

Changing Class: Size Transition in European Firms

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Abstract

The paper tests the hypothesis that the upsizing and downsizing processes may be a broken mirror. Using a wide sample of European firms in the period 2001-2008, stemming from the combination of a survey on a large set of qualitative firm characteristics (Efige) and the Amadeus databank, we test the hypothesis that firm growth is governed by distinct determinants than shrinking. Descriptive evidence suggests that downsizing is quantitatively as relevant as upsizing and contribute to explain aggregate productivity dynamics. Multinomial logit estimates reveal that the upsizing process is associated mainly to structural, economic and financial characteristics of the firm. In particular, upsizing firms are younger, exhibit higher labour productivity and capital intensity, have better access to credit, a more articulated internationalization and a higher propensity to innovate. Downsizing firms are to some extent specular to the upsizers (i.e. they are the less productive and innovative and more financially constrained), but they mostly exhibit peculiar characteristics, such as lower wages (suggesting lower quality of the labour force), negative profit performance and a specific governance structure. In particular, not being part of a group or be a family-owned firm are significantly associated with substantial downsizing.

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1. Introduction

Why do firm size dynamics matter? As suggested by Rajan and Zingales (1998), during the last decades, almost two thirds of the output growth in the manufacturing industries in developed economies is explained by increases in the size of existing firms. This is consistent with Bartelsman and Doms (2000), who report that a large portion of aggregate productivity is attributable to resource reallocation¹. In Table 1², we confirm that firms increasing in size play a key role in ups and downs of the aggregate productivity in France, Spain and Italy. The aggregate (nominal) productivity growth rate in the period 2001-2008, computed from micro-aggregated data from a large sample of firms with more than 10 employees, scored between 17 (Italy) and 23-24 (respectively Spain and France) percentage points. Firms that have significantly increased employment (*upsizers*)³ contributed positively to aggregate productivity dynamics (in Italy and Spain they respectively account for 12 and 13 percentage points of the productivity growth). However, Table 1 also points out that downsizing firms contributed negatively to aggregate productivity. This phenomenon is particularly evident in Italy, where *downsizers* have contributed for almost a - 6%. Furthermore, as argued by Bravo Biosca (2010) for European and US firms, and will be shown in detail later in this paper for Italy, France and Spain, downsizing is at least as (if not more) frequent and economically relevant as it is upsizing.

Against this background this paper investigates the determinants of the process of firm upsizing and downsizing. In particular, we submit that the process of firm shrinking does not mirror firm increase in size. By understanding the characteristics of firms which opt for an upsizing or downsizing strategy we will attempt to answer the question whether the two processes (upsizing and downsizing) are governed by distinct determinants⁴. This will be done using firm-level data from three large European countries (France, Italy and Spain) stemming from the combination of a novel survey (Efige) providing information on a number of qualitative and quantitative firm characteristics, and the Amadeus databank, providing economic and financial data for the period 2001-2008. In particular, we will assign each firm to a size class in a given year (computed from the deciles of the employment distribution) and define as *upsizers* and *downsizers* those firms which have moved into a higher or lower size class in subsequent years. Then we will estimate a multinomial logit model of the conditional probability of these two events (upsizing and downsizing) as a function of a given set of firms' characteristics, opposed to the probability of persisting in the same size class.

Results suggest that the upsizing process is associated to mainly to structural, economic and financial characteristics of the firm (such as firm (younger) age, productivity, capital-labor ratio and access to financial resources a more articulated internationalization and a higher propensity to innovate). Downsizing firms are to some extent part specular to the upsizers (i.e. they are the less productive and innovative and more financially constrained), but they mostly exhibit peculiar characteristics, such as lower wages (suggesting

¹ Admittedly, there are differences across countries in the importance of the reallocation mechanism, which are related to how efficient the market selection of the best performing firms in different countries (Arnold, Nicoletti and Scarpetta, 2008; Bartelsman, Haltiwanger and Scarpetta, 2009).

² Table 1 is based on firm-level data from the Amadeus-Efige dataset. More details on the dataset will be provided in Section 3 (Data and descriptive analysis). Labor productivity is computed as thousands of Euros per employee. To prove the reliability of the data used in the analysis, a comparison of them with those provided by OECD-STAN is reported in the Data Appendix A2.

³ Upsizers (downsizers) are those firms that move to a higher (lower) decile of the size distribution (measured in terms of employees at 2001) between 2001 and 2008. The residual category is composed of firms that do not change significantly employment and remain in the same size class. More details on this definition will be provided in Section 3.

⁴ As a matter of fact, studies focusing on explaining the determinants of firm growth implicitly assume that the same factors that affect positively growth would have a negative impact on firms' downsizing. We show that this is not necessarily the case for a number of determinants.

lower quality of the labour force), lower past profit growth and a specific governance structure. In particular, not being part of a group or be a family-owned firm are significantly associated with substantial downsizing.

The paper is organized as follows. Section 2 discusses the related literature. Section 3 presents the data and some descriptive evidence. Section 4 lays out the econometric analysis and results. Section 5 concludes.

2. Growth and downsizing: a broken mirror?

The literature on firm growth is extensive (for comprehensive surveys of both theory and empirics we cross-refer to Trau, 1996; Coad, 2007): simplifying the ongoing debate, in the past decades, two main approaches have been followed to address the firm growth process.

On the one hand, the *law of proportionate effects*, as proposed in Gibrat (1931), has generated an enormous amount of empirical studies in a large set of countries and industries (see Hall, 1987; Evans, 1987; Dunne et al., 1989; Wagner, 1992; Mata et al., 1995; Lotti et al. 2003; Lotti, 2007). These studies have tried to assess the validity of the hypothesis of independency and identical distribution of growth rates across firms which differ in their initial size, without reaching a definite general answer regarding the validity/rejection of the Gibrat law. Nonetheless, a qualification of that law, postulating the validity of the law for sub-samples of firms, has been advanced in a number of studies. Many studies have focused on the prominent role of size (Hall, 1987; Bottazzi and Secchi, 2003) and age (Dunne et al., 1989) on growth. In particular, some of them have found –according to Mansfield’s third formulation⁵ of the law – that Gibrat’s law holds for firms larger than a given threshold, while it does not hold for small firms (Becchetti and Trovato, 2002). Furthermore, Lotti et al. (2003) have interacted the size dimension with firms’ age, finding that Gibrat’s law does not hold in the years immediately following start-up, while it cannot be rejected in subsequent years, as patterns of growth of new smaller firms do not differ significantly from those of larger entrants. Other structural variables may also explain firms’ growth, such as market’s size, the technological-intensity of the industry in which firms operate, the degree of competition in the industry and the role of industry’s growth (Audretsch and Mahmood, 1994).

On the other hand, more recently, several studies have started to look at the growth process as determined by endogenous (strategic) characteristics of the firm and not just as an erratic process (Geroski, 1999) or as a purely-driven-by-structural-characteristics one: the central focus of this strand of the literature is the identification of those factors which distinguish growing firms from those which do not grow (Arrighetti and Ninni, 2009). Thus, a substantial bunch of multivariate empirical analyses on firms’ growth have appeared, investigating the growth process as if it was not generated by a stochastic process or by previous size and age only.

The role of productivity in fostering firms’ growth has been heavily discussed in the literature. From the theoretical point of view, both the evolutionary approach of the ‘growth of the fitter’ (Nelson and Winter, 1982) and the neo-classical models of passive learning (Jovanovic, 1982) are consistent with the idea that more efficient firms would grow and the worse performing firms would shrink, and eventually exit the market. However, while theory predicts a positive role of firms’ efficiency in enhancing their capacity to grow, empirical findings are not as clear-cut (Coad 2007). Baily et al. (1996), analyzing a sample of U.S. manufacturing firms between 1977 and 1987, find that there are both *upsizers* and *downsizers* among firms

⁵ Holding on Mansfield (1962), Gibrat’s law can be formulated in three ways, which rest on different ways in which the role of survival and size are regarded in the process: (i) it may hold for all firms; (ii) it may hold for all “surviving” firms; (iii) it may hold only for those firms exceeding the minimum efficient scale.

which increased their productivity in the period; Bottazzi et al. (2010) do not find a robust relationship between productivity and growth in a sample of Italian and French firms observed from the nineties to the early 2000's. The relationship between productivity and growth may be mediated by profitability, a possibility which has been studied less: however, results do not provide strong support for this hypothesis and Coad (2007) suggests to consider firm's profit rate and its subsequent growth in size as entirely independent. Besides production factors, financial constraints may well determine firms' growth. Becchetti and Trovato (2002) find evidence for a negative role of credit rationing on small firms' growth, while Fagiolo and Luzzi (2006) find mixed results for the role liquidity constraints. Following a less deterministic approach, it could be also stated that there are some ubiquitous and persistent firm-specific characteristics which may be associated to a greater propensity --for those firms which possess them-- to grow. Other studies claim for the relevant role of entrepreneurs' willingness to make their firms grow. In this perspective firm growth thus depends on subjective as well as on structural characteristics of the firm (see Hart, 2000; Coad 2007 among others).

Most of the literature on firm growth implicitly assumes that the same factors that affect positively the increase in size, would negatively affect a decrease in size. In other words, upsizing and downsizing are assumed to be two mirroring processes. However, in an environment characterized by increasing competition, due for example to a greater degree of markets' openness, an increasing number of firms have to undergo restructuring strategies with peculiar characteristics. As Coucke et al. (2007) suggest, the restructuring process may take three different forms:

1. a relocation of part of the activity in other countries which may be motivated by several reasons as the possibility of experimenting gain in efficiency (e.g. labor cost savings), exploiting economies of scale in new and growing markets and benefiting of attractive governments regulations;
2. *downsizing* as a voluntary strategy implemented by the firm through a reduction of its workforce, aimed at becoming more efficient at its existing plants;
3. if the firm is not able to raise its profitability, after a given period of time will exit the market.

Setting up a model of restructuring through employee layoff, the authors suggest that, *coeteris paribus*:

- *downsizing* (and relocating) firms are more sensitive to deteriorating profitability with respect to exiting firms, and are also older than exiting firms (due to the passive learning mechanism);
- firms operating in industries characterized by economies of scale are more likely to undertake relocating than *downsizing* strategies;
- labor-intensive firms are more likely undertake relocating strategies with respect to *downsizing*, due to, respectively, a greater possibility of experiencing gains from favorable wages differences in other countries;
- finally, multinational enterprises (MNEs) are also more likely to undertake relocating strategies with respect to *downsizing* due to their strategic advantage of in coordinating activities in different countries.

The two processes of growth (*upsizing*) and restructuring (*downsizing* or relocating), may be definitely seen as non-mirror phenomena which may be motivated by environmental conditions (exogenous factors), but which also may be the result of different strategies and ubiquitous differences among firms (endogenous factors). Unfortunately, to our knowledge, there are no studies which contemporaneously contemplate both phenomena in an enlarged multivariate empirical framework of analysis.

In this paper we aim at filling this gap in the literature, directly investigating environmental factors and firms' characteristics which bring firms either to "upsize" or "downsize" in France, Spain and Italy in the period which goes from 2001 to 2008.

3. Data and descriptive analysis

We exploit an original database which has been recovered by merging the Bureau Van Dijk's Amadeus database with the Efige⁶ survey. The first one contains balance sheet and financial information which have been used to build measures of performance of the firm, like measures of productivity, profitability, labor cost and the number of employees; the second one is an extensive survey which has been conducted in seven European countries (Italy, France, Spain, United Kingdom, Germany, Hungary and Austria) in 2008, and which collects information about ownership and governance, management, innovation and degree of internationalization for 14,911 manufacturing firms which had at least 10 employees in 2007. The overall merge sums up to 119,288 observations in the period which goes from 2001 to 2008.

Given that the information on the number of employees is essential for our purpose of studying the patterns of change in firms' size, we are constrained to limit our attention to those observations which have information on employment. In particular, we restrict our analysis to three countries, France, Spain and Italy, which have the largest number of non-missing observations. Moreover, in order to observe an appreciable change in firms' size we took the largest available time-span, focusing on those firms which have information on employment both at 2001 and 2008. This data trimming left us with a sample of 4,628 firms in France, Spain and Italy with information on the number of employees in 2001 and 2008. In the following paragraphs we will also analyse changes in firms' size in shorter time periods, i.e. 2001 - 2004 and 2005 - 2008.

Table 2 shows the total number of firms which have the relevant information on the number of employees, broken down by deciles of the employment distribution. We computed deciles at the beginning of our observation period (2001) for each country, in order to allow for different size structures in different countries and avoiding that some size class would over-represent firms from a given country. We believe the taxonomy based on deciles of the distribution of employment is less discretionary with respect to the more standard definitions to define size classes (i.e. micro, small, medium and large enterprises), and thus we have used it as the baseline⁷. It is possible to appreciate that deciles of the employees' distribution in France are different with respect to those in Spain and Italy in two directions: first, minimum and maximum of deciles are bigger than those in the other two countries, and second, deciles of France have larger ranges. Both these facts indicate that French firms tend to be larger (in each decile and overall) than firms in Spain and Italy.

Table 3 depicts the size transition from 2001 to 2008 in the whole sample of firms and the three countries: each cell (n,m) indicates the percentage of firms that were classified in size class "n" in 2001 and moved to size class "m" at the end of 2008. Several facts emerge rather clearly, from the pooled sample of observations. Persistence in the same class is a frequent phenomenon, and, in fact, cells on the main diagonal display the highest percentages in almost all the rows of Table 3, except for the two central starting classes (4 and 5) where shifting to the nearest inferior class is more frequent than remaining in the same class; moreover, persistence is far more frequent if firms start larger (i.e. as size at the beginning of the period increases), especially from the seventh decile upward. This may be due both to the fact that the size range increases in higher deciles (making more likely that a small increase in size does not imply a change in size class), but may also reflect the fact that smaller and younger firms are usually found to grow (and shrink) more than their larger counterparts, as predicted by the learning theory of firms' growth (Jovanovic, 1982; Audretsch and Mahmood, 1994).

⁶ EFIGE is the acronym for "European Firms in a Global Economy: internal policies for external competitiveness", which is a project funded by the European Union under the FP7 framework.

⁷ Nonetheless, we have performed both the descriptive analysis with quintiles and more standard definitions of size classes as robustness checks: we cross-refer the reader to the Data Appendix A4 for further details on alternative taxonomies.

One way to look at these transitions is to collapse them into binary indicators. We do this in Table 4, where we identify three “types” of firms, and we define as *upsizers* those firms which were in a given class in 2001 and moved into a superior class at the end of 2008. Conversely, we define as *downsizers* those firms which moved to a lower class at the end of 2008. The group *same class* comprehends firms which did not change class with respect to 2001 (corresponding to cells in the main diagonal). The synthetic transition matrix by firm type indicates that upsizing is a relevant phenomenon in almost all the classes (without considering the first and the last one) and it becomes less likely as the initial size increases, while, on the contrary downsizing patterns are not linear and show an inverted U-shape relationship with respect to the starting class. Interestingly enough, for all the central classes (4, 5, 6, 7, 8) the percentage of firms which reduced employment significantly is higher than the percentage of firms which moved upwards, and if we exclude the first and last deciles of the initial size distribution (where downsizing and upsizing, respectively, is by definition not possible) the percentage of *downsizers* is equal to 37% of the sample (i.e. the biggest group of firms) in the period 2001-2008, while *upsizers* are the 30.94%, thus indicating a prevalence of downsizing with respect to the upsizing phenomenon. This result, which is in line with Bravo Biosca (2010)’s findings, suggests that downsizing should receive at least as much attention as upsizing.

It is interesting to compute the (collapsed) transition matrix for each country in order to discover peculiarities in patterns of firms’ size dynamics (Table 5). First, French firms show an higher frequency of staying in the same class (45.54 % of observations) with respect to the other two countries, regardless of the starting size class. Second, Spain shows the higher frequency of *upsizers* (almost the 43%) and again this is true for all the size classes⁸. Third, Italian firms present a higher frequency of *downsizers* with respect to the corresponding in France and Spain: the remarkable high value of 39.99% is far bigger than the almost 25% of firms in the other two countries⁹.

This peculiarity of the Italian firms is further investigated in Table 6. If we split the transition analysis into seven yearly transitions, some qualifications may be added. In fact, focusing on firms changing size class, while we confirm that persistence is higher in France than in Spain and in Italy in each year, and that the higher propensity towards upsizing in Spain does not depend on the year in question (except for the 2007-2008), the higher probability of downsizing in Italy showed in Table 5 is a figment of a huge downsizing occurring in the 2003-2004 period, when the percentage of firms which moved to lower size class (35.97%) is more than double than the corresponding probability in the other years¹⁰. This fact may be related to the co-occurrence of two phenomena happening in the same period: the introduction in 2003 of a new regulation making it easier for firms to hire temporary workers (known as the Biagi Law) and a restricting of Italian firms following the 2001 crisis (Isae, 2006). We will explore this issue further in the next section.

So far, we have shown that downsizing is at least as relevant than upsizing, and this should justify a specific analysis aimed at understanding whether these two processes are governed by the same determinants. On top of this, Table 1 showed that downsizing firms provide a negative and non negligible contribution to aggregate productivity growth in all the three countries considered in this analysis, while upsizing firms are responsible for a significant portion of productivity growth. Following a standard

⁸ This evidence is consistent with the expanding phase of the economic cycle in Spain in the last decade, as suggested by Bravo Biosca (2010) and Lopez-Garcia and Puente (2011).

⁹ This is consistent with Lotti (2007), who showed that , using a comprehensive dataset of Italian manufacturing and services firms, downsizing is more likely than upsizing.

¹⁰ The found patterns are not sample-driven: in particular, the dramatic increasing in the percentage of downsizing firms in Italy is not due to the reducing of the sample with respect to the previous period (from 1,917 to 1,187 observations). If we compute the yearly transition with the balanced panel of firms, results remain unchanged. We cross-refer the reader to the Data Appendix, Table A7.

decomposition of the aggregate productivity growth into the *within*, *between* and *covariance* effects (adapted from Baily, Barltesman and Haltiwanger (1996) and discussed in greater details in the Data Appendix A2), we can get further insights into how firm dynamics map into aggregate productivity growth. As documented in Table A2, changes in the aggregate productivity along the period are mostly explained by increases in productivity within individual plants¹¹. However, the change in firm size, which governs the between firms effect, also matters. It is negative for downsizers in all countries and it is rather sizable, especially in Italy, while it is positive and sizable for upsizers, especially in Spain. Decomposing the *between* component, into a *reallocation effect* – i.e. reallocation of market shares toward firms more productive than the country average-- and an effect which account for changes in market shares, assuming an average productivity level, we gather that *upsizers* tend to contribute to productivity via both a positive reallocation effect and an increase of their size *per se*. These two effects are more pronounced in France (1.1% and 7.4%) and Spain (7.3% and 11.1%), while in Italy a small and negative reallocation effect for *upsizers* (-0.1%) couples with a relevant downsizing phenomenon measured by the negative “average” *between* effect (-14%) for *downsizers*, which raises doubts on how effective is the market mechanism in reallocating market shares to the most productive firms. Downsizing also contributes positively to aggregate productivity through reallocation, to the extent that firms reducing employment are the less productive ones. The *covariance* term – which is due to the simultaneous change in productivity and market share -- is negative in the three countries, but with different magnitudes (more pronounced in Spain). This last piece of evidence, which is consistent with fact that firms increasing market share are actually reducing productivity (or, conversely, that firms increasing productivity are shrinking), further casts doubts on the effectiveness of competitive markets in Europe (see Bravo Biosca, 2010) and may also suggests the possibility of a strategic *downsizing* implemented by firms in order to boost productivity (see Bottazzi et al., 2010, p. 1964).

Exploiting the information on firms’ characteristics contained in the database, we can have a first hint as to what extent these differ across countries and whether they map into the up and downsizing behavior. Table 7 shows that French firms are usually older, bigger, more productive and pay higher wages than Spanish and Italian (except for productivity) firms at the beginning of the period (2001). Spanish firms have experienced higher growth rates (in terms of employees) than French and Italian firms. As for the financial position, French firms have, on average, more liquidity than Spanish and Italian firms. Looking at the governance dimension, France is the country which shows a higher frequency of firms belonging to an industrial group (either national or international); conversely, Italian and Spanish firms are more likely to be family-owned (more than 70% of firms are actually family-owned businesses); Italian firms show the highest percentage of firms with centralized decision systems, and, together with Spanish firms, the higher number of banks with which firms have established credit positions. In terms of innovation, Italian firms performed quite well with respect to the introduction of new products, and the 50% of firms in our sample introduced at least one new product in the 2007-2009 period; however, a smaller percentage (43%) of firms introduced a new process in the same period, which instead appears a peculiarity of Spanish firms. Finally, more than 50% of firms in each country sell their product abroad, with a remarkable 71% in Italy and, on average firms sell abroad their products in 6-7 countries; French firms show the highest percentage of firms which have internationalized their production, either through direct investments (5.2%) or international outsourcing (5.4 %), then Italy and Spanish follow with respect to this dimension.

¹¹ This is in line with previous findings in the literature exploring the role of firm dynamics in the aggregate productivity in the OECD countries (Bottazzi et al., 2010; see Rincon and Vecchi, 2003, for a detailed review): the contribution of the *within-firm* growth is particularly significant in periods of expansion and it usually counts more in decomposing labor productivity than total factor productivity growth rates.

Table 8 provides descriptive statistics splitting the sample according to the type of firm. On average, *upsizers* at 2008 are younger and smaller than *downsizers* and *same-class*-firms at the beginning of the period (2001); *upsizers* are also more productive than downsizers, but slightly less productive than *same-class*-firms. Furthermore, even if the three types of firms all experienced a negative variation in the EBITDA margin during the period, upsizers had the best performance. *Same-class* firms, which did not incur in heavy organizational changes during the period 2001-2008 -- moving neither to an inferior nor to a superior size class -- perform quite well too in some directions: they paid the highest average wage at the beginning of the period and they show the highest liquidity ratio. Furthermore, they exhibit the highest percentages of firms belonging to an industrial group and the lowest both in terms of family-owned firms and centralized decision system. *Upsizers* appear to be the most innovative firms both in terms of products (50% of upsizers introduced at least 1 new product in the 2007-2009 period) and processes (48%). In terms of internationalization, *same-class* firms perform very well in terms of direct exports, show the highest average number of export markets and the highest propensity to engage in international production and outsourcing.

Summing up, *upsizers* and *downsizers* are clearly different with respect to many performance and organizational characteristics and the former are much better to the latter in several directions. *Same-class* firms are an intermediate class which include firms which did not undergo through significant organizational changes, and, consequently, may perform better than growing firms on specific dimensions.

4. Econometric analysis

The previous section highlighted the existence of differences between firms transitioning towards different size classes, as well as among manufacturing firms located in France, Italy and Spain. However, country, sector and firm characteristics may well be related to each other: more productive firms at the beginning of the period may be also more innovative; growing firms may belong to some sectors or there could be some country specificities (related, for example, to the institutional context) which facilitate firm grow or increase their propensity to downsize. All these characteristics may jointly map into an upsizing or downsizing behavior.

In order to assess the relative importance of various determinants (either internal or external to the firm), of firms' size dynamics, we use a multinomial logit model, in which the dependent variable take three mutually exclusive values: -1 for *downsizers*, 1 for *upsizers*, and 0 for the firms which do not change size class, which will be our reference category (*same-class* firms). The probability of a firm belonging to the group of *upsizers* or *downsizers* is compared to the probability of belonging to the *same-class* firms, and explained by a vector of firm characteristics (X), which include also country and sector fixed effects. The log-likelihood of the multinomial logit model can be written as:

$$L(\beta; y, X) = \sum_{i=1}^n \sum_j y_{ij} \ln(P_{ij})$$

and

$$\Pr(y_i = j) = \frac{\exp(X_i \cdot \beta_j)}{1 + \sum_{h=1}^J \exp(X_i \cdot \beta_h)}$$

where $j=(upsizers, downsizers)$ and for the reference category,

$$\Pr(y_i = \text{same class}) = \frac{1}{1 + \sum_{h=1}^J \exp(X_i \cdot \beta_h)}$$

Thus, coefficients β_j show the relationship between each firms' characteristics and the probability of being *upsizers* or *downsizers* with respect to the probability of staying in the same size class.

We estimate several specifications of the previous multinomial logit model, starting from one in which the probability of moving into another class (either upward or downward) in the period from 2001 to 2008 is only explained by country fixed effects. Results are showed in Table 9, Specification 1. As we could gauge from Table 5, Italian manufacturing firms (the omitted category) show a higher probability of being *downsizers* than French and Spanish counterparts. At the same time, Italian firms show a higher propensity of *upsizing* with respect to French manufacturers. In Specification 2, we introduce a vector of dummy variables for the size class (decile) at the beginning of the period (2001) and a of for sector dummies. Results confirm the higher propensity of Italian firms to downsize during the period 2001-2008, while an unclear pattern is found for the upsizing behavior with respect to the other two countries: French firms show a lower probability of moving to a higher size class, while Spanish firms show a higher probability of upsizing comparing to Italy. On the one hand, size at the beginning of the period (proxied by the decile of the country-specific employment distribution in which each firm was in 2001) is negatively associated with the probability of upsizing starting from the 7th decile onward; conversely, deciles from 2 to 6 does not show differences in the probability of upsizing with respect to the excluded class (5th decile): this result may be viewed as consistent with previous studies which observe a negative relationship between firm size and growth¹². On the other hand, previous size (class) seems to have an inverted U-shaped relationship with the probability of downsizing, i.e. medium-sized firms at the beginning of the period are those which show the higher probability of downsizing¹³. Moreover, changing size class rarely seem to have a characterization by sectors (few sector dummies are significant), and it seem to be mostly a phenomenon driven by within-industry firm heterogeneity.

In column 3 (Table 10) firms' characteristics at the 2001 are used to explain the probability of changing size class between 2001 and 2008, while in columns 3.1-3.9 the transition is observed over shorter time periods. In particular, in 3.1 to 3.7 we compute year-by-year transitions, while in 3.8 and 3.9 we split the sample into two sub-periods, 2001-2004 and 2005-2008. In all of these regressions, explanatory variables are measured at the initial period. Results are rather consistent over time, even if some not all coefficients are always well measured. The most robust findings are the following. First, the probability of being an *upsizer* is negatively correlated with the age of the firm, This evidence is in line with the theoretical prediction that younger firms are more dynamic and show a higher probability of augment employment in the first years of activity (Haltiwanger et al. 2010). Second, labor productivity at the beginning of the period is positively correlated with the probability of upsizing and negatively correlated with the probability of downsizing: this is consistent with the prediction of a wide array of models, ranging from both the evolutionary theory of the "growth of the fitter"(Nelson and Winter, 1982) to the neoclassical models of passive learning (Jovanovic,

¹² In fact, the negative relationship between firm size and growth has been qualified in several studies as Mowery (1983) and Hart and Oulton (1996), who observe a mean reversion in the pooled data, whereas when splitting the sample according to size, no relation between size and growth is found for larger firms.

¹³ The reason for lower probabilities of downsizing of both small-sized and large firms may have different motivations: for example, smaller firms may be constrained to opt for an exit-the-market strategy when suffering negative profits, instead of downsizing or relocating some part of the production abroad (Coucke et al., 2007); conversely, larger firms may have already reached a "threshold" size which ensures more stability to them.

1982)¹⁴. Third, the effect of wages is more sensitive to the period analyzed, but it seems that lower wages are mostly associated with a higher probability of downsizing, while they are not clearly associated with upsizing. This is consistent with the fact that a lower average wage may reflect lower share of skilled workers, more than lower costs (which should instead boost firms growth). Fourth, the negative sign on the liquidity ratio and the positive sign on the capital-labor ratio for *upsizers* is consistent with the fact that the growth process requires investments in capital accumulation (which would rise the capital-labor ratio) and higher debt (which is reflected in lower liquidity ratio). A lower capital-labor ratio is instead associated with a higher probability of downsizing.

Country fixed-effects do not appear to significantly relate to the distribution of firm characteristics across countries. In fact, over the period 2001-2008, even controlling for firm characteristics, Italian firms still have a higher probability of downsizing than French and Spanish ones, while the probability of upsizing in Italy is lower than in Spain and higher than in France. As we showed in Table 6, the propensity of Italian firms to shrink has been particularly high in 2003, so in Table 10 we check whether this specificity holds in the econometric framework too (controlling for sector specificities and ex-ante firm characteristics). We estimate year-by-year transition conditional probabilities of Specification 3 from 2002 to 2008. Results support that in 2003-2004 the coefficient on the France and Spain dummies is far larger than in other years. This phenomenon is confirmed also in columns 3.8 and 3.9 where we split the 2001-2008 into two parts, one (3.8) in which we use the characteristics of firms at 2001 to estimate their probability of transition into different size classes between 2001 and 2004, and the second (3.9) where we use firm characteristics at 2005 as determinant of size transitions between 2005 and 2008. Results confirm that Italy has a significantly higher propensity to downsize relative to both Spain and France in the earlier period, while no significant differences between Italian and French firms dynamics appear in the 2005-2008 period and Spanish firms seem to be less static than Italians in the second period.

We can advance two main explanations of the high propensity to downsize in Italy in the first half the years 2000's. On the one hand, as we mentioned in Section 3, in 2003 a new regulation on temporary workers was introduced in Italy¹⁵. The spike in downsizing firms in around the year 2003 is consistent with many firms substituting permanent workers (which could be retired or laid off) with new workers with temporary contracts. As a matter of fact, as illustrated in Table 6, in the following years (except from 2007-2008), Italian firms show a high percentage of persistence in the same class (about 70% in each period): this phenomenon has been explained by Boeri and Garibaldi (2007), who claim that firms, after the introduction of asymmetric labor market reforms may start to use temporary workers to react to the cyclical fluctuations of the demand. These firms did not increase regular employment after 2004, but simply used temporary workers to follow the upward in the aggregate demand. Unfortunately, data on employment from Amadeus do not capture temporary jobs and this would explain the apparent downsizing. On the other hand, it has been observed that the 2001 crisis lasted longer in Italy, and firms underwent a profound restructuring and transformation in the first half of 2000s, which may explain the significantly higher propensity to downsize (Isae, 2006). It is not easy to assess the contribution of these two phenomena in explaining the higher propensity toward downsizing in Italian firms. However, if only the explanation based on the higher use of temporary workers were to matter, we would expect that Italian firms would not shrink more than Spanish

¹⁴ It is worth mentioning that, while the idea that more efficient firms are more likely to grow and less efficient firms to decrease is well established in theoretical literature, this result is not always borne out by empirical works. However, there is ample evidence suggesting that low productivity helps to predict exit. See Coad (2007) for further discussion on the relationship between relative productivity and growth.

¹⁵ This regulation is known as the Biagi Law, after professor Marco Biagi one of the consultants at the Ministry of Labour who helped drafting the law.

or French ones in terms of value added. To try and disentangle these two effects we construct size classes in terms of deciles of the (deflated) value added distribution in 2001 and define as *upsizers* (*downsizers*) firms that move to higher (lower) size classes in subsequent years. Table 11 reports the coefficients associated with the dummy for Spanish and French firms (controlling for firms' characteristics, initial size class, country and sector dummies), which reveal that over the 2001-2008 period, Italian firms have actually a higher probability of downsizing than French ones, but not relative to Spanish ones. However, when we look at yearly transitions, we notice that up to 2004 the Italian peculiar propensity to downsize, with respect to both France and Spain, is confirmed also in terms of value added. In other words, we find that until mid-2000s Italian firms had a higher propensity to significantly reduce both employment and value added. This suggests that the substitution of permanent with temporary workers alone cannot explain the Italian peculiarity.

Let us now extend our empirical model by adding more firms' characteristics. This allows us to analyse the role of the correlation between the probability of changing size class with *management* and *governance* structure of the firm (including a dummy for family-owned firms, one taking value one for firms which are part of a group and one identifying firms with centralized vs. decentralized decision systems), measures of innovation (two dummy variables indicating whether firms introduced process or product innovation), a further measure of access to financial resources (the number of banks used by the firm) and measures of internationalization (a dummy taking value 1 for those firms which directly export their products, the number of export markets, two dummies taking value 1 if a firm engaged in international production and outsourcing). The problem with these variables that refer to 2008 or to the period 2007-2009. Thus, we cannot make strong statements about the causal effect of those characteristics on the probability of upsizing and downsizing, since they are observed once the transition has been completed. Therefore, we will interpret the following regressions as conditional correlations, which nonetheless give us a flavor of which are the endogenous factors systematically associated with the changing-class phenomenon, and, much interesting for the purpose of the present analysis, if some of them are uniquely associated with the upsizing or downsizing process. As an attempt to mitigate the problem of reverse causality we will introduce these additional controls only as explanatory variables of the size transition between 2005 and 2008.

The baseline estimation for the period 2005-2008 (already presented in the last column of Table 9) is reported also in Table 12 for purpose of comparison. In Specification 4, we introduce the change in the EBITDA margin in the previous period (2001-2004) and results show a negative relationship with the probability of downsizing, i.e. those firms which experienced an augment in profitability in the previous period have a lower probability of shrinking in their size or, vice versa, downsizing follows a negative trend in profitability. This is in line with previous evidence suggesting that the market selection mechanism does not always work through productivity dynamics, but rather through profits (Foster et al., 2008; Bottazzi et al. 2010). Firms that experience lowering profits are likely to shrink, and eventually exit the market.

Once firm characteristics available in the Efige survey are included in the multivariate analysis, we confirm previous findings that upsizers tend to be older, more productive and more indebted (lower liquidity ratio), while downsizers are less productive and pay lower wages. The correlation between changes in profitability and downsizing approaches zero and become not significantly different from zero, suggesting that profits dynamics are actually related to other firm characteristics.

Analyzing the relation between size transition and the qualitative characteristics of firms, we notice that that upsizing (downsizing) is more (less) likely in firms which are part of a group, non-family owned, and more decentralized, but these correlations are rather poorly managed. We will see that some of these results are more neat when we distinguish heavy upsizers and downsizers. The correlation with some

measures of access to finance, innovation and internationalization is instead more significant. First, firms introducing product innovation show a lower probability of downsizing in the period, while firms introducing process innovation tend to upsize. The possibility of using a larger number of banks to finance growth (consistently with the result on the negative sign associated with the liquidity ratio) is associated with a higher probability of growth. Rather surprisingly, firms which serve a foreign market are more likely do downsize, but upsizers have a higher propensity to be engaged in more articulated internationalization. In particular, they are active in a larger number of international markets and outsource production abroad.

One limitation of our analysis so far is that what we define as upsizing and downsizing may actually somewhat noisy, since it corresponds to very limited change in size. For example, French firms increasing employment from 12 to 15 employees remain in the same class, while those moving up to 16 employees are considered upsizers and in our definition they are equivalent to firms doubling their size. We try and overcome this limitation by using a richer definition of upsizing and downsizing. In particular, we construct a dependent variable which takes value 2 and -2 if firms move up or down two size classes, and call these firms *heavy upsizers* and *heavy downsizers* firms. Then, we estimate a multinomial with 5 possible outcomes of the dependent variable. Results are presented in Table 13. The evidence is perfectly consistent with earlier results, with the important addition that the effect of each variable is magnified, when we focus on *heavy upsizers* and *heavy downsizers*. Furthermore, it is interesting to note that some variables which were imprecisely measured are now statistically significant.

In particular, age seems to be a relevant factor affecting the probability of moving toward a higher size class (consistent with the literature on growth rates, which has been surveyed in Section 2), while does not affect the probability of downsizing. Conversely, productivity at the beginning of the period has a rather symmetric effect on upsizing (positive) and downsizing (negative). Similarly, the number of banks used by the firm and the propensity to introduce process innovation have a symmetric effect: positive on upsizing and negative on downsizing. Instead, other variables have effect on either one or the other. The level of capital intensity and the liquidity ratio at the beginning of the period is correlated only to a significant increase in size, while positive changes in profitability are negatively associated with the probability of heavily downsizing in the period of time. This latter result is consistent with evidence suggesting that the market selection mechanism is particularly efficient in selecting out the worst firms which, for example, have exhibiting very negative pattern in performance. Interestingly, heavy downsizers appear to have peculiar a governance structure: they are more likely to be independent (not part of a group) and family-owned. Table 13 also highlights an odd positive correlation between exporting and heavy downsizing, but it also confirms that the more articulated internationalization (as measured by the number of export markets and the propensity to engage in international outsourcing) is a feature of upsizing firms. As far the country fixed effects are concerned, once controlled to firm characteristics, in the 2005-2008 period, no significant difference in the propensity to change size class between Italian and French firms if estimated, while Spanish firms are the more likely to both upsize and downsize.

5. Concluding remarks

Firm dynamics matter for aggregate growth: a suggestive/preliminary analysis on labor productivity growth in France, Spain and Italy in the period from 2001 to 2008 (Table 1) clearly shows that firms which have increased employment (*upsizers*) in the period have also contributed positively to aggregate productivity, while downsizing firms have brought a negative contribution to country's productivity growth. Downsizing is also at least as frequent event in firms' life as it is upsizing. This suggests that both processes of size transition are relevant and merit a specific analysis. We address this issue by recognizing the specificities of both upward and downward change in firm size, and we explicitly allow them to be explained by different determinants.

The paper is a first –to our knowledge—attempt to test the hypothesis that the two processes (upsizing and downsizing) may be governed by distinct determinants, both internal and external to the firm. Using a wide sample of firms in the period 2001-2008, stemming from a novel database, we are able to investigate this hypothesis in three important European countries, namely France, Italy and Spain. A preliminary analysis of the data reveals that the three countries show differences in firm dynamics: Italian firms have been characterized by a higher probability of downsizing in the first half of the 2000s, which may be explained by the co-occurrence of asymmetric reforms in the labor market and a heavy restructuring process which have characterized the Italian economy starting after the 2001 economic crisis. However, once taken into account this specificity of the Italian firms, which mainly confined up to 2003-2004, and after having introduced some firm characteristics in the multivariate analysis, Spanish firms show more dynamism either in terms of downsizing and upsizing, while no systematic differences can be observed between French and Italian firms.

In the econometric analysis, we take a step further and we look at the determinants of the upsizing and downsizing processes, introducing both measures of economic and financial performance of the firm, and qualitative information regarding management and governance, the degree of innovation and the internationalization *status*. Results suggest that the upsizing process is associated to mainly to structural, economic and financial characteristics of the firm (such as firm (younger) age, productivity, capital-labor ratio and access to financial resources a more articulated internationalization and a higher propensity to innovate). Downsizing firms are to some extent part specular to the upsizers (i.e. they are the less productive and innovative and more financially constrained), but they mostly exhibit peculiar characteristics, such as lower wages (suggesting lower quality of the labour force), lower past profit growth and a specific governance structure. In particular, not being part of a group or be a family-owned firm are significantly associated with substantial downsizing.

Summing up, our results show that the process of firm growth is somewhat of a broken mirror: not all firms' characteristics that are positively associated with upsizing are also (symmetrically) negative determinants of downsizing dynamics.

Table 1 – Contribution of upsizing and downsizing firms to labor productivity growth rate in 2001-2008 in France, Italy and Spain

Variable	Country	Downsizers	Same Class	Upsizers	Total %
Gr. Rate 2001-2008	France	-0.035	0.190	0.088	0.244
Gr. Rate 2001-2008	Spain	-0.024	0.122	0.130	0.228
Gr. Rate 2001-2008	Italy	-0.054	0.107	0.119	0.172

Source: Elaborations on Amadeus-Efige database

Labor productivity is expressed as nominal value added (in millions of EUR) over employees (in thousands)

Firms' productivity has been weighted by their market shares, based on each firm share in the country's total employment

Table 2 – Number of firms and range of employees of each decile in 2001.

		Deciles at 2001										
Country		1	2	3	4	5	6	7	8	9	10	Total
France	Number of firms	163	144	158	108	140	142	147	132	141	139	1,414
	Range (# employees)	10-11	12-15	16-19	20-23	24-30	31-39	40-49	50-80	81-180	182-26320	
Italy	Number of firms	173	141	160	163	145	152	149	150	154	151	1,538
	Range (# employees)	10-10	11-13	14-16	17-20	21-26	27-31	32-39	40-55	56-107	108-2227	
Spain	Number of firms	206	174	136	171	178	169	141	173	165	163	1,676
	Range (# employees)	10-10	11-12	13-14	15-17	18-21	22-26	27-32	33-44	45-83	84-2235	
Total number of firms		542	459	454	442	463	463	437	455	460	453	4,628

Deciles are country-specific and refer to the beginning of the period (2001)

The sample refers to those firms which have non-missing information on employees both in 2001 and 2008

Table 3 – Transition matrix (2001-2008); whole sample (France, Spain and Italy)

Size class in 2001	Size class in 2008										Total	Number of firms
	1	2	3	4	5	6	7	8	9	10		
1	17.16	27.68	20.11	14.02	7.56	4.98	3.51	1.66	1.48	1.85	100.00	542
2	14.60	34.42	20.04	12.42	9.15	4.36	2.40	1.53	1.09	0.00	100.00	459
3	8.37	22.47	29.52	17.62	11.23	4.41	3.30	1.54	1.32	0.22	100.00	454
4	4.30	17.19	22.62	19.91	18.33	7.92	5.43	2.94	1.13	0.23	100.00	442
5	1.73	5.83	12.31	24.62	24.19	13.39	8.42	6.05	3.02	0.43	100.00	463
6	1.08	4.54	7.13	12.31	22.25	22.89	16.20	9.07	4.32	0.22	100.00	463
7	0.46	0.92	1.60	4.12	13.27	20.37	31.12	20.37	7.32	0.46	100.00	437
8	0.66	0.44	0.44	1.76	3.08	7.69	20.66	42.42	21.10	1.76	100.00	455
9	0.22	0.22	0.43	0.65	1.74	3.04	7.17	27.39	50.22	8.91	100.00	460
10	0.44	0.00	0.00	0.22	0.22	0.00	0.22	0.44	13.25	85.21	100.00	453
Total	5.14	11.69	11.58	10.85	11.04	8.82	9.66	11.15	10.31	9.77	100.00	4,628

Deciles are country-specific and refer to the beginning of the period (2001)

The sample refers to those firms which have non-missing information on employees both in 2001 and 2008

Table 4 – Collapsed transition matrix (2001-2008), by the firm type

Size class at 2001	Downsizers	Same Class	Upsizers	Total	N. firms
1	0.00	17.16	82.84	100.00	542
2	14.60	34.42	50.98	100.00	459
3	30.84	29.52	39.65	100.00	454
4	44.12	19.91	35.97	100.00	442
5	44.49	24.19	31.32	100.00	463
6	47.30	22.89	29.81	100.00	463
7	40.73	31.12	28.15	100.00	437
8	34.73	42.42	22.86	100.00	455
9	40.87	50.22	8.91	100.00	460
10	14.79	85.21	0.00	100.00	453
Total	30.64	35.37	33.99	100.00	4,628
Total (no 1, 10)	37.19	31.87	30.94	100.00	3,633

Deciles are country-specific and refer to the beginning of the period (2001)

The sample refers to those firms which have non-missing information on employees both in 2001 and 2008

Table 5 - Aggregate transition matrix (2001-2008), by firm type and country

Size class at 2001	France				Spain				Italy			
	Downsiz ers	Same Class	Upsize rs	N. Firms	Downsiz ers	Same Class	Upsize rs	N. Firms	Downsiz ers	Same Class	Upsize rs	N. Firms
1	0.00	36.20	63.80	163	0.00	5.83	94.17	206	0.00	12.72	87.28	173
2	22.22	47.22	30.56	144	6.32	28.74	64.94	174	17.02	28.37	54.61	141
3	24.68	41.14	34.18	158	21.32	22.79	55.88	136	45.00	23.75	31.25	160
4	43.52	29.63	26.85	108	25.73	21.64	52.63	171	63.80	11.66	24.54	163
5	50.71	28.57	20.71	140	33.15	25.84	41.01	178	52.41	17.93	29.66	145
6	46.48	30.28	23.24	142	36.69	25.44	37.87	169	59.87	13.16	26.97	152
7	31.29	44.90	23.81	147	37.59	30.50	31.91	141	53.02	18.12	28.86	149
8	27.27	50.76	21.97	132	38.73	36.99	24.28	173	36.67	41.33	22.00	150
9	34.04	60.99	4.96	141	33.94	52.73	13.33	165	54.55	37.66	7.79	154
10	15.11	84.89	0.00	139	9.82	90.18	0.00	163	19.87	80.13	0.00	151
Total	28.71	45.54	25.74	1,414	23.69	33.41	42.90	1,676	39.99	28.15	31.86	1,538

Deciles are country-specific and refer to the beginning of the period (2001)

The sample refers to those firms which have non-missing information on employees both in 2001 and 2008

Table 6 - Yearly transition matrix, by the firm type and country

	France				Spain				Italy			
	Downsizers	Same Class	Upsizers	N. Firms	Downsizers	Same Class	Upsizers	N. Firms	Downsizers	Same Class	Upsizers	N. Firms
2001-2002	10.23	78.07	11.70	1,496	12.09	65.46	22.45	1,960	9.32	63.26	27.42	1,889
2002-2003	10.21	78.02	11.77	1,597	13.54	64.46	22.01	2,113	15.96	60.98	23.06	1,917
2003-2004	9.70	79.52	10.79	1,650	13.37	65.21	21.42	2,236	35.97	51.14	12.89	1,187
2004-2005	11.33	77.23	11.44	1,704	13.32	64.90	21.78	2,342	12.59	73.23	14.18	1,382
2005-2006	11.89	75.28	12.83	1,497	13.05	62.10	24.85	2,467	12.13	74.52	13.35	1,550
2006-2007	10.04	75.68	14.29	1,365	14.04	62.86	23.10	2,507	12.93	71.08	15.99	2,358
2007-2008	10.10	78.72	11.18	1,485	21.85	61.59	16.56	2,192	16.69	60.82	22.49	2,139
2001-2008	28.71	45.54	25.74	1,414	23.69	33.41	42.90	1,676	39.99	28.15	31.86	1,538

Deciles are country-specific and refer to the beginning of the period (2001)

Table 7 – Descriptive statistics by country

	FRA		SPA		ITA		Total	
	Mean	N. Firms	Mean	N. Firms	Mean	N. Firms	Mean	N. Firms
Firm age (2008)	40.619	1389	27.277	1651	31.742	1515	32.831	4555
Size (log n. of employees, 2001)	3.559	1389	3.180	1651	3.353	1519	3.353	4559
Growth rate (log n. of employees, 2001-2008)	0.040	1389	0.186	1651	0.048	1519	0.096	4559
Labor productivity (log, 2001)	3.767	1235	3.442	1609	3.768	1491	3.647	4335
Capital-labor ratio (log, 2001)	2.309	1380	2.727	1640	3.163	1509	2.745	4529
Change in EBITDA margin (2001-2008)	-0.022	1389	-0.023	1637	-0.029	1506	-0.025	4532
Average wage (log, 2001)	3.486	1389	3.062	1648	3.279	1502	3.264	4539
Liquidity ratio (2001)	1.304	1389	1.145	1650	1.077	1519	1.171	4558
Part of a group (% over total number of firms, 2008)	0.387	1389	0.166	1651	0.192	1519	0.242	4559
Family owned (% over total number of firms, 2008)	0.580	1389	0.764	1651	0.739	1519	0.699	4559
Has centralized decision system (% over total number of firms, 2008)	0.759	1345	0.621	1606	0.846	1475	0.738	4426
Average n. banks (2008)	2.704	1380	4.379	1649	4.486	1518	3.906	4547
Has introduced ≥ 1 product innovations (2007-2009)	0.462	1389	0.466	1651	0.503	1518	0.477	4558
Has introduced ≥ 1 process innovations (2007-2009)	0.384	1389	0.505	1651	0.433	1518	0.444	4558
Directly sell abroad some/all of their product (% over total number of firms, 2008)	0.538	1389	0.532	1651	0.706	1519	0.592	4559
Average n. of export countries (only exporters, 2008)	6.312	1389	4.941	1651	8.679	1519	6.604	4559
Has outsourced abroad (% over total number of firms, 2008)	0.054	1389	0.019	1651	0.045	1518	0.038	4558
Has part of its production abroad (% over total number of firms, 2008)	0.052	1389	0.032	1651	0.035	1518	0.039	4558

Table 8 – Descriptive statistics by firm type

	Downsizers		Same Class		Upsizers		Total	
	Mean	N. Firms	Mean	N. Firms	Mean	N. Firms	Mean	N. Firms
Firm age (2008)	36.265	1394	36.994	1612	25.363	1544	32.824	4550
Size (log n. of employees, 2001)	3.428	1395	3.888	1614	2.715	1545	3.349	4554
Growth rate (log n. of employees, 2001-2008)	-0.391	1395	0.029	1614	0.604	1545	0.095	4554
Labor productivity (log, 2001)	3.563	1343	3.705	1536	3.663	1451	3.647	4330
Capital-labor ratio (log,2001)	2.530	1385	2.810	1609	2.868	1530	2.744	4524
Change in EBITDA margin (2001-2008)	-0.035	1394	-0.024	1609	-0.016	1524	-0.025	4527
Average wage (log, 2001)	3.227	1394	3.329	1610	3.228	1530	3.263	4534
Liquidity ratio (2001)	1.207	1394	1.217	1614	1.090	1545	1.171	4553
Part of a group (% over total number of firms, 2008)	0.194	1395	0.328	1614	0.193	1545	0.241	4554
Family owned (% over total number of firms, 2008)	0.740	1395	0.644	1614	0.722	1545	0.700	4554
Has centralized decision system (% over total number of firms, 2008)	0.783	1343	0.709	1573	0.729	1505	0.738	4421
Average n. banks (2008)	3.532	1392	4.067	1607	4.040	1543	3.894	4542
Has introduced ≥ 1 product innovations (2007-2009)	0.428	1394	0.494	1614	0.505	1545	0.477	4553
Has introduced ≥ 1 process innovations (2007-2009)	0.377	1394	0.469	1614	0.478	1545	0.444	4553
Directly sell abroad some/all of their product (% over total number of firms, 2008)	0.599	1395	0.636	1614	0.539	1545	0.592	4554
Average n. of export countries (only exporters, 2008)	5.569	1395	8.551	1614	5.368	1545	6.558	4554
Has outsourced abroad (% over total number of firms, 2008)	0.034	1394	0.045	1614	0.035	1545	0.038	4553
Has part of its production abroad (% over total number of firms, 2008)	0.027	1394	0.064	1614	0.023	1545	0.039	4553

Table 9 – Determinants of downsizing and upsizing, 2001-2008: country, size and sector dummies (multinomial logit estimates)

	Specification 1		Specification 2	
	Downsize	Upsize	Downsize	Upsize
Dummy France	-0.81*** (0.09)	-0.70*** (0.09)	-0.88*** (0.10)	-0.82*** (0.11)
Dummy Spain	-0.68*** (0.09)	0.12 (0.09)	-0.72*** (0.10)	0.20* (0.10)
Initial size class (2001): decile 5 is the excluded class				
DEC1			-34.66	1.36***
DEC2			-1.51***	0.15
DEC3			-0.61***	0.12
DEC4			0.13	0.32*
DEC6			0.10	0.00
DEC7			-0.35**	-0.31*
DEC8			-0.86***	-0.93***
DEC9			-0.90***	-2.05***
DEC10			-2.47***	-35.86
Sector dummies (Food is the excluded category)				
DB+DE - Textiles + Pulp and paper; publishing and printing			0.17	-0.17
DC+DI+DL - Leather + Non metallic mineral + Electrical eq.			-0.05	-0.21
DD - Wood and wood products			-0.28	-0.67***
DF - Coke; refined petroleum products and nuclear fuel			-1.60	-0.97
DG - Chemicals, chemical products and man-made fibres			-0.44*	-0.48*
DH - Rubber and plastic products			0.02	-0.16
DJ - Basic metals and fabricated metal products			-0.19	-0.43***
DK - Machine and equipment N.E.C.			0.08	-0.06
DM - Transport equipment			-0.24	-0.23
DN - N.E.C.			0.06	-0.04
Constant	0.34*** (0.06)	0.12* (0.07)	1.24*** (0.19)	0.67*** (0.19)
Log-likelihood			-4896	-4033
Observations			4554	4554
St. err. in brackets; those referred to size and sector dummies have been omitted to save space				
Significance levels: * 10%, ** 5%, *** 1%				

Table 10 – Determinants of downsizing and upsizing, 2001-2008 and sub-periods; firms' characteristics at the beginning of the period (multinomial logit estimates)

	(3) 2001-2008		(3.1) 2001-2002		(3.2) 2002-2003		(3.3) 2003-2004		(3.4) 2004-2005		(3.5) 2005-2006		(3.6) 2006-2007		(3.7) 2007-2008		(3.8) 2001-2004		(3.9) 2005-2008	
	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up
Firm age (t_1)	0.004** (0.002)	-0.013*** (0.002)	-0.004* (0.002)	-0.011*** (0.002)	-0.002 (0.002)	-0.006*** (0.002)	0.000 (0.002)	-0.010*** (0.002)	-0.000 (0.002)	-0.015*** (0.002)	0.001 (0.002)	-0.009*** (0.002)	-0.000 (0.002)	-0.012*** (0.002)	-0.002 (0.002)	-0.013*** (0.002)	-0.003 (0.002)	-0.015*** (0.002)	-0.001 (0.002)	-0.017*** (0.002)
Labor productivity (t_1)	-0.455*** (0.159)	0.640*** (0.159)	-0.625*** (0.180)	0.375*** (0.128)	-0.542*** (0.159)	0.301** (0.128)	-0.277* (0.160)	0.029 (0.129)	-0.706*** (0.168)	-0.113 (0.130)	-0.485*** (0.146)	0.229* (0.127)	-0.361*** (0.122)	0.360*** (0.118)	-0.585*** (0.131)	0.501*** (0.133)	-0.593*** (0.160)	0.218* (0.133)	-0.547*** (0.134)	0.426*** (0.126)
Capital-labor ratio (t_1)	-0.134*** (0.042)	0.076* (0.044)	-0.048 (0.048)	0.045 (0.037)	-0.088** (0.041)	0.059 (0.036)	-0.141*** (0.042)	0.065 (0.040)	-0.073* (0.042)	0.102*** (0.038)	-0.034 (0.041)	0.038 (0.035)	-0.026 (0.036)	0.086*** (0.033)	-0.010 (0.035)	0.055 (0.035)	-0.073* (0.042)	0.119*** (0.039)	-0.085** (0.037)	0.070** (0.035)
Average wage (t_1)	-0.424** (0.216)	-0.405** (0.204)	-0.514** (0.227)	0.192 (0.170)	-0.430* (0.227)	0.021 (0.158)	-1.014*** (0.222)	0.310* (0.163)	-0.325 (0.224)	0.573*** (0.173)	-0.551*** (0.199)	-0.103 (0.168)	-0.946*** (0.182)	-0.020 (0.165)	-0.896*** (0.182)	0.294 (0.186)	-0.063 (0.212)	-0.027 (0.16)	-0.396** (0.16)	-0.203 (0.167)
Liquidity ratio (t_1)	0.051 (0.042)	-0.159*** (0.052)	0.035 (0.050)	-0.139*** (0.051)	0.064 (0.048)	-0.090* (0.047)	0.077* (0.040)	-0.002 (0.034)	-0.013 (0.042)	0.010 (0.027)	-0.087* (0.049)	-0.051 (0.035)	-0.034 (0.039)	-0.106** (0.042)	0.038 (0.029)	-0.185*** (0.051)	0.076* (0.043)	-0.073 (0.043)	-0.021 (0.048)	-0.061* (0.034)
Constant	4.387*** (0.546)	-0.137 (0.508)	2.462*** (0.594)	-2.221*** (0.437)	2.699*** (0.562)	-1.566*** (0.378)	4.595*** (0.541)	-1.842*** (0.417)	2.436*** (0.532)	-2.583*** (0.432)	2.223*** (0.495)	-1.633*** (0.401)	3.490*** (0.474)	-2.521*** (0.420)	4.045*** (0.475)	-3.272*** (0.492)	3.529*** (0.535)	-0.532 (0.406)	2.877*** (0.471)	-1.008** (0.412)
Dummy France	-0.952*** (0.113)	-0.613*** (0.126)	-0.054 (0.137)	-1.117*** (0.119)	-0.777*** (0.125)	-0.910*** (0.116)	-2.072*** (0.132)	-0.951*** (0.147)	-0.311** (0.133)	-0.290** (0.131)	-0.086 (0.133)	-0.034 (0.128)	-0.143 (0.128)	0.085 (0.118)	-0.697*** (0.126)	-0.780*** (0.118)	-1.380*** (0.12)	-0.422*** (0.126)	-0.099 (0.116)	-0.064 (0.109)
Dummy Spain	-1.040*** (0.111)	0.377*** (0.112)	-0.130 (0.130)	-0.157* (0.089)	-0.658*** (0.110)	-0.069 (0.089)	-1.831*** (0.111)	0.023 (0.120)	-0.373*** (0.123)	0.552*** (0.109)	-0.204* (0.117)	0.790*** (0.104)	-0.303*** (0.103)	0.862*** (0.092)	-0.337*** (0.100)	0.074 (0.101)	-1.498*** (0.115)	0.337*** (0.11)	0.240** (0.108)	0.618*** (0.099)
Sector dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Deciles dummies (t_1)	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Log-likelihood	-3719		-3614		-3954		-3392		-3539		-3714		-4289		-4150		-3694		-4087	
Number of observations	4309		5030		5273		4701		5034		5122		5841		5411		4285		4715	

St. err. in brackets; those referred to size and sector dummies have been omitted to save space

Significance levels: * 10%, ** 5%, *** 1%

Table 11 – Downsizing and upsizing defined by change in deciles of (deflated) value added, 2001-2008 (multinomial logit estimates)

	(3) 2001-2008		(3.1) 2001-2002		(3.2) 2002-2003		(3.3) 2003-2004		(3.4) 2004-2005		(3.5) 2005-2006		(3.6) 2006-2007		(3.7) 2007-2008	
	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up
Dummy France	-0.550*** (0.130)	0.418*** (0.115)	-0.414*** (0.110)	-0.074 (0.106)	-0.678*** (0.109)	0.175* (0.099)	-0.512*** (0.118)	0.412*** (0.097)	-0.263** (0.119)	0.294*** (0.106)	-0.337*** (0.126)	0.105 (0.099)	-0.136 (0.114)	0.420*** (0.095)	-0.511*** (0.101)	0.044 (0.106)
Dummy Spain	-0.125 (0.111)	0.229** (0.105)	-0.579*** (0.102)	-0.042 (0.095)	-0.729*** (0.097)	0.199** (0.088)	-0.204** (0.098)	0.009 (0.088)	-0.041 (0.111)	0.124 (0.098)	0.163 (0.112)	-0.095 (0.092)	-0.041 (0.098)	0.221*** (0.084)	0.099 (0.086)	-0.265** (0.104)
Firm characteristics (t_1) as in Table 9	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Sector dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Deciles dummies (t_1)	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Log-likelihood	-3768		-4252		-4701		-4558		-4280		-4437		-5194		-5093	
Number of observations	4227		5171		5700		5604		5312		5490		6257		5905	

St. err. in brackets; those referred to size and sector dummies have been omitted to save space

Significance levels: * 10%, ** 5%, *** 1%

Table 12 – Determinants of downsizing and upsizing, 2005-2008: additional firm characteristics
(multinomial logit estimates)

	Specification 3.9 2005-2008		Specification 4 2005-2008		Specification 5 2005-2008	
	Downsize	Upsize	Downsize	Upsize	Downsize	Upsize
Firm age (t_T)	-0.001 (0.002)	-0.017*** (0.002)	0.000 (0.002)	-0.015*** (0.003)	0.001 (0.002)	-0.016*** (0.003)
Labor productivity (t_1)	-0.547*** (0.134)	0.426*** (0.126)	-0.502*** (0.166)	0.715*** (0.169)	-0.445*** (0.168)	0.573*** (0.172)
Capital-labor ratio (t_1)	-0.085** (0.037)	0.070** (0.035)	-0.045 (0.045)	0.005 (0.045)	-0.042 (0.046)	0.013 (0.047)
Average wage (t_1)	-0.396** (0.185)	-0.203 (0.167)	-0.614*** (0.238)	-0.318 (0.231)	-0.635*** (0.244)	-0.298 (0.238)
Liquidity ratio (t_1)	-0.021 (0.030)	-0.061* (0.034)	-0.055 (0.043)	-0.193*** (0.056)	-0.062 (0.045)	-0.134** (0.058)
Difference EBITDA (2001-2004)			-1.167* (0.665)	-0.309 (0.638)	-1.036 (0.680)	-0.063 (0.653)
Part of a group (t_T)					-0.025 (0.134)	0.018 (0.134)
Family owned (t_T)					0.185 (0.117)	-0.038 (0.113)
Centralised management (t_T)					0.161 (0.116)	-0.133 (0.112)
Number of Banks (t_T)					-0.021 (0.023)	0.071*** (0.022)
Product innovation (t_T)					-0.188* (0.103)	-0.010 (0.103)
Process innovation (t_T)					-0.160 (0.101)	0.291*** (0.099)
Direct exporter (t_T)					0.238** (0.113)	0.005 (0.112)
Number of export markets (t_T)					-0.008 (0.006)	0.010* (0.005)
Outsourcing abroad (t_T)					0.411 (0.277)	0.626** (0.280)
Production abroad (t_T)					-0.159 (0.299)	0.336 (0.311)
Constant	2.877*** (0.471)	-1.008** (0.412)	3.363*** (0.606)	-1.476** (0.594)	3.081*** (0.656)	-1.483** (0.645)
Dummy France	-0.099 (0.116)	-0.064 (0.109)	0.020 (0.138)	-0.120 (0.139)	0.003 (0.151)	0.005 (0.152)
Dummy Spain	0.240** (0.108)	0.618*** (0.099)	0.266** (0.127)	0.683*** (0.125)	0.324** (0.135)	0.668*** (0.133)
Log-likelihood	-4087		-2900		-2768	
Number of observations	4715		3358		3254	

St. err. in brackets; those referred to size and sector dummies have been omitted to save space
Significance levels: * 10%, ** 5%, *** 1%

Table 13 – Downsizing and upsizing by more than one size class, 2005-2008 (multinomial logit estimates)

	Specification 5 2005-2008		Specification 6 2005-2008			
	Downsizer	Upsizer	Heavy Down	Downsizer	Upsizer	Heavy Up
Firm age (t_T)	0.001 (0.002)	-0.016*** (0.003)	0.000 (0.004)	0.002 (0.002)	-0.013*** (0.003)	-0.030*** (0.006)
Labor productivity (t_1)	-0.445*** (0.168)	0.573*** (0.172)	-0.421 (0.288)	-0.458** (0.182)	0.597*** (0.185)	0.525* (0.286)
Capital-labor ratio (t_1)	-0.042 (0.046)	0.013 (0.047)	-0.059 (0.078)	-0.037 (0.050)	-0.048 (0.050)	0.192** (0.079)
Average wage (t_1)	-0.635*** (0.244)	-0.298 (0.238)	-1.596*** (0.407)	-0.315 (0.268)	-0.514* (0.263)	0.234 (0.372)
Liquidity ratio (t_1)	-0.062 (0.045)	-0.134** (0.058)	-0.107 (0.094)	-0.051 (0.048)	-0.093 (0.061)	-0.252** (0.106)
Difference EBITDA (2001-2004)	-1.036 (0.680)	-0.063 (0.653)	-2.069* (1.123)	-0.656 (0.748)	-0.216 (0.717)	0.420 (1.044)
Part of a group (t_T)	-0.025 (0.134)	0.018 (0.134)	-0.471* (0.273)	0.077 (0.144)	0.045 (0.142)	-0.194 (0.251)
Family owned (t_T)	0.185 (0.117)	-0.038 (0.113)	0.476** (0.223)	0.109 (0.126)	-0.013 (0.122)	-0.137 (0.190)
Centralised management (t_T)	0.161 (0.116)	-0.133 (0.112)	0.213 (0.201)	0.129 (0.127)	-0.184 (0.121)	0.037 (0.186)
Number of Banks (t_T)	-0.021 (0.023)	0.071*** (0.022)	-0.073* (0.044)	-0.008 (0.024)	0.068*** (0.023)	0.088** (0.035)
Product innovation (t_T)	-0.188* (0.103)	-0.010 (0.103)	-0.180 (0.172)	-0.195* (0.113)	-0.014 (0.112)	0.019 (0.167)
Process innovation (t_T)	-0.160 (0.101)	0.291*** (0.099)	-0.501*** (0.176)	-0.054 (0.110)	0.242** (0.108)	0.451*** (0.162)
Direct exporter (t_T)	0.238** (0.113)	0.005 (0.112)	0.403** (0.189)	0.195 (0.124)	0.015 (0.122)	-0.042 (0.182)
Number of export markets (t_T)	-0.008 (0.006)	0.010* (0.005)	0.003 (0.009)	-0.012* (0.006)	0.008 (0.005)	0.015* (0.009)
Outsourcing abroad (t_T)	0.411 (0.277)	0.626** (0.280)	0.461 (0.460)	0.399 (0.301)	0.524* (0.298)	0.931** (0.440)
Production abroad (t_T)	-0.159 (0.299)	0.336 (0.311)	-0.453 (0.637)	-0.096 (0.318)	0.358 (0.319)	0.182 (0.666)
Constant	3.047*** -0.657	-1.486** -0.647	1.652** -0.728	-0.977 -0.719	4.939*** -1.084	-5.088*** -1.014
Dummy France	0.003 (0.151)	0.005 (0.152)	-0.005 (0.164)	0.015 (0.161)	0.050 (0.282)	-0.176 (0.304)
Dummy Spain	0.324** (0.135)	0.668*** (0.133)	0.292** (0.148)	0.396*** (0.144)	0.388* (0.236)	1.433*** (0.225)
Log-likelihood	-2767		-3532			
Number of observations	3254		3254			

St. err. in brackets; those referred to size and sector dummies have been omitted to save space

Significance levels: * 10%, ** 5%, *** 1%

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A. Data appendix

A1 – Database description

The present paper makes use of the firm level EU-Efige/Bruegel-UniCredit dataset. The data have been collected within the project Efige – “European Firms in a Global Economy: internal policies for external competitiveness” - supported by the Directorate General Research of the European Commission through its FP7 program. GFK Eurisko dealt with the collection of data via CATI (Computer Assisted Telephone Interview) and CAWI (Computer Assisted Web Interview). This database collects information for seven European Countries – Austria, France, Germany, Hungary, Italy, Spain and United Kingdom – and provides different pieces of information on the following firm characteristics and activities: Structure of the Firm; Workforce; Investment, Technological Innovation and R&D; Internationalization; Finance; Market and Pricing.

The survey data have been matched with balance sheet data from Amadeus (Bureau van Dyck) which covers firms with at least 10 employees. In order to investigate firms’ transition across classes of employment, we need the information on the number of employees, which comes from Amadeus: consequently, the analysis focuses on the three countries with the largest number of observations with non-missing information on the number of employees: France, Spain and Italy.

As for the Efige survey, this paper exploits information on management and governance, access to credit, innovation and degree of internationalization. In particular, Table A1 describes how measures and proxy for firms’ characteristics have been built.

Table A1 - Definition of explanatory variables

Variable	Definition	Unit
Firm age (t_T)	Number of years since the firm establishment	Absolute value
Labor productivity (t_1)	(log of) Ratio of deflated value added to the number of employees	thous. euro / employees
Capital-labor ratio (t_1)	(log of) Ratio of tangible fixed assets to the number of employees	thous. euro / employees
Average wage (t_1)	(log of) Ratio of the total personnel cost to the number of employees	thous. euro / employees
Liquidity ratio (t_1)	Ratio of cash (& equivalents) to total assets	Ratio
Δ EBITDA margin (2001-2004)	Change in the EBITDA margin (ebitda/sales) between 2001 and 2004	Δ Ratio
Part of a group (t_T)	Dummy variable which is 1 for firms belonging to an industrial group	Dummy
Family owned (t_T)	Dummy variable which is 1 for firms whose ultimate owner is a family	Dummy
Centralised management (t_T)	Dummy variable which is 1 for firms with a centralized decision system	Dummy
Number of Banks (t_T)	Number of banks with which the firm has a credit relationship	Absolute value
Product innovation (t_T)	Dummy variable which is 1 for firms which introduced a new product between 2007 and 2009	Dummy
Process innovation (t_T)	Dummy variable which is 1 for firms which introduced a new process between 2007 and 2009	Dummy
Direct exporter (t_T)	Dummy variable which is 1 for firms which sell products abroad without intermediaries	Dummy
Number of export markets (t_T)	Number of markets to which the firm exports	Absolute value
Outsourcing abroad (t_T)	Dummy variable which is 1 for firms which performs some production abroad through contracts/agreements with local firms	Dummy
Production abroad (t_T)	Dummy variable which is 1 for firms which performs some production abroad through direct investments	Dummy

Note: the subscript 1 refers to the first year of the period; the subscript T to the last year of the period

A2 – Aggregate labor productivity

The decomposition of aggregate productivity, used in Section 3 builds on Baily, Bartelsman and Haltiwanger (1996) and does not take into account firm entry and exit, which are not available in our dataset:

$$\frac{\Delta LP_{2008}}{LP_{2001}} = \frac{\sum_i \theta_{2001,i} \cdot \Delta LP_{2008,i}}{LP_{2001}} + \frac{\sum_i \Delta \theta_{2008,i} \cdot LP_{2001,i}}{LP_{2001}} + \frac{\Delta \theta_{2008,i} \cdot \Delta LP_{2008,i}}{LP_{2001}}$$

where $LP_{t,i}$ is the labor productivity level of the i^{th} firm in the t^{th} period of time, $\theta_{t,i}$ is the market share of the i^{th} firm in the t^{th} period of time, and $\Delta LP_{t,i}$ and $\Delta \theta_{t,i}$ are, respectively, the variation in labor productivity and in the market share which have been experienced by the i^{th} firm during the entire period of time (2001-2008). The first component of the left-hand side of the equation is the *within* effect, i.e. the contribution of firm-specific productivity changes holding constant the share of the firm in the industry; the second component is the *between* effect, measuring the contribution due to changes in market share, holding productivity at the beginning of the period constant; finally, the third component is the *covariance* effect which refers to the contribution of firms which have increased their productivity and (same time) their market share.

Re-arranging the above equation, adding and subtracting $\sum_i \Delta \theta_{2008,i} \cdot LP_{2001}$ --where LP_{2001} is the average labor productivity of the country— we get a more convenient expression for the aggregate growth rate:

$$\frac{\Delta LP_{2008}}{LP_{2001}} = \frac{\sum_i \theta_{2001,i} \cdot \Delta LP_{2008,i}}{LP_{2001}} + \frac{\sum_i \Delta \theta_{2008,i} \cdot (LP_{2001,i} - LP_{2001})}{LP_{2001}} + \frac{\sum_i \Delta \theta_{2008,i} \cdot LP_{2001}}{LP_{2001}} + \frac{\Delta \theta_{2008,i} \cdot \Delta LP_{2008,i}}{LP_{2001}}$$

where, as before, the first component is the *within* effect, the fourth component is the *covariance* effect, and the second and the third sum up to the “between” term: in particular, the second one (re-allocation term) is positive if firms with levels of productivity above than the average of the country (LP_{2001}) gain shares of the market, and the third one is the contribution in terms of variation of market shares of the firm with the “average” level of productivity (average between term).

When computing aggregate productivity from firm-level data, one should be concerned of how well these measures match with official statistics. In order to test for the representativeness of the measures data of aggregate productivity growth that we use in our analysis, we report in Table A3 a comparison between the aggregate labor productivity recovered from the Amadeus-Efige database and the information provided by OECD-STAN. Comparing the not-deflated series (columns 2 and 3 of Table A2), the Amadeus-Efige database mimics quite well the dynamics of labor productivity found in the OECD-STAN database for all the three countries; however, a note of caution is warranted: labor productivity levels are underestimated for France, both at 2001 and 2008, while they are slightly overestimated for Spain (in 2001 and 2008).

Table A2 – Labor productivity growth rate decomposition in 2001-2008 in France, Italy and Spain

France	Downsizers	Same Class	Upsizers	Total	%
Gr. Rate 2001-2008	-0.035	0.190	0.088	0.244	
Within	0.034	0.184	0.008	0.226	92.9%
Between	-0.057	0.021	0.085	0.049	20.1%
Reallocation	0.014	0.024	0.011	0.049	20.1%
Avg. Between	-0.071	-0.003	0.074	0.000	0.0%
Covariance	-0.013	-0.015	-0.005	-0.032	-13.0%
Spain	Downsizers	Same Class	Upsizers	Total	%
Gr. Rate 2001-2008	-0.024	0.122	0.130	0.228	
Within	0.063	0.191	0.022	0.276	121.0%
Between	-0.047	-0.028	0.183	0.108	47.3%
Reallocation	0.027	0.009	0.073	0.108	47.3%
Avg. Between	-0.074	-0.037	0.111	0.000	0.0%
Covariance	-0.040	-0.041	-0.076	-0.156	-68.4%
Italy	Downsizers	Same Class	Upsizers	Total	%
Gr. Rate 2001-2008	-0.054	0.107	0.119	0.172	
Within	0.115	0.092	0.021	0.228	132.9%
Between	-0.129	0.064	0.091	0.027	15.6%
Reallocation	0.017	0.011	-0.001	0.027	15.6%
Avg. Between	-0.145	0.053	0.092	0.000	0.0%
Covariance	-0.040	-0.050	0.007	-0.083	-48.5%

Source: Elaborations on Amadeus-Efige database

Labor productivity is expressed as nominal value added (in millions of EUR) over employees (in thousands)

Firms' productivity has been weighted by their market shares, based on each firm share in the country's total employment

Table A3 – Aggregate labor productivity levels; comparison between Amadeus-Efige and OECD- STAN

Country	Year	STAN not deflated	Amadeus-Efige not deflated
France	2008*	69.05	56.52
	2001	59.26	45.78
	Δ(2008-2001)	9.80	10.74
Spain	2008*	49.20	51.81
	2001	39.63	42.66
	Δ(2008-2001)	9.57	9.15
Italy	2008	60.94	60.41
	2001	54.56	52.70
	Δ(2008-2001)	6.38	7.71

*France and Spain do not have information on employees for 2008 in the OECD-STAN database: values refer to 2007

A3 - Size Classes

In this section we introduce alternative taxonomies for defining classes of firm size: the first one is based on quintiles of the distribution of employees (Table A4), and the second one is based on a more standard taxonomy (Table A5). The distribution of firms by country which appears in Table A3 is much in line with the evidence provided in Table 2, in which France shows quintiles which are more “shifted to the right” in the distribution of the number of employees and ranges are longer.

Table A4 - Number of firms and range of employees of each quintile in 2001

		Quintiles					
Country		1	2	3	4	5	Total
France	Number of firms	307	266	282	279	280	1,414
	Range of employees	10-15	16-23	24-39	40-80	81-26320	
Spain	Number of firms	380	307	347	314	328	1,676
	Range of employees	10-12	13-17	18-26	27-44	45- 2235	
Italy	Number of firms	314	323	297	299	305	1,538
	Range of employees	10-13	14-20	21-31	32-55	56-2227	
Total number of firms		1,001	896	926	892	913	4,628

Quintiles are country-specific and refer to the beginning of the period (2001)

The sample refers to those firms which have not-missing observation both in 2001 and 2008

Moreover, the taxonomy by size classes (which are, of course, common to each country) depicts a well known picture.

Table A5- Number of firms and range of employees of each size class in 2001

		Size Classes						
country		1	2	3	4	5	6	Total
France	Number of firms	307	387	308	174	138	100	1,414
	Percentage	0.22	0.27	0.22	0.12	0.10	0.07	1.00
	Range of employees	10-15	16-29	30-49	50-99	100-246	250-26320	
Spain	Number of firms	584	531	274	147	70	70	1,676
	Percentage	0.35	0.32	0.16	0.09	0.04	0.04	1.00
	Range of employees	10-15	16-29	30-49	50-99	100-247	258-2235	
Italy	Number of firms	428	429	344	174	92	71	1,538
	Percentage	0.28	0.28	0.22	0.11	0.06	0.05	1.00
	Range of employees	10-15	16-29	30-49	50-99	100-239	255-2227	
Total number of firms		1,319	1,347	926	495	300	241	4,628

Classes refer to the beginning of the period (2001)

The sample refers to those firms which have not-missing observation both in 2001 and 2008

Italy and Spain show higher percentages of firms in lower classes with respect to France, which show higher number of firms in classes 5 (from 100 to 249 employees) and 6 (firms with more than 250 employees). Italy shows a remarkable number of firms with 20-49 employees.

A4 - Transition matrices

This section provides transition matrices by quintiles (Table A6) of the employment distribution and by standard size classes (Table A7).

Table A6 - Transition matrix (2001-2008); whole sample (France, Spain and Italy)

quintiles at 2001	quintiles at 2001					Total	N. firms
	1	2	3	4	5		
1	46.75	33.37	12.99	4.60	2.30	100.00	1,001
2	26.23	44.87	20.87	6.58	1.45	100.00	896
3	6.59	28.19	41.36	19.87	4.00	100.00	926
4	1.23	3.92	21.97	57.40	15.47	100.00	892
5	0.44	0.66	2.52	17.74	78.64	100.00	913
Total	16.83	22.43	19.86	20.81	20.07	100.00	4,628

Quintiles are country-specific and refer to the beginning of the period (2001)

The sample refers to those firms which have not-missing observation both in 2001 and 2008

Tabella A7 - Transition matrix (2001-2008); whole sample (France, Spain and Italy)

Size classes	Size classes						Total	N. firms
	1	2	3	4	5	6		
1	59.36	33.66	4.93	1.21	0.45	0.38	100.00	1,319
2	22.72	59.32	15.29	2.45	0.15	0.07	100.00	1,347
3	3.24	29.37	51.51	13.71	1.73	0.43	100.00	926
4	0.40	5.05	29.09	52.73	11.11	1.62	100.00	495
5	1.00	0.67	1.67	26.00	55.33	15.33	100.00	300
6	0.41	0.00	0.41	0.83	12.45	85.89	100.00	241
Total	24.31	33.32	19.40	11.17	5.94	5.86	100.00	4,628

The sample refers to those firms which have not-missing observation both in 2001 and 2008

Table A8 depicts yearly transitions for the balanced panel.

Table A8 – Aggregate yearly transitions; balanced panel

	France				Spain				Italy			
	Downsizers	Same Class	Upsizers	N. Firms	Downsizers	Same Class	Upsizers	N. Firms	Downsizers	Same Class	Upsizers	N. Firms
2001-2002	9.98	80.18	9.83	651	12.40	65.11	22.49	1,476	7.89	67.43	24.68	786
2002-2003	9.06	80.95	9.98	651	13.41	65.04	21.54	1,476	19.47	62.60	17.94	786
2003-2004	8.45	83.26	8.29	651	14.30	65.85	19.85	1,476	36.39	51.78	11.83	786
2004-2005	11.98	78.80	9.22	651	13.28	67.48	19.24	1,476	12.47	74.17	13.36	786
2005-2006	10.45	79.72	9.83	651	13.48	63.96	22.56	1,476	12.34	75.70	11.96	786
2006-2007	9.52	79.26	11.21	651	13.69	66.26	20.05	1,476	11.20	75.06	13.74	786
2007-2008	9.22	79.26	11.52	651	21.36	63.59	15.05	1,476	15.01	68.45	16.54	786
2001-2008	27.58	46.69	25.73	651	23.59	33.63	42.78	1,476	41.60	31.30	27.10	786