FR	1.12	58.6	-100.0	-68.5	-5.8	0.0	5.3	68.3	11069.2	85535
IT	0.14	91.0	-100.0	-78.7	-7.8	0.0	6.7	92.0	32023.1	180594
NL	0.43	69.7	-100.0	-87.6	-6.1	0.0	6.3	87.3	9833.3	67792
PT	2.39	44.7	-98.6	-68.4	-5.4	0.0	8.2	100.0	6613.3	45399
SE	-1.29	52.9	-100.0	-100.0	-6.1	0.0	7.1	85.7	8953.3	45610

Table 5: Annualized Country-Sector Employment Growth p.p. in Hours Worked (2013-2016)

	Mean	SD	Min	p25	p50	p75	Max	n
BE	-0.04	2.9	-7.3	-2.1	0.1	2.2	5.3	15
DE	0.68	2.2	-5.6	0.4	1.0	1.6	3.0	14
ES	2.13	2.4	-3.1	1.4	2.6	3.9	4.9	15
FR	-0.12	1.6	-3.6	-1.4	0.2	0.9	2.9	15
IT	0.39	1.7	-3.1	-0.7	-0.0	1.6	3.5	15
NL	1.10	2.0	-1.8	-0.2	0.5	2.8	5.7	14
PT	2.55	2.4	-2.4	0.9	2.9	4.7	5.6	15
SE	1.32	2.5	-3.0	-0.7	1.6	3.2	5.0	12

Table 6: Firm Growth Dynamics and Labor Productivity Growth

Each observation corresponds to an industry-country pair, with 8 countries and up to 15 sectors. Columns 1 to 3 include Germany whereas Colums 4 to 6 include Germany. All columns are estimated wtih OLS, witl standard errors in parentheses clustered both at country and industry level. Eurostat is used for productivity measures. Labor Productivity Growth is defined as gross value added per hour worked by persons engaged The share of static firms is the share of all firms with 10 or more employees with annual average employmen growth between -1% and 1% (>1% are growing firms, <-1% are shrinking firms). Annual employment growtl in hours worked at the industry-country pair level controls for potential business cycle effects. Distance to frontier is defined as $-\ln(\text{LP}_{ij}/\text{LP}^{leader(j)})$ at 2013, the beginning of period. All regressions include country and industry fixed effects. The table follows the specification of Table 7 from Bravo-Biosca (2016) as closely as possible.

	(1) LP Growth	(2) LP Growth	(3) LP Growth	(4) LP Growth	(5) LP Growth	(6) LP Growth
Percent Static	-0.036	-0.074		-0.128**	-0.134*	
	(0.063)	(0.069)		(0.047)	(0.057)	
Employment Growth		-0.184	-0.093		-0.185	-0.013
		(0.217)	(0.224)		(0.224)	(0.253)
Distance to Frontier		0.025	0.032		0.024	0.032
		(0.041)	(0.036)		(0.048)	(0.040)
Percent Growing			0.001			0.054
			(0.097)			(0.106)
Percent Shrinking			0.135			0.239***
			(0.077)			(0.038)
Observations	115	115	115	101	101	101
Adjusted R^2	0.300	0.331	0.345	0.268	0.291	0.323

Standard errors in parentheses clustered at the
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 7: Percentage of Active Firms with Sales Data in Amadeus as a Share of Eurostat

For the Sectors Manufacturing, Information and Communication, and Construction. Firms are limited to those with 10 or more employees.

Country	2013	2014	2015	2016
FR	39%	45%	44%	39%
BE	43%	43%	44%	42%
DE	42%	30%	28%	29%
ES	77%	79%	82%	82%
IT	87%	91%	96%	95%
NL	7%	7%	7%	6%
PT	91%	93%	93%	93%
SE	78%	81%	85%	88%

Table 8: Firm Growth in Sales (Annualized over 2013-2016)

	Mean	SD	Min	p1	p25	p50	p75	p99	Max	n
BE	7.50	155.6	-100.0	-67.6	-3.3	2.2	8.5	114.0	14933.3	15581
DE	12.99	660.4	-100.0	-40.3	-0.7	2.1	8.5	120.3	119093.5	101711
ES	102.24	26827.7	-100.0	-65.6	-2.1	5.1	14.7	188.7	9436085.0	124586
FR	32.87	4779.9	-100.0	-50.2	-4.8	1.2	8.0	119.7	1324540.9	81520
IT	595.68	133372.2	-100.0	-86.3	-4.1	3.4	13.7	636.1	48577200.0	174363
PT	57.42	7355.8	-100.0	-71.2	-3.7	4.1	14.0	266.4	1546286.9	44556
SE	15.31	274.7	-100.0	-79.0	-1.7	5.0	14.5	196.0	35966.7	39216

Table 9: Firm Size in Sales in Millions (2016)

	Mean	SD	Min	p1	p25	p50	p75	p99	Max	n
BE	44.69	391.48	0.00	0.02	3.03	8.90	21.97	560.17	29927.81	14641
DE	39.47	768.71	0.00	0.35	1.40	2.80	7.59	464.60	124100.01	88612
ES	11.31	175.08	0.00	0.07	0.73	1.57	4.10	124.15	23723.55	124253
FR	30.18	429.43	0.00	0.23	1.69	4.05	11.83	369.99	53567.19	80204
IT	12.03	216.32	0.00	0.03	0.84	1.97	5.13	132.37	48215.10	174345
PT	5.55	71.86	0.00	0.03	0.39	0.89	2.44	66.36	10866.52	44340
SE	150.78	1447.00	0.00	0.96	12.36	24.95	62.32	1914.17	118554.65	38797

Table 10: Firms with Exactly Zero Employment Growth as a Share of Static Firms

This table compares the number of firms with exactly zero growth to the number of "static" firms, i.e. those with growth $< 1\%$ and $> -1\%$ per annum over 2013 to 2016. Column 1 limits the sample to firms with less than 50 employees. Column 2 limits the samples to firm with 50 or more employees.

	Zero Growth Firms (<50 employees)	Zero Growth Firms (50+ employees)
BE	0.90	0.76
DE	0.98	0.92
ES	0.95	0.87
FR	0.94	0.82
IT	0.95	0.87
NL	0.97	0.88
PT	0.95	0.87
SE	0.96	0.91

Table 11: Firms with Exactly Zero Sales Growth as a Share of Static Firms

This table compares the number of firms with exactly zero sales growth to the number of "static" firms, i.e. those with sales growth between $< 1\%$ and $> -1\%$ per annum, over 2013 to 2016. Column 1 limits the sample to firms with less than 50 employees. Column 2 limits the samples to firm with 50 or more employees.

	Zero Growth Firms
BE	0.02
DE	0.46
ES	0.02
FR	0.01
IT	0.01
NL	0.00
PT	0.03
SE	0.02

References

Adamopoulos, T., Brandt, L., Leight, J., Restuccia, D. 2017. Misallocation, selection and productivity: A quantitative analysis with panel data from China. University of Toronto. Department of Economics, WP 593.

Arkolakis, C. 2011. A unified theory of firm selection and growth. NBER WP 17553.

Asturias, J., Hur, S., Kehoe, T. J., Ruhl, K. J. 2017. Firm entry and exit and aggregate growth. NBER WP 23202.

Baily, M. N., Hulten, C., Campbell, D., Bresnahan, T., Caves, R. E. 1992. Productivity dynamics in manufacturing plants. Brookings Papers on Economic Activity. Microeconomics, 187-267.

Bartelsman, E. J., Gautier, P. A., De Wind, J. 2016. Employment Protection, technology choice, and worker allocation. International Economic Review 57: 787-826.

Bartelsman, E. J., Haltiwanger, J., Scarpetta, S. 2013. Cross-country differences in productivity: The role of allocation efficiency and selection. American Economic Review 103: 305-334.

Brandt, L., Van Biesebroeck, J., Zhang, Y. 2012. Creative accounting or creative destruction? Firm-level productivity growth in Chinese manufacturing. Journal of Development Economics 97, 339-351.

Bravo-Biosca, A. (2011) 'A Look at Business Growth and Contraction in Europe.' Nesta Working Paper No. 11/02.

Bravo-Biosca, A. 2016. Firm growth dynamics across countries: Evidence from a new database. Nesta Working Paper 16/03.

Cameron, A., Gelbach, J. and Miller, D. (2006) 'Robust Inference With Multiway Clustering.' Jounal of Business & Economic Statistics, 29(2), 238-249.

Da-Rocha, J.-M., Tavares, M. M., Restuccia, D. 2016. Firing costs, misallocation, and aggregate productivity. NBER WP 23008.

Davis, S. J., Haltiwanger, J. C., Schuh, S. 1996. Job creation and destruction. MIT Press. Cambridge, MA.

Davis, S., Haltiwanger, J. 1996. Gross job creation, gross job destruction and employment reallocation. Quarterly Journal of Economics 107: 819-863.

Decker, R. A., Haltiwanger, J., Jarmin, R. S., Miranda, J. 2014. The role of entrepreneurship in US job creation and economic dynamism. Journal of Economic Perspectives 28: 3-24.

Decker, R. A., Haltiwanger, J., Jarmin, R. S., Miranda, J. 2018. Changing business dynamism and productivity: Shocks vs responsiveness. NBER WP 24236.

Foster, L., Haltiwanger, J., Krizan, C. J. 2001. Aggregate productivity growth: Lessons from microeconomic evidence. In: Hulten, C. R., Dean, E. R., Harper, M. J. (eds.) New developments in productivity analysis. Chicago: University of Chicago Press, 303-372.

Haltiwanger, J., Jarmin, R. S., Kulick, R., Miranda, J. 2016. High growth young firms: Contribution to job, output, and productivity growth. In: Haltiwanger, J., Hurst, E., Miranda, J., Schoar, A. (eds.). Measuring entrepreneurial businesses: Current knowledge and challenges. University of Chicago Press.

Haltiwanger, J., Jarmin, R. S., Miranda, J. 2013. Who creates jobs? Small versus large versus young. Review of Economics and Statistics 95: 347-361.

Haltiwanger, J., Scarpetta, S., Schweiger, H. 2014. Cross country differences in job reallocation: The role of industry, firm size and regulations. Labour Economics 26: 11-25.

Hopenhayn, H., Rogerson, R. 1993. Job turnover and policy evaluation: A general equilibrium analysis. Journal of Political Economy 101: 915-38.

McGowan, M.A., Andrews, D., Millot, V. (2017): The walking dead? Zombie firms and productivity performance in OECD countries. OECD WP 1372.

Restuccia, D. 2018. Misallocation and aggregate productivity across time and space. University of Toronto. Department of Economics, WP 608.

Schivardi, F., Sette, E.,Tabellini, G. (2017): Credit misallocation during the European financial crisis. Bank of Italy Working Paper No. 3/2017.

Schumpeter, J. 1942. Capitalism, socialism and democracy. Harper and Brothers. New York.