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La Grande Recessione e le imprese manifatturiere

The Impact of the Great Recession on Manufacturing Firms

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SWIMMING UPSTREAM THROUGHOUT THE TURMOIL:
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Swimming Upstream Throughout the Turmoil: Evidence on Firm Growth During the Great Recession

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Abstract

In contrast to the so-called cleansing effect, during the Great Recession we observe highly heterogeneous firm performances. In particular, a not negligible subset of firms grew considerably despite of the general tendency towards downsizing. In this paper, we explain the behaviour of these *swimming upstream firms* (*SUFs*). We obtain three main results. First, *SUF*s exhibit certain firm-specific characteristics: they are younger and relatively more productive than *non-SUF*s. Second, *SUF*s adopt highly proactive strategic profiles, which assign significant importance to activities related to innovation, intangibles, and internationalization. Third, *SUF*s tend to react to changes in market opportunities, although they suffer from sticky processes of resource reallocation between exiting and surviving firms. Moreover, their growth seems to take place primarily within a regime of cumulative destruction rather than creative destruction. Some of the implications of these results for managers and policy makers are discussed.

Keywords: *Crisis, Cleansing effect, Heterogeneity, Growth, Firm performance, Manufacturing industry.*

JEL codes: **D22** (Firm Behaviour: Empirical Analysis); **L21** (Business Objectives of the Firm); **L25** (Firm Performance: Size, Diversification, and Scope); **O32** (Management of Technological Innovation and R&D)

1. Introduction

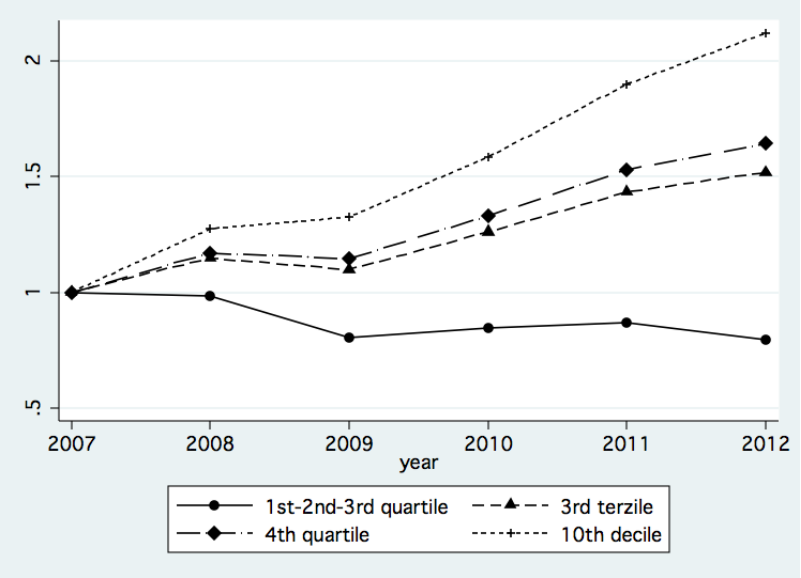
Recessions are generally recognized as having significant influence on industrial structure and firm dynamics (Geroski and Gregg, 1997; Campbell, 1998). Models investigating the relationship between economic cycle and industrial structure highlight the role of the cleansing effect (Caballero and Hammour, 1994): in a given industry, where firms with different levels of productivity are active, a significant decrease in demand does not uniformly reduce the turnover of all production units. To the contrary, economic recessions mainly hit the less innovative, smaller, and less efficient firms and make them exit the market (Alchian, 1950; Jovanovic, 1982; Ericson and Pakes, 1995). Therefore, during an economic downturn, the cleansing effect increases uniformity within manufacturing sectors in terms of size, technological characteristics, and performance of the surviving firms.

However, some recent contributions question such a conclusion and the effectiveness of the cleansing mechanism, especially during a severe recession. Foster et al. (2016), for instance, show that, in the presence of sharp demand contractions, differences in the exit and growth rates between high and low productivity establishments appear to decline. Similarly, with reference to Japan, Nishimura et al. (2005) observe that, in times of crisis, efficient firms in terms of TFP exit at a higher rate than inefficient ones, suggesting a malfunctioning of the natural selection mechanism. In addition, studies on the heterogeneity of within-industry firm dynamics (Syverson, 2004; Thomas and D'Aveni, 2009; Foster et al., 2008; D'Aveni et al., 2010), on the extensive role of differentiated strategic profiles (Helper et al., 2012; Criscuolo, Haskel and Slaughter, 2010), and on high-growth firms (Davidsson and Delmar, 1997; Holzl, 2009; Stam and Wennberg, 2009) do not call for a significant mitigation of the differentiation processes in a recessionary phase. In fact, the maintenance or even the increase of within-industry heterogeneity during an economic crisis is fully consistent with the hypotheses developed in these works.

Evidence that an economic downturn increases rather than reduces firm heterogeneity emerges from recently available data on the performance of a large sample of Italian manufacturing firms during the observation period of 2007-2012 (for more information on the data, see Section 3). Despite the intensity and duration of the recession for the Italian manufacturing system, we observe two divergent trends. While the majority of firms report a significant reduction in activity (-20% of the yearly turnover), a significant minority attain very positive performances: one third of production units increased sales by an average of 60%; one-tenth of the firms increased sales by as much as 110% (see Figure 1). From this point of view, the recession highlights processes that are, if not unique, certainly not yet adequately examined, particularly with regard to the role that

swimming upstream firms (*SUFs*), i.e., firms that grow amidst a general tendency towards downsizing, play in overall industry dynamics. Interestingly, this phenomenon cannot be explained by pre-existing firm heterogeneity since in our data the within-industry dispersion (measured as industry-normalized standard deviation) of sales and labour productivity (measured as added value per employee) increased between 2007 and 2012 from 2.636 and 1.378 to 3.172 and 6.324, respectively.

Figure 1 – Evolution of sales across growth quintiles



Notice: growth quintiles are computed considering the distribution of sales in 2012 over sales in 2007. For each reported quintiles of firms the figure shows the evolution of firm sales between 2007 and 2012, using 2007 as a base year.

This paper explores the heterogeneity of firm conducts in a recessionary context and, in particular, addresses the following research questions: a) What are the factors that distinguish *SUFs* from other productive units?; b) Are these factors related to the structural characteristics of the firms or the strategic profile adopted before the recession?; c) Is the accelerated growth of *SUFs* driven by processes of creative destruction or cumulative destruction?

To answer these questions, we rely on a large firm-level dataset with detailed information on firm characteristics and performance during the Great Recession (i.e., 2008-2012). On this basis, we obtain three main results. First, we find that *SUFs* are younger and have a higher than average initial productivity. Nevertheless, they are not dissimilar to the other firms in terms of size, profitability, and initial financial exposure. Second, *SUFs* are characterized by the adoption of

strategic profiles that are strongly oriented towards innovation, intangible investments, and internationalization. Third, they react to changes in market opportunities, although they suffer from sticky processes of resource reallocation between exiting and surviving firms. Finally, at least until 2012, their growth seems to take place primarily within a regime of cumulative destruction and not of creative destruction.

The contribution of this paper to the pre-existing literature is twofold. First, it allows a better understanding of the intra-sector firm dynamics during the Great Recession and, specifically, it sheds light on the characteristics of within-industry reallocation processes that, unlike the predictions of the cleansing effect hypothesis, appear to favour incumbent over entrant firms. Secondly, it confirms that the heterogeneity among firms is not reduced during a recession but is instead strengthened by the impact that differentiated strategic profiles, along with firm productivity and age, have on performance.

The paper is organised as follows. Section 2 examines the relevant literature on firm heterogeneity and business cycles, developing the main hypotheses and explaining firm growth during an economic downturn. In Section 3, the database employed in the empirical analysis is presented and some descriptive statistics for *SUFs* and *non-SUFs* are reported. Section 4 illustrates the econometric model. Section 5 presents estimates for probit and quantile regressions, as well as a robustness check based on a heckprobit model. Finally, Section 6 concludes.

2. Literature and hypotheses

2.1 Firm heterogeneity and recession

As already noted, the variety of growth patterns during a recession appears to be less surprising when one takes into account recent contributions on industrial dynamics. Specifically, the explanation of growth during recessions can be traced to at least four main approaches available in the literature.

The first is the set of contributions that question the uniformity of firm behaviour on the basis of the high within-industry heterogeneity of firm characteristics (Helper and Kleiner, 2007; Syverson, 2004; Bartelsman and Doms, 2002) and the related growing variance in performance (Foster et al., 2008; Syverson, 2011; Mathew, 2012; Accetturo et al., 2011; Bottazzi e Secchi, 2006). Interpretations of this phenomenon vary. On the one hand, the growing role of accumulated internal resources and the ensuing diversity in evolutionary paths is shown (McGahan and Porter, 1997;

Teece et al., 1997; Leiponen and Drejer, 2007). On the other, the growing volatility of the competitive advantages of individual firms in the context of hyper-competition is highlighted (Thomas and D'Aveni, 2009). In any event, the various explanations converge to predict different (or even conflicting) evolutionary dynamics among firms operating in the same competitive environment. In an increasingly rugged environment due to competitive pressures associated with recession, the local optima are multiple and ex-ante substantially equivalent (Levinthal, 1997), extending the range of experiments attempted and the strategies implemented by firms. Moreover, a crisis increases uncertainty (Bloom 2009; Bloom et al., 2013). Consequently, during a recession, the interpretation of the competitive environment tends to vary across firms, resulting in a further increase in the heterogeneity of behaviours and performances (see also Geroski and Gregg, 1997). Finally, if a crisis reduces available credit, liquidity constraints have a greater impact on "the performance of those firms that rely more on external finance for investment and working capital relative to those firms that rely less on external financing" (Claessens et al., 2012), artificially differentiating the growth potential of individual firms.

Alongside the ruggedness of the selection environment, a second group of works have emphasized the variety in the strategic profiles of firms as an important determinant of their heterogeneous performance. In fact, differently from what is usually presumed, the sustained process of globalization has only apparently accentuated the uniformity of strategic conduct. Although the emphasis on the role of intangible resources, innovation, and extension of geographic markets is generally associated with global engagement (Bridges and Guariglia, 2008; Criscuolo et al., 2005; Castellani and Zanfei, 2007), different strategic alternatives remain open. Moreover, during a severe recession, the heterogeneity of strategic profiles adopted by firms is strengthened – not diminished – by the different perception of the competitive environment by decision-makers (Coriat, 2001), as well as the different reaction capabilities of individual enterprises (Archibugi et al., 2013; Landini et al., 2015). Similarly, the preference of management for active vs. passive learning (Ericson and Pakes, 1995; Ortega-Argiles and Moreno, 2007) and the diversity of profit thresholds considered acceptable for continuing the activity (D'Elia et al., 2011) contribute to differentiating firm conduct and ultimately affect the diversity of growth performances.

A third group of contributions attempted to link the heterogeneity of firm conduct with the existence of especially rapid patterns of growth. In many industries, in fact, processes of accelerated size growth are seen as important drivers of within-industry heterogeneity. Robust evidence indicates that "most firms start small, live small and die small" (Davidsson et al., 2005 and 2007) and that a limited number of firms are growing a lot and are responsible for much of the change in employment and turnover (Brüderl and Preisendörfer, 2000; Coad and Rao, 2008; Holzl, 2009;

Stam and Wennberg, 2009; Goedhuys and Sleuwaegen, 2015). The diffusion of the phenomenon of high growth firms is an established feature of industrial dynamics (Acs, 2008). Some variables differentiate fast-growing businesses from others. Age, initial size, ownership concentration, and the quality of human capital play an important role (Arrighetti and Lasagni, 2013). The influence of solvency and leverage variables is less certain since the empirical evidence concerning the impact of financial variables is ambiguous (Moreno and Casillas, 2007). In any event, the characterizing variables are often not directly influenced by the economic cycle and if they are (for example, age and initial size), the impact of the economic downturn may limit the rate of growth but not eliminate it. Geroski and Gregg (1997) confirm this conclusion since they found that firms that grew rapidly during the early stages of a recession proved less vulnerable to the recession than others. Higson et al. (2004) achieve similar results.

The final set of contributions that merits attention consists of the studies that relate business cycles and industrial dynamics as determinants of firm heterogeneity. In this view, the effects of the economic cycle may differentiate between incumbent firms and new entrants. In particular, it has been noted that certain features of technological dynamics become particularly relevant during a recession. For instance, Archibugi et al. (2013) observe that during the Great Recession processes of cumulative destruction better describe firm investments in innovative capabilities than creative destruction. In addition, the economic cycle simultaneously and oppositely affects the firm birth and death rate. An increase (decrease) in demand raises (reduces) the opportunities of entry, regardless of the level of entry barriers. Similarly, demand growth (reduction) increases (decreases) the market opportunity for all companies and thus increases (decreases) the chances of survival. Ilmakunnas and Topi (1999) confirm this hypothesis with reference to the Finnish manufacturing sector. Moreover, a decrease in demand differentially affects firms depending on their age: a downturn reduces turnover performance of younger firms more than older ones (Fort et al., 2013; Bartz and Winkler, 2016). The effect of the economic crisis on firm size is less explicit but nonetheless differentiated. In Kolasa et al. (2010), the recession improves the performance of the largest (and foreign-owned) firms while in Moscarini and Postel-Vinay (2012), the downturn strengthens the employment performance of smaller ones. Finally, a recession influences the resource reallocation among active plants: the economic contraction reduces the opportunity cost of productivity-enhancing reallocation processes, increasing the opportunities for growth of more productive firms at the expense of less productive firms. Therefore, regardless of the entry process, the reallocation is more intense when more productive establishments show lower exit rates and higher growth rates than less productive ones and where the difference in growth and exit rates between high and low productive firms is very marked (Foster et al., 2016).

2.2 Firm growth and recession: main hypotheses

On the basis of the above-mentioned literature, it is possible to derive a set of research hypotheses to explain the growth performance of *SUFs*. Depending on the type of explanatory variable considered, we organize these hypotheses in three main groups: a) firm characteristics, b) strategic profiles, and c) variables related to demand and industry dynamics.

2.2.1 Firm characteristics

The literature on firm performance associates growth in size to several firm characteristics observed at the beginning of the reference period (in the present case, before the outbreak of the recession). In this sense, much of the empirical research highlights an inverse relationship between growth and firm age (Evans, 1987; Coad, 2009). Younger firms are driven to quickly exploit product and process innovations and to reach the minimum optimal size (Lee, 2010): their growth rate tends to be above average and, in some cases, their performances approach those of high-growth firms (Dobbs and Hamilton, 2007). Initial firm size also affects the rate of growth: in general, smaller firms grow faster. Only after reaching a fairly high size threshold is a relative independence between size and growth observed, confirming Gibrat's Law (Coad, 2009; Lotti et al., 2003; Geroski and Gugler, 2004). For this reason, the first hypothesis that we put forward is:

HP. 1a: During a recession, the probability that a firm grows is negatively correlated with firm age and initial size

In addition to size and age, growth has been associated with productivity and profitability. However, the relationship between these variables and growth remains complex (Coad, 2009) and many empirical studies failed to find an unambiguous influence on performance (Foster et al., 1998; Bottazzi et al., 2002, 2006 and 2010). In any event, during a severe recession, internal efficiency and cash flow represent safety barriers against the processes of natural selection and a tool for adopting aggressive pricing and investment policies without incurring heavy losses. Therefore, we propose that:

HP. 1b: Firm productivity and profitability before the recession positively impacts the probability that the firm grows during the recession

As already noted, several contributions also point to financial variables as important

determinants of firm growth. The access to external financing indeed limit the growth of smaller businesses while being neutral for the growth of larger firms (Becchetti and Trovato, 2002; Oliveira and Fortunato, 2006). During a recession, overall firm financial exposure is expected to affect growth even more explicitly since a share of the available resources are devoted to survival. On this basis, we test the following hypothesis:

HP. 1c: The financial exposure of the firm before the recession negatively impacts the probability that the firm grows during the recession.

2.2.2 Strategic profiles

Alongside firm characteristics, strategic profiles are considered important for growth. Changes in the competitive paradigm have indeed extended the variety of strategic alternatives available to firms. Some strategic profiles are characterized by defensive choices and waiting attitudes. Others appear more proactive, signalling relevant tangible and intangible investments, with an explicit focus on innovation and a willingness to broaden the geographic size of markets. In this sense, Arrighetti et al. (2015) show that the heterogeneity of strategic behaviours influenced the performance of manufacturing firms during the recent recession. Moreover, Guariglia and Mateut (2010) observe that small, young, risk-oriented, and internationally committed firms are less sensitive to changes in financial variables and more resilient to the recession than average firms. At the same time, however, defensive strategies of restructuring and resizing (reducing expenditures, withdrawing from markets, disinvesting assets) continue to be very common (Michael and Robbins, 1998; Istat, 2014). These considerations lead to the following hypothesis:

HP 2 A firm's pre-crisis strategic profile affects the probability that the firm grows during the recession. In particular, the more (less) proactive the strategic profile, the greater (lower) the chances of growing.

2.2.3 Demand and industry dynamics

In addition to firm characteristics and strategic profiles, firm growth is also affected by the features of the surrounding environment, with particular reference to demand and industry dynamics. As argued in Paragraph 2.1, sizable reductions in demand can severely affect the market opportunities of active firms and thus impair their probability of survival. If this is true for survival,

it holds even truer for firm growth, which requires firms to expand their overall market base. For this reason, we expect growth processes during the Great Recession to be favoured in industries that experienced smaller reductions in demand or, in other words, that:

HP 3a: During a recession, a firm that operates in an industry facing a relatively small decrease (or even a possible increase) in demand has a greater probability of growing.

The negative trend of the business cycle, however, not only affects the evolution of demand but also the internal composition of industries. As the firms suffering the most leave the market, one could in fact expect more resources to be available to the surviving ones, in terms of both production inputs and consumer base. The impact of this process on the probability of growth depends on the resource reallocation system across firms. If this system is effective and leads to a reallocation process that favours the most productive firms among the surviving ones, then we should expect firm growth to be favoured in contexts in which the market share of exiting firms is large. On the flipside, if both demand and production inputs are sticky (*i.e.*, they are not easily reallocated across firms) and the overall process is ineffective, then we should expect the opposite outcome. On this basis, the hypothesis that we test is the following

HP 3b: During a recession, a firm that operates in an industry with a large share of exiting firms has a greater probability of growing.

If *HP 3b* is confirmed, it provides evidence in favour of an effective system of resource reallocation. If *HP 3b* is contradicted, there will instead be some support for the presence of a sticky process of resource reallocation across firms.

Finally, the literature on industrial dynamics suggests that, during a deep recession, the overall composition of an industry is also affected by the type of selection process taking place among firms and how the latter interacts with the entry dynamics. In particular, during the Great Recession, if a cumulative destruction type of selection is prevailing, then we should expect the growth patterns of incumbent firms not to be affected by the entry of new firms. In this case, in fact, the driver of firm growth is the set of capabilities previously accumulated by incumbents, which is not altered by the entry dynamics. On the contrary, if a creative destruction type of selection is the main force, then we should expect the growth process to be driven primarily by the entry of new and highly innovative firms, which should in turn reduce the growth opportunities of incumbents. Based on these arguments, we test the following hypothesis

HP 3c: During a recession, the market share of new entrants in a given industry has no effect on the firm's probability of growing.

Once again, if *HP 3c* is confirmed, it supports the idea that the Great Recession strengthens the patterns of cumulative destruction. On the other hand, if *HP 3c* is contradicted, there will be some support for the notion that the Great Recession encourages processes of creative destruction.

3. Data, variables, and descriptive analysis

3.1 Data

We use data collected from two sources: the first wave of the MET Survey and the AIDA-BVD database. The MET Survey is a survey conducted by an Italian private research centre (*Monitoraggio Economia e Territorio s.r.l.*) every two years using a stratified sample of nearly 25,000 Italian manufacturing firms (with partial sample overlap among the different waves).[1] In contrast to other Italian datasets, the sample contains information on firms of all size classes, even micro firms with less than ten employees. The survey contains firm-level information on the company's internal structure, including information on firm size, main investment strategies, and reference markets. The original sample follows a disproportionate Bayesian scheme and is representative at the size (4 dimensional classes), region of origin (20 regions), and industry (10 sectors disaggregated following the 3-digits ATECO 2002 classification) levels. The first wave was conducted during the summer of 2008, a few months before the bankruptcy of Lehman Brothers. Therefore, it contains detailed information on the pre-crisis characteristics of firms, specifically during 2006-2007. [2]

The AIDA-BVD database contains disaggregated balance sheet and profit and loss statement information for the period 2007–2012 for all Italian firms. Moreover, it contains information on the present status of the firms (active vs. non-active and merged vs. acquired). After selecting the firms that are active as of 2007, we match information from the AIDA-BVD datasets with responses to

[1] The MET Survey share many features of the Capitalia Survey on Manufacturing Firms, another business survey carried out in Italy, which covers the periods ending in 1997, 2000, 2003, and 2006, respectively.

[2] For more details about the sampling scheme, administrative methods, control procedures, and sample representativeness of the MET Survey see Brancati (2008) and Brancati et al. (2015).

the MET Survey, obtaining a final sample of 5058 firms.[3] The original sample representativeness in terms of firm size, region of origin, and industry of activity is preserved.[4]

Thus, we obtain an unbalanced panel with information in two time-horizons. First, we have firm-level information on both the internal structure and financial position for the period 2006-2007. Second, we have access to the disaggregated balance sheet of all firms for the period 2006-2012. These data allow us to study the growth performance of the firms during the Great Recession.

3.2 Variables

We measure firm growth in terms of sales growth rate between 2007 and 2012 (*GROWTH*). *GROWTH* is the crucial variable of our analysis. In particular, for the firms in our sample, we want to understand which factors can explain the probability of being a *swimming upstream firm* (*SUF*) during the Great Recession, where the latter is defined as a firm that belongs to the fourth quartile of *GROWTH*.

Following the discussion presented in Section 2.2, we focus our attention on three main types of explanatory variables. First, we consider variables related to the firms' internal characteristics such as size, age, productivity, profitability, as well as financial exposure. Second, we consider variables that capture the heterogeneity of the firms' strategic profile. Finally, we consider variables associated with demand and industry dynamics. A set of proxies is chosen for each of these dimensions.

As a measure of size and age, we consider the total number of employees (*SIZE*) and the years since the firms' founding (*AGE*), respectively. For productivity, we consider the value added per employee (*LABPRDTY*), whereas return on investments is used as a proxy for profitability (*ROI*). *SIZE*, *AGE* and *LABPRTDY* are taken in logs as a way to smooth the distribution. The degree of financial exposure is instead measured as the ratio between borrowing costs and operating profit (*FINEXP*). All these variables are measured by taking the average between 2006 and 2007, except for *SIZE* and *AGE* where we only consider 2007.

[3] The reduction in the size of the original sample is due to the availability of disaggregated balance sheets in the AIDA-BVD database (see subsection 3.2).
[4] Tables reporting on the sample's representativeness are available from the authors upon request.

Table 1 – Cluster analysis, the list of variables used

Type of variable	Variable
Categorical variables (dichotomous)	Productive internationalization, 2005-2007 (*INTERNAZ*)
	Tangible assets, 2005-2007 (*TANASSETS*)
	Intangible assets, 2005-2007 (*INTASSETS*)
	Organization/management innovation, 2005-2007 (*ORGINN*)
	Product innovation, 2005-2007 (*PRODINN*)
	Process innovation, 2005-2007 (*PROCINN*)
Continuous variables	Percentage of turnover sold in local markets, 2007 (*LOCMKT*)
	Percentage turnover sold in export markets, 2007 (*EXPORT*)
	Competitive advantages (synthetic index) , 2007 (*COMPADV*)
	R&D expenditure (% of turnover) , 2007 (*R&DEXP*)

The second group of variables that we consider concerns the classification of the firms' strategic profiles. Following Arrighetti et al. (2015), we employ a cluster analysis to identify specific profiles according to the competitive behaviour of different firms. More specifically we proceed in two steps. First we select a set of variables on the basis of the strategies and behaviours adopted by firms rather than on the basis of their structural characteristics (size, sector, region, etc.). The variables capture components of the firm's strategic profile such as market, investment, and R&D activities (see Table 1). Then, we run a standard hierarchical clustering algorithm to identify three groups of firms (for more details on the clustering procedure see Arrighetti et al., 2015):

- *CLUSTER1. Most dynamic firms (17.1% of the sample).* As shown in Table 2, this group represents the most dynamic firms in terms of strategies and behaviours. These firms are engaged in several activities with a high degree of strategic complementarity to improve their competitiveness. Investments in immaterial assets, a high degree of internationalization activities, and significant R&D expenditures are common features of this cluster. These firms represent the "excellence" of the Italian industrial system.
- *CLUSTER2. Moderately dynamic firms (43.6% of the sample).* The activities representative of dynamic behaviour are present, but they do not cover all of the features considered. Export activities are mainly carried out without any other internationalization process; R&D is present, but at levels that are consistently below those of cluster #1. Often, companies belonging to cluster #2 struggle to engage in R&D, innovation, and internationalization all at once. Many of them, for instance, undertake innovation without investing in research, or they reach foreign markets without due support from R&D activities.

- *CLUSTER3. Static firms (39.3% of the sample).* The last group refers to static firms: they sell mainly on the local market and have no dynamic strategies (in terms of investments, innovation or R&D, and internationalization activities or exports).

Table 2 – Cluster characteristics

	Cluster 1			Cluster 2			Cluster 3			
	N.	**mean**	**sd**	**N.**	**mean**	**sd**	**N.**	**mean**	**sd**	**F-test**
INTERNAZ	867	0.399	0.490	2204	0.000	0.000	1987	0.000	0.000	***
TANASSETS	867	0.764	0.425	2204	0.678	0.467	1987	0.464	0.499	***
INTASSETS	867	0.682	0.466	2204	0.000	0.000	1987	0.020	0.140	***
ORGINN	867	0.499	0.500	2204	0.451	0.498	1987	0.153	0.361	***
PRODINN	867	0.580	0.494	2204	0.740	0.438	1987	0.000	0.000	***
PROCINN	867	0.479	0.500	2204	0.632	0.482	1987	0.000	0.000	***
LOCMKT	867	27.291	35.262	2204	49.895	41.945	1987	52.617	43.034	***
EXPORT	867	33.975	32.359	2204	16.896	25.943	1987	13.330	24.429	***
COMPADV	867	6.039	3.710	2204	5.025	3.453	1987	4.021	3.313	***
R&DEXP	867	2.751	4.193	2204	2.100	4.202	1987	0.696	2.499	***

Legend: for each variable used in the cluster analysis, the mean values and standard deviation are reported; the last column reports the results of an F-test between the cluster means; ***=sig. 1%.

In the following sections, the outcome of this classification procedure is employed to understand whether the cluster of firms representing specific strategic profiles can explain part of the heterogeneity in growth performances.

Finally, to study the role of demand and industry dynamics, we combine a set of three indexes. First, we consider the ISTAT industry production index in 2012 (base year = 2010, 3-digits Ateco classifications) as a proxy of changes in demand (*INDPROD*). Second, we consider the sales of firms exited between 2008 and 2012 over total industry sales in 2007 (2-digits Ateco classification) as a proxy of the market shares freed by exit (*MKTEXIT*). Third, we consider the sales of firms entered between 2008 and 2012 over total industry sales in 2012 (2-digits Ateco classification) as a measure of the entry dynamics (*MKTENTRY*). Both *MKTEXIT* and *MKTENTRY* are measured on the basis of the industry population data available in the AIDA-BVD database.

3.3. Descriptive analysis

Table 3 reports some descriptive statistics for the entire sample of firms (column 1), *non-SUFs*

(column 2) and *SUFs* (column 3). The last column reports the results of an F-test on the difference between the mean values for *non-SUFs* and *SUFs*. We notice that *SUFs* are on average younger (*AGE*) and more productive (*LABPRDTY*) than *non-SUFs*. Interestingly, we find no significant difference regarding firm size (*SIZE*), profitability (*ROI*), and financial exposure (*FINEXP*).

Table 3 – Descriptive statistics

	All			Not SUF (Bottom 75%)			SUF (Top 25%)			
	N.	**mean**	**sd**	**N.**	**mean**	**sd**	**N.**	**mean**	**sd**	**F-test**
GROWTH	5058	0.012	0.550	3767	-0.204	0.224	1291	0.642	0.712	***
Log (SIZE)	5058	3.467	1.084	3767	3.468	1.080	1291	3.464	1.097	
Log (AGE)	5058	3.370	0.494	3767	3.391	0.484	1291	3.310	0.516	***
ROI	5058	0.066	0.076	3767	0.066	0.078	1291	0.066	0.072	
Log (LABPRDTY)	5058	10.714	0.586	3767	10.697	0.564	1291	10.762	0.645	***
FINEXP	5058	0.299	2.115	3767	0.292	2.169	1291	0.322	1.951	
CLUSTER1 (d)	5058	0.171	0.377	3767	0.162	0.368	1291	0.199	0.399	***
CLUSTER2 (d)	5058	0.436	0.496	3767	0.432	0.495	1291	0.447	0.497	
CLUSTER3 (d)	5058	0.393	0.488	3767	0.406	0.491	1291	0.354	0.478	***
INTERNAZ (d)	5058	0.068	0.252	3767	0.063	0.243	1291	0.084	0.277	**
TANASSETS (d)	5058	0.609	0.488	3767	0.611	0.488	1291	0.601	0.490	
INTASSETS (d)	5058	0.125	0.330	3767	0.119	0.324	1291	0.141	0.348	**
ORGINN (d)	5058	0.343	0.475	3767	0.328	0.469	1291	0.387	0.487	***
PRODINN (d)	5058	0.422	0.494	3767	0.410	0.492	1291	0.456	0.498	***
PROCINN (d)	5058	0.357	0.479	3767	0.346	0.476	1291	0.392	0.488	***
INDPROD	5058	93.374	9.220	3767	93.188	9.277	1291	93.916	9.034	**
MKTEXIT	5058	0.051	0.051	3767	0.053	0.053	1291	0.046	0.044	***
MKTENTRY	5058	0.162	0.142	3767	0.164	0.142	1291	0.157	0.142	

Legend: for each variable used in the analysis, the mean values and standard deviation are reported; the last column reports the results of an F-test between *SUF*s and *not-SUF*s; *=sig. 10%; **=sig. 5%; ***=sig. 1%.

Some significant differences also exist with respect to the firms' strategic profiles. In particular, the proportion of most dynamic firms (*CLUTER1*) is larger for *SUFs* (19.9%) than for *non-SUFs* (16.2%) and the difference is statistically significant. Static firms (*CLUSTER3*) are significantly less frequent among *SUFs* (35.4%) than among *non-SUFs* (40.6%). No significant difference emerges instead with respect to moderately dynamic firms (*CLUSTER2*). Similar results are obtained when we compare the differences for some of the individual variables used to compute the clusters (*INTASSETS*, *ORGINN*, *PRODINN*, *PROCINN*): overall, *SUFs* are characterized by strategic profiles that are relatively more oriented towards investments (especially in immaterial assets) and innovation than *non-SUFs*.

With respect to demand and industry-related variables, the univariate analysis suggests that, on

average, *SUFs* operate in sectors that have experienced a smaller reduction in demand than *non-SUFs* (*INDPROD*). This result is in line with the simple intuition that, during the Great Recession, firm growth is favoured in contexts that exhibit a relatively small decrease in business opportunities. However, for both *SUFs* and *non-SUFs*, the index is smaller than 100, which suggests that *SUFs* are actually "swimming upstream" with respect to their industry's trend.

Finally, the variables related to the market share freed by exited firms (*MKTEXIT*) and the sales of new entrants (*MKTENTRY*) reveal two interesting findings. First, *SUFs* tend to be located in industries where the market share of exiting firms is significantly smaller than that of *non-SUFs*. Therefore, the departure of some firms does not seem to free up more space for the growth of others; rather, the contrary seems to be true – growth opportunities tend to be fewer when negative shocks drive several firms out of the market. Secondly, we find that *SUFs* and *non-SUFs* do not differ in terms of average market share of new entrants. In other words, the growth process that characterizes *SUFs* does not seem to be constrained by the fact that they operate in industries with fewer entrants than *non-SUFs*.

Overall, the descriptive statistics provide some initial support for our hypotheses. A more rigorous test, however, requires the use of multivariate analysis. This is precisely the aim of the next two sections.

4. Empirical strategy

We model the probability that a firm *i* is *SUF* as a function of three main types of variables. First, we consider firm-specific variables (XF_i) that include firm internal characteristics such as Log($SIZE_i$), Log(AGE_i), Log($LABPRDTY_i$), ROI_i, $FINEXP_i$, as well as dummies for highly dynamic and static strategic profiles, i.e., $CLUSTER1_i$ and $CLUSTER3_i$. Second, we consider variables related to the industry and demand dynamics (XD_i), including $INDPROD_i$, $MKTEXIT_i$, $MKTENTRY_i$. Third, we consider control variables (XC_i), such as the industry (2-digits Ateco) and the geographic region in which the firm operates. On this basis, we estimate the effect of each variable on the probability that a firm belongs to the top quartile of the distribution of sales growth during period 2007-2012.

Formally, our baseline model takes the following form:

$$\Pr(SUF_i = 1) = F(XF_i'\beta_F + XD_i'\beta_D + XC_i'\beta_C), \quad (1)$$

where $\Phi(\cdot)$ is the cumulative distribution function for the standard normal, and β_F, β_D and β_C are the vectors of parameters to be estimated. All independent variables in equation (1) are evaluated at the beginning of the period, i.e., during 2006-2007, and are used to predict the probability that firm *i* is *SUF* during the next 5 years. This should reduce the risk of biased estimates due to simultaneity. At the same time, the structure of the data does not allow us to exclude the possibility of model misspecification and omitted variable bias. However, the large number of variables, including dummies, to control for industry and region fixed effects, as well as the acceptable degree of correlation among regressors (see Table 4), make us confident enough to interpret the results. To estimate model (1), we rely on maximum likelihood (ML) estimation.

Table 4 – Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Log (SIZE)	1.00															
(2) Log (AGE)	0.27*	1.00														
(3) ROI	-0.04*	-0.05*	1.00													
(4) Log(LABPRDTY)	0.03*	0.09*	0.40*	1.00												
(5) FINEXP	0.01	-0.01	-0.02	0.02	1.00											
(6) CLUSTER1 (d)	0.17*	0.06*	-0.03	0.04*	0.00	1.00										
(7) CLUSTER2 (d)	0.02	0.01	-0.01	-0.02	0.01	-0.40*	1.00									
(8) CLUSTER3 (d)	-0.15*	-0.06*	0.03*	-0.01	-0.01	-0.37*	-0.71*	1.00								
(9) INTERNAZ (d)	0.15*	0.05*	-0.02	0.03*	0.01	0.60*	-0.24*	-0.22*	1.00							
(10) TANASSETS (d)	0.15*	0.09*	0.02	0.03*	0.01	0.14*	0.13*	-0.24*	0.02	1.00						
(11) INTASSETS (d)	0.11*	0.03*	-0.01	0.05*	0.00	0.77*	-0.33*	-0.25*	0.11*	0.14*	1.00					
(12) ORGINN (d)	0.12*	0.02	-0.01	0.03*	0.01	0.15*	0.20*	-0.32*	0.08*	0.08*	0.11*	1.00				
(13) PRODINN (d)	0.11*	0.04*	-0.02	0.00	0.01	0.14*	0.57*	-0.69*	0.11*	0.11*	0.10*	0.28*	1.00			
(14) PROCINN (d)	0.10*	0.05*	-0.02	0.02	0.01	0.11*	0.50*	-0.60*	0.11*	0.17*	0.07*	0.31*	0.38*	1.00		
(15) INDPROD	0.00	0.00	0.02	0.03*	0.01	0.00	-0.02	0.02	0.01	0.01	0.00	0.01	0.00	0.00	1.00	
(16) MKTEXIT	-0.03*	-0.03	-0.01	-0.05*	-0.02	-0.03*	0.00	0.02	-0.04*	-0.02	-0.02	-0.02	-0.01	-0.03	-0.05*	1.00
(17) MKTENTRY	-0.02	-0.02	0.01	-0.03*	0.01	-0.01	0.01	0.00	0.01	-0.01	-0.02	0.00	-0.01	0.00	-0.26*	0.02

Legend: *=sig. 5%

Our conjecture is that the different variables included in our baseline model may play different roles as determinants of sales growth depending on the point in the distribution that we consider. For instance, growth patterns at the very top of the distribution (say 10th decile) could be driven more by the firms' innovative capabilities than demand dynamics. On the other hand, growth performances in the middle of the distribution (say the median) may be more strictly associated with demand trends than innovation.

To test for these different types of effects, we estimate a set of quantile regressions. An important advantage of this method is that it reveals differences in the relationship between the dependent and independent variables at different points of the conditional distribution of the dependent variable (see Koenker and Hallock, 2001). The quantile regression model that we estimate can thus be written as follows (see Coad and Rao, 2008):

$$GROWTH_i = X_i' b_q + u_{qi} \qquad \text{with} \qquad \text{Quant}_q\left(GROWTH_i \middle| X_i\right) = X_i' b_q, \tag{2}$$

where $X_i = \left(XF_i, XD_i, XC_i\right)$ is the vector of regressors, $b = \left(b_F, b_D, b_C\right)$ is the vector of parameters to be estimated, and u is a vector of residuals. Quant$_\theta(\cdot)$ denotes the θ^{th} conditional quantile of $GROWTH_i$ given X_i. The θ^{th} regression quantile, $0 < \theta < 1$, solves the following problem:

$$\min_b \frac{1}{n}\left\{ \sum_{i:GROWTH_i \geq X_i' b} q\left|GROWTH_i - X_i' b\right| + \sum_{i:GROWTH_i < X_i' b} (1-q)\left|GROWTH_i - X_i' b\right| \right\} \tag{3}$$

$$= \min_b \frac{1}{n} \sum_{i=1}^{n} r_q\left(u_{qi}\right),$$

where $\rho_\theta(\cdot)$, which is known as the 'check function', is defined as

$$r_q\left(u_{qi}\right) = \begin{cases} q u_{qi} & if \quad u_{qi} \geq 0 \\ (1-q) u_{qi} & if \quad u_{qi} < 0 \end{cases} \tag{4}$$

The solution of this minimisation problem gives OLS estimates that approximate the θ^{th} conditional quantile of the dependent variable rather than the conditional mean. The model coefficients are therefore allowed to vary across quantiles of the conditional distribution of *GROWTH*, giving us the possibility of testing the performance of our explanatory variables at different points of *GROWTH*.

5. Results

5.1 Probit and quantile regressions

Table 5 reports the probit estimates for our model, translated into marginal and impact effects for the continuous and dummy variables, respectively. We add regressors included in XF_i and XD_i in blocks, estimating a total of three models (columns 1, 2 and 3). In the last column, we run an additional model, replacing the dummies for the firm strategic profiles with some of the individual variables that we used to compute the clusters (column 4). This estimate serves as a robustness check and tests for the existence of complementarity among the variables that qualify the clusters.

The first interesting result that we obtain concerns *AGE* and *LABPRTDY*. Being younger and more productive increases the probability of being *SUF* by 8% and 4% on average, respectively. These effects are significant and robust across all the estimated models. At the same time, neither *SIZE* nor profitability (*ROI*) seems to play a relevant role. While *ROI* is never significant, *SIZE* is positive and significant only in the model reported in column 1, where we include the variables related to firm characteristics. As soon as the dummies for strategic profiles are included, this effect disappears. No significant effect is found for *FINEXP* either. This suggests that the firms' financial conditions have played a relatively unimportant role in terms of growth constraints during the Great Recession.

The second group of variables that we include in our regressions consist of the dummies for strategic profiles, *i.e.*, *CLUSTER1* and *CLUSTER3*. Quite interestingly, while being a highly dynamic and proactive firm (*CLUSTER1*) increases the probability of being *SUF* by 4% on average, being a static and non-proactive firm (*CLUSTER3*) reduces it by 3% on average. This result is significant in both columns 2 and 3. Moreover, when we replace the cluster dummies with the individual variables (column 4), none of them, except *ORGINN*, turn out to be significant. This result suggests that, to be relevant for explaining high growth, these different types of activity need to be undertaken simultaneously or, in other words, that some degree of complementarity exists among them.

Finally, the last group of regressors that we consider include the variables related to the demand and industry dynamics. In this respect, the existence of a positive trend in demand at the industry level (*INDPROD*) increases the probability that the firm is *SUF* by only 0.1% on average, the share of market exit (*MKTEXIT*) reduces it by 27%, whereas market entry (*MKTENTRY*) is not significant. The result for *MKTEXIT* suggests that the process of high growth is far from favoured by the exit of competitors at the industry level. This result points to the existence of a relatively

slow and ineffective process of resource reallocation from exiting firms to surviving ones, which turns out to severely damage the latter. At the same time, the effect of *MKTENTRY* is not significantly different from zero, which means that the existence of new entrants does not limit the opportunities of further growth for incumbents. If anything, this result seems to provide more support for industry dynamics led by cumulative destruction than by creative destruction.

Table 5 – Determinants of firm growth: Probit regressions

	(1)	**(2)**	**(3)**	**(4)**
	Dep. Var.: dummy = 1 if the firm is SUF, 0 otherwise			
Log(SIZE)	0.011*	0.007	0.007	0.007
	(0.01)	(0.01)	(0.01)	(0.01)
Log(AGE)	-0.078***	-0.078***	-0.078***	-0.077***
	(0.01)	(0.01)	(0.01)	(0.01)
ROI	-0.069	-0.057	-0.059	-0.056
	(0.09)	(0.09)	(0.09)	(0.09)
Log(LABPRDTY)	0.040***	0.039***	0.038***	0.037***
	(0.01)	(0.01)	(0.01)	(0.01)
FINEXP	-0.001	-0.001	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)
CLUSTER1 (d)		0.037**	0.037**	
		(0.02)	(0.02)	
CLUSTER3 (d)		-0.026*	-0.026*	
		(0.01)	(0.01)	
INDPROD			0.001*	0.001*
			(0.00)	(0.00)
MKTEXIT			-0.272**	-0.271**
			(0.13)	(0.13)
MKTENTRY			-0.023	-0.024
			(0.05)	(0.05)
INTERNAZ (d)				0.04
				(0.03)
TANASSETS (d)				-0.014
				(0.01)
INTANASSETS (d)				0.026
				(0.02)
ORGINN (d)				0.028**
				(0.01)
PRODINN (d)				0.013
				(0.01)
PROCINN (d)				0.014
				(0.01)
Regional dummies	*yes*	*yes*	*yes*	*yes*
Industry dummies	*yes*	*yes*	*yes*	*yes*
Obs	5058	5058	5058	5058
LogL	-2738.499	-2732.32	-2728.14	-2725.615
Chi2	253.999***	264.275***	274.238***	279.715***

Legend: robust standard errors in parentheses; marginal effects evaluated at the means of the independent variables for the unconditional expected values of the dependent variable are reported; for binary variables, the discrete change from 0 to 1 is reported. *=sig. 10%; **=sig. 5%; ***=sig. 1%

A richer set of results is obtained from the estimates of the quantile regressions. For the sake of simplicity, we only report in Table 6 the results for the median (50th percentile), as well as the 75th and 90th percentiles. In this case, the impact of each variable can be investigated in greater detail.

Table 6 – Determinants of firm growth: quantile regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var.: GROWTH (50th perc.)		Dep. Var.: GROWTH (75th perc.)		Dep. Var.: GROWTH (90th perc.)	
Log(SIZE)	0.0185***	0.0170***	0.0051	0.006	-0.0265*	-0.0314*
	(0.0063)	(0.0057)	(0.0076)	(0.0083)	(0.0139)	(0.0172)
Log(AGE)	-0.0435***	-0.0464***	-0.1079***	-0.1120***	-0.1679***	-0.1594***
	(0.0139)	(0.0125)	(0.0169)	(0.0184)	(0.0312)	(0.0381)
ROI	0.0042	0.024	-0.0603	-0.0245	-0.1106	-0.0586
	(0.0946)	(0.0848)	(0.1107)	(0.1198)	(0.2165)	(0.2621)
Log(LABPRDTY)	0.0681***	0.0687***	0.0504***	0.0492***	0.0276	0.0306
	(0.0123)	(0.0111)	(0.0156)	(0.0170)	(0.0333)	(0.0402)
FINEXP	-0.0004	-0.0011	-0.002	-0.0017	-0.0002	-0.0072
	(0.0031)	(0.0027)	(0.0037)	(0.0040)	(0.0053)	(0.0065)
CLUSTER1 (d)	0.008		0.0556**		0.1158***	
	(0.0186)		(0.0220)		(0.0395)	
CLUSTER3 (d)	-0.0250*		-0.0280*		-0.0657**	
	(0.0143)		(0.0170)		(0.0304)	
INDPROD	0.0002	0.0002	0.0008	0.0006	0.0008	0.0006
	(0.0007)	(0.0007)	(0.0009)	(0.0009)	(0.0017)	(0.0020)
MKTEXIT	-0.4065***	-0.4034***	-0.5100***	-0.4234**	-0.4650*	-0.4663
	(0.1329)	(0.1200)	(0.1617)	(0.1751)	(0.2500)	(0.3088)
MKTENTRY	-0.0181	-0.0072	-0.067	-0.0825	-0.0974	-0.1798
	(0.0475)	(0.0427)	(0.0564)	(0.0616)	(0.1007)	(0.1224)
INTERNAZ (d)		-0.0009		0.0268		0.103
		(0.0235)		(0.0336)		(0.0686)
TANASSETS (d)		0.0278**		0.0025		-0.0378
		(0.0124)		(0.0178)		(0.0357)
INTANASSETS (d)		0.0166		0.0338		0.026
		(0.0180)		(0.0257)		(0.0508)
ORGINN (d)		0.0364***		0.0544***		0.0575
		(0.0131)		(0.0190)		(0.0382)
PRODINN (d)		0.0077		0.025		0.0829**
		(0.0130)		(0.0186)		(0.0373)
PROCINN (d)		0.0064		0.0017		0.0124
		(0.0136)		(0.0195)		(0.0389)
Regional dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Industry dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Costant	-0.9091***	-0.9592***	-0.3668*	-0.3658	0.445	0.2804
	(0.1714)	(0.1540)	(0.2094)	(0.2285)	(0.4084)	(0.5086)
Obs	5058	5058	5058	5058	5058	5058

Legend: standard errors in parentheses; *=sig. 10%; **=sig. 5%; ***=sig. 1%

First, we find that, in line with the results of the probit estimates, firm profitability (*ROI*) is never significant in explaining sales growth. *SIZE* is positive and significant in the median (columns

1 and 2), not significant in the 75th percentile (columns 3 and 4), and becomes negative and weakly significant in the 90th percentile (columns 5 and 6), which suggests that fast-growing firms tend to be smaller than the others on average. *LABPRDTY* is positive and significant both in the median and 75th percentile, but not in the 90th percentile. Once again, *AGE* is by far the firm characteristic with the strongest effect: across all the considered portions of the distribution, the younger the firm, the higher the growth rate. It is interesting that the absolute value of the coefficient of *AGE* increases as we move rightward in the distribution of *GROWTH.* In particular, at the 90th percentile, it is nearly 4 times larger than at the median. The evidence therefore suggests that, when we consider fast-growing firms, being young makes an important contribution to superior growth performance.

The quantile regressions provide additional evidence in favour of the limited role of financial constraints in explaining firm growth. Similar to the probit estimates, the coefficient of *FINEXP* is in fact not significantly different from zero at all considered percentiles. This result strengthens even further the idea that, during a recession, the main sources of firm growth lay elsewhere and are not strictly related to financial conditions.

Similar to firm age, the heterogeneity of strategic profiles is confirmed as one of the strongest predictors of firm growth during the Great Recession. In all the considered portions of the distributions, being a static and non-proactive firm (*CLUSTER3*) has a negative and significant effect on sales growth. At the same time, being a proactive and highly dynamic firm (*CLUSTER1*) has a positive and significant effect both in the 75th and 90th percentile. In line with the probit estimates, these effects seem to be driven by a composite mix of activities. Moreover, it is interesting that the absolute value of the coefficients at the 90th percentile for *CLUSTER1* is respectively 2 and 14 times higher than at the 75th percentile and median (note, however, that the coefficient is not statistically significant in the latter case), which suggests that being a proactive and highly dynamic firm is particularly important for explaining exceptionally fast processes of growth.

Finally, for the variables related to the demand and industry dynamics, we obtain results that are partially in line with the probit estimates. In this case as well, the coefficient associated with *MKTEXIT* is negative and significant, and this result holds for all the considered percentiles. At the same time, we find no significant effect for *MKTENTRY*. Combined, these results confirm that, during the Great Recession, there has been a relatively slow process of resource redistribution from exiting to surviving firms as well as a dominance of cumulative destruction over creative destruction. Quite interestingly and differently from the probit estimates, we find that the proxy for the demand dynamics (*INDPROD*) is never significant in the quantile regressions.

5.2 Heckman's correction

One could argue that the estimation results reported above are affected by selection bias. Indeed, both the probit and the quantile regression models are based on observations that refer only to the firms that survived during the period 2008-2012 and do not take into account the firms that exited. This could potentially bias the estimated coefficients.

In this section, we address this issue by carrying out a robustness check based on a heckprobit model, *i.e.*, a selection model that accommodates the binary nature of our dependent variable. In particular, we follow two steps: first, we exploit the information contained in the AIDA-BVD database to distinguish between the firms that exited the market by 2012 and those that survived (for a similar approach, see Landini et al., 2015); second, we run a heckprobit model for the probability of being *SUF* where the selection equation takes a dummy with a value equal to 1 as a dependent variable if the firm survived. As a selection variable, we consider the ratio between liquid resources and total assets (*LIQUIDITY*).

Table 7 reports the results of the heckprobit estimates for both the selection equations (columns 1 and 2) and main equation (columns 3 and 4). Columns 5 and 6 report the estimated marginal effects for the probability of being *SUFs*. As we can see, even after controlling for possible selection bias, most of the previous results hold. Comparing the results of the selection equation with the results of the main equation, it is interesting that, during the Great Recession, firm survival and growth seem to be driven by relatively different variables. For a more detailed discussion of this diversity in the explanatory models see Arighetti et al. (2015).

Table 7 – Determinants of firm growth: Heckprobit

	(1)	(2)	(3)	(4)	(5)	(6)
	Selection		**Main**		**Marginal Effects**	
	Dep. Var.: dummy = 1 if the firm is alive, 0 otherwise		**Dep. Var.: dummy = 1 if the firm is SUF, 0 otherwise**		**Dep. Var.: dummy = 1 if the firm is SUF, 0 otherwise**	
Log(SIZE)	0.036	0.035	0.025	0.023	0.007	0.007
	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
Log(AGE)	0.151***	0.148***	-0.236***	-0.231***	-0.071***	-0.070***
	(0.06)	(0.06)	(0.04)	(0.04)	(0.01)	(0.01)
ROI	3.504***	3.494***	0.069	0.079	0.021	0.024
	(0.61)	(0.62)	(0.31)	(0.31)	(0.09)	(0.09)
Log(LABPRDTY)	0.213***	0.212***	0.142***	0.139***	0.043***	0.042***
	(0.05)	(0.05)	(0.04)	(0.04)	(0.01)	(0.01)
FINEXP	-0.012	-0.012	-0.003	-0.003	-0.001	-0.001
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
CLUSTER1 (d)	-0.097		0.098*		0.030*	
	(0.07)		(0.05)		(0.02)	
CLUSTER3 (d)	-0.049		-0.088**		-0.026**	
	(0.06)		(0.04)		(0.01)	
INDPROD	-0.001	-0.001	0.004*	0.004*	0.001*	0.001*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MKTEXIT	-2.002***	-1.994***	-1.014**	-1.016**	-0.306**	-0.306**
	(0.44)	(0.44)	(0.42)	(0.42)	(0.13)	(0.13)
MKTENTRY	0.191	0.191	-0.054	-0.056	-0.016	-0.017
	(0.20)	(0.20)	(0.14)	(0.14)	(0.04)	(0.04)
INTERNAZ (d)		-0.096		0.109		0.034
		(0.10)		(0.08)		(0.02)
TANASSETS (d)		0.036		-0.038		-0.012
		(0.05)		(0.04)		(0.01)
INTANASSETS (d)		-0.037		0.073		0.022
		(0.08)		(0.06)		(0.02)
ORGINN (d)		-0.053		0.088**		0.027**
		(0.06)		(0.04)		(0.01)
PRODINN (d)		0.001		0.038		0.012
		(0.06)		(0.04)		(0.01)
PROCINN (d)		0.068		0.054		0.016
		(0.06)		(0.04)		(0.01)
LIQUIDITY	0.763**	0.756**				
	(0.33)	(0.33)				
Regional dummies	*yes*	*yes*	*yes*	*yes*		
Industry dummies	*yes*	*yes*	*yes*	*yes*		
Costant	-1.544**	-1.580**	-2.034***	-2.070***		
	(0.62)	(0.63)	(0.50)	(0.49)		
Obs	5500	5500	5500	5500		
LogL			-4166.172	-4162.36		
Chi2			241.817***	248.404***		

Legend: robust standard errors in parentheses; *=sig. 10%; **=sig. 5%; ***=sig. 1%

5.3 Discussion

Bringing together the results obtained from the probit, quantile, and heckprobit regressions, we derive a fairly encouraging picture concerning the test of our theoretical hypotheses. First, in accordance with *HP1a*, we find age to be a significant predictor of firm growth. This is true, in particular, for firms that experience fast growth processes. Instead, contrary to *HP1a*, we find size to be a relatively weak predictor. Although this result seems to go against part of the available evidence, it is important to note that our data refers to growth process taking place during a deep recession, which has probably shrunk most growth opportunities, especially for small firms.

With respect to *HP1b*, we find support for the role of firm productivity as a driver of growth. No evidence is instead obtained in support of the contribution of profitability. This difference suggests that the growth of manufacturing firms was fuelled more by internal efficiency than by profit during the Great Recession. This result has interesting policy implications for the arguments that tax cuts on profit margins are needed to foster growth (on this point, see also Bottazzi et al., 2010).

The test of *HP1c* points instead toward a rejection. In all the estimated models, the proxy of the firm financial exposure is not significant. This result is somewhat surprising given the relevance that finance-related indicators are attributed in the current debates on the Great Recession. At the same time, this result confirms the idea that growth is a process that has strong links with firm fundamentals, which have more to do with innovation capabilities than with financial conditions (for similar results, see D'Aurzio et al., 2015).

This idea is also confirmed by the test of *HP2* that concerns the role of strategic profiles. All the estimated models reveal that firms with high (low) orientation towards innovation, investments, and internationalization–what we called proactive and dynamic firms–have higher (lower) chances of growing during the Great Recession. Moreover, this effect seems to be driven by a composite strategy that combine several dimensions, from R&D and export to investments in both tangible and intangible assets.

Finally, the test of the hypotheses that relate to the demand and industry dynamics provides some interesting findings. First of all, in line with *HP3b*, there seems to be a relatively weak process of resource reallocation from firms that exit to firms that survive during the Great Recession. In other words, the market share that is freed by the firms that exit does not leave more space for the firms that remain, but the opposite is true. In the context of deep transformation of the industrial structure, a severe process of firm exit brings with it a loss of resources that eventually constrains the growth opportunities of surviving firms.

With reference to *HP3a* and *HP3c*, our empirical exercise achieves two results. First of all,

during the Great Recession, growth has been favoured in those contexts in which demand has reduced relatively less, although this effect is small on average. Secondly, industrial dynamics seem to have been driven more by a process of cumulative destruction than creative destruction. The latter result partially confirms the evidence reported by Archibugi et al. (2013).

6. Conclusion

This paper attempted to study the heterogeneity of firm growth during the Great Recession. In particular, the focus has been on the behaviour of *swimming upstream firms (SUFs)*, i.e., firms that, despite of the negative shock caused by the recession, exhibited remarkable growth performances. Overall, we achieve three main results. First, we find that *SUFs* exhibit some firm-specific characteristics: they are younger and relatively more productive than *non-SUFs*. At the same time, we find no significant differences in their size, level of profitability, or financial exposure. Second, *SUFs* adopt highly proactive strategic profiles, placing high relevance on activities related to innovation, intangible investments, and internationalization. Third, *SUFs* tend to react to changes in market opportunities, although they suffer from sticky processes of resource reallocation between exiting and surviving firms. Moreover, their growth seems to take place primarily within a regime of cumulative destruction rather than creative destruction.

These results have interesting implications for both managers and policymakers. For managers, they provide further evidence of the role managerial strategies oriented towards innovation and internationalization play in fostering firm performance. If this is true in general, it is even more important during a recession, when competition to retain residual market opportunities becomes tougher. With respect to policymakers, the most relevant implications are of two types. First, our results show that the recession has not reduced the variety in firm behaviours in the manufacturing system. Rather, it has left room for highly differentiated conducts. At the industry level, this translates into a high degree of firm heterogeneity, which deprives industries of their habitual explanatory power in understanding (and possibly fixing) the impact of the Great Recession. Policymakers should take this into account while designing their interventions. Second, our analysis suggests that, during the recession, the average reduction of sales in the manufacturing sector was partly counterbalanced by growth processes driven mainly by highly innovative incumbent firms. In this sense, at least during a recession, policy interventions aimed at sustaining the accumulation of innovative capabilities of already existing firms should be favoured over interventions to foster firm restructuring via new entry.

Obviously, these results can be improved in several ways. In particular, we highlight two. First, it

could be interesting to deepen the analysis of creative destruction as opposed to cumulative destruction as a driver of industrial change. To do so, however, some more detailed firm-level data on the entry and exit dynamics are required. Second, an analysis of how the Great Recession has impacted strategies adopted by firms would be of value. In this sense, it could be particularly interesting to evaluate how flexible firms are in their strategic choices and whether such flexibility translates to improved market performance.

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