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ASSESSING THE DETERMINANTS
OF HIGH-GROWTH FIRMS IN ITALY

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Abstract

Few firms grow rapidly, but their contribution to employment growth is often impressive. The main purpose of this paper is to analyse both the external and internal factors that can affect the probability of being a high-growth firm (HGF) in Italy. We found that HGFs are, on average, young firms and are present in different sectors, but the role of demand is important to understanding their performance at the sectoral level. Moreover, our findings show that financial constraints and profitability are not associated with the probability of being a HGF. HGFs, on average, are characterised by high productivity, but only when growth is measured in terms of sales. The most original results of this study concern the endogenous determinants of rapid growth, which have yet to be adequately examined in the literature. First, we found that the concentration of ownership is important for HGFs that grow in sales. Second, the quality of human capital is a strong point for firms experiencing rapid employment growth.

Keywords: high-growth firms, human capital, manufacturing industries; Italy

JEL code: D24; L25; L26.

1 Introduction¹

Firm growth is a selective and heterogeneous phenomenon. Only a very small percentage of active firms increase their sales and workforces significantly. The available evidence demonstrates that “most firms start small, live small and die small” (Davidsson et al. 2005, pp. 7). Few firms seem to grow rapidly, but their contribution to employment growth is often impressive. Over a short period of time, a limited number of agents generate most of the variation and increases in employment, organisational innovation and sales (Delmar and Davidsson 1998; Bruderl and Preisdorfer 2000). Using a quantile regression approach, Coad and Rao (2008) observed that innovation has a crucial impact on performance only for a handful of ‘superstar’ fast-growth firms (on this issue see also: Holzl 2009, Goedhuys and Sleuwaegen 2010, and Stam and Wennberg 2009).

A number of factors underpin the increasing attention on high-growth firms. According to some scholars (Anyadike-Danes *et al.* 2009), high-growth firms are ‘engines of creative destruction’ at the sectoral level and are fundamental for increasing long-term productivity. In addition, their contribution to job creation is decisive in advanced industrial systems. Accordingly, Hart *et al.* (2009) observed that, regardless of which universe of firms is considered, a limited subset of HGFs is largely responsible for the bulk of net employment growth. In the UK, high-growth firms account for 6% of the total population² but half of the 2005-2008 increase in employment (Anyadike-Danes *et al.* 2009). Kirchoff (1994) showed that between the end of the 1970s and the beginning of the 1980s, 4% of firms were responsible for 75% of total employment growth in the US manufacturing sector. Davidsson and Delmar (1997) estimated that during 1987-96 in Sweden, a decline of approximately 70,000 units in industrial employment was the net result of 185,000 new jobs in HGFs and 255,000 jobs lost by other firms. Several surveys have confirmed these regularities (see Davidsson et al. 1998; Henrekson and Johansson 2010).

The aim of the present work is twofold. First, it focuses on demonstrating that in Italy, the growth in the size of manufacturing firms in recent years is largely due to high-growth firms. Second, it seeks to identify variables able to explain the probability of being a “high-growth firm” (HGF).

As discussed in Nystrom (2009), Anyadike-Danes *et al.* (2009) and Parker et al. (2010), it is important to understand the high growth phenomenon, not only for analytical purposes. A proper model would also be useful to policy makers to design adequate support policies for more robust firms and improve the competitiveness of industrial systems.

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² The population of reference consists of firms having 10 employees or more.

We found that HGFs are, on average, young firms and are present in different sectors, but the role of demand is important to understand their performance at the sectoral level. Moreover, our findings reveal that financial constraints and profitability are not associated with the probability of being a HGF. HGFs, on average, are characterised by high productivity, but only when growth is measured in terms of sales. The most original results of this paper concern the endogenous determinants of rapid growth, which have yet to be adequately examined in the literature. First, we found that the concentration of ownership is important for HGFs that grow in sales. Second, the quality of human capital is a strength of firms experiencing rapid employment growth.

The paper is organised as follows. Section 2 examines the relevant literature, selecting the main hypotheses for explaining the rapid growth of firms. In Section 3, we present the database and some explorative statistics to provide a preliminary overview of rapid growth in the Italian manufacturing sector. In addition, Section 4 illustrates the variables to be used in the econometric model. Section 5 presents our econometric results, while some robustness checks are performed in Section 6. In Section 7, we discuss these results. Finally, Section 8 concludes.

2 Literature and hypotheses

Despite the importance of the issues concerning HGFs and a growing body of literature addressing them, we have no solid consensus framework or sufficient empirical evidence upon which to construct generalisations (Davidsson and Delmar 1997; Davidsson et al. 2005; Parker et al. 2010).

One of the subjects on which there is still no satisfactory agreement among scholars concerns certain crucial methodological aspects such as the definition and measurement of HGFs. There is no common consensus regarding how to approach organic or external size growth, or regarding the variables that should be used to measure growth³. There is also a diversity of approaches regarding the time period within which the phenomenon is measured and different preferences regarding the use of single variables or multiple indicators. Different preferences are also found concerning the use of relative growth (with respect to a given population of firms operating in one sector or country) or absolute growth (Delmar et al. 2003; Moreno and Casillas 2007; Weinzimmer 2000; Hart *et al.* 2009). These differences are partly due to the information available in the databases employed, which often represent insuperable limitations and in some cases impose obligatory choices. Nevertheless, it remains doubtful whether comparisons can be drawn among empirical studies that utilise strikingly different methodologies and definitions. These differences are indeed very stark: Birch (1987), in one of the first studies on HGFs, identifies these firms in terms of variation in turnover ($\geq 20\%$) over a particular number of years starting from a minimum sales figure. The definition used by the OECD (1998) is also different and refers to “*a firm with an average employment growth rate exceeding 20% per annum over a three-year period and with ten or more employees at the start of the*

³ For a multidimensional approach to the analysis of firm growth processes, see Coad *et al.* 2011.

period". Acs et al. (2007) rely on a definition based on turnover (growth of at least 100% in four years) and an employment growth quantifier (that measures the relationship between absolute value and percentage value) of at least two in the same period. Finally, firms are considered to be "high growth" if they lie within the first decile (quintile) of the decreasing ranking of the firms with respect to the employment (or turnover) growth rate in a time period between 5 and 10 years, starting from variable initial sizes but often greater than zero (see for example Delmar, Davidsson and Gartner 2003; Schreyer 2000).

The primary contributions on the topic demonstrate that high-growth firms are not over-represented in some sectors and under-represented in others. Although technology has a positive influence on the growth paths of firms in the start-up phase (Brixy and Kohaut 1999), no significant relationship is observed among the level of innovation in the firm, the technological intensity of the sector and rapid growth (Wyrwich 2010). Similarly, the degree of maturity of the industry does not act as an important detriment to the appearance of rapid growth phenomena (Anyadike-Danes *et al.* 2009; Hart *et al.* 2009).

The hypothesis of a lack of correlation between the sector and a firm's propensity for rapid growth will be tested for the Italian manufacturing industry. This analysis would appear to be of great interest considering the anomalous character of Italian productive specialisation compared to other industrialised countries (high concentration in traditional industries, low presence in high-tech sectors, and a low average size of manufacturing firms) and the possibility of introducing control variables hitherto unused, such as variations in the production indices in the study period and trends in sectoral industrial demography. In brief, our first hypothesis is:

Hypothesis 1 – Firms belonging to particular industries are not likely to be HGFs

Several empirical studies have demonstrated that firm growth is negatively associated with initial size. The majority of existing studies reject Gibrat's Law (Goddard et al. 2002; Becchetti and Trovato, 2002; Correa Rodriguez *et al.* 2003; Oliveira and Fortunato, 2006; Teruel-Carrizosa 2010; Arrighetti and Ninni, 2009). In addition, they emphasise that start-up firms frequently enter markets with sub-optimal sizes. Lastly, these works show that firm growth in many cases represents a survival condition (Audretsch and Santarelli, 2007). Such evidence appears to be consistent with theoretical models (for example, Jovanovic 1982; see also Kamshad 1996) predicting that the sub-optimal entry and subsequent growth contribute to the exploration of market opportunities and checking the level of entrepreneur's managerial competencies. Nevertheless, some studies (Lotti et al. 2001 and 2003; Becchetti and Trovato, 2002, Correa Rodriguez *et al.* 2003) show that growth is not correlated with size, in particular when the sample examined consists of large or medium firms. Thus, the following hypothesis seems worth verifying:

Hypothesis 2 – The higher is the initial firm size, greater the likelihood of being a HGF

A number of studies have suggested that there is a relationship between a firm's age and its rate of growth. In particular, influential interpretation frameworks such as resources-based models perceive growth as stemming from the accumulation of skills (Wernerfelt 1984; Galbreath 2005; Tan and Mahoney 2005; Meyer 2006). It follows that if the process of skill consolidation requires time, age matters and, in this case, in a way favourable to growth. Hence, there is room for growth even for relatively mature firms, when considering rapid growth phenomena. Indeed, Anyadike-Danes *et al.* (2009) remarks that high-growth firms are more likely to be young, but considering the high incidence of older firms in the overall population, the majority of HGFs tend not to be young ones. Moreover, most studies found that firms tend to grow when they are young, partly, as was already mentioned, to match their effective size with the optimal one after starting up and testing their ability to compete in the sector, and partly because young firms have less bureaucratic decision-making procedures than older firms. Therefore, young firms are able to take more extensive advantage of the growth opportunities emerging in the markets (Cassia *et al.* 2009). The inverse correlation between age and growth is documented in several empirical studies (Evans 1987a and b; Dunne and Hughes 1994; Farinas and Moreno 2000; Sutton 1997; Almus and Nerlinger 1999; Yasuda 2005). A means of reconciling the two conflicting approaches is provided by Coad *et al.* (2010). They found that "firms improve with age, because ageing firms are observed to have steadily increasing levels of productivity, higher profits, larger size". However, the performance and responsiveness of firms to external opportunities worsens with age. Younger firms show higher expected growth rates in sales, profits and productivity than older ones. Consequently, although older firms cannot be ruled out, younger firms have a higher potential and organisational flexibility to move onto an accelerated growth path. Given these considerations, we articulate our third hypothesis as follows:

Hypothesis 3 – The younger the firm, the more likely it is to be a HGF

A clear consensus regarding the relationship between the productivity levels and growth rates of firms has not been reached in the literature. High (or increasing) productivity can be the result of an increase in the firms' economic activities. However, the direction of causality may be reversed: a rise in productivity is able to increase the competitiveness of the firm and enhance output and size growth.

With respect to theory, it would be natural to assume that competition will force firms to struggle for growth opportunities. According to this view, market selection would discriminate in favour of the most productive firms. However, there is little empirical support for a positive link between productivity and growth. For example, Bottazzi *et al.* (2002) (and Bottazzi *et al.* 2006) fail to find robust evidence for this relationship using Italian data. Baily, *et al.* (1996) also find that a productivity increase can occur as a result of downsizing processes. Finally, high levels of productivity can be associated with both a fall in the number of employees and an increase in sales. Even if the literature on this topic does not seem to have reached conclusive results, some partial findings are present. In this sense, Acs and Audretsch (1990), using microdata, show that changes in productivity levels can produce a direct and significant impact on sales growth.

As suggested by Coad (2007): “the evidence is consistent with the hypothesis that many of the more productive firms may not actually seek to grow, or may be unable to grow.” We decided to introduce the variable “productivity” in our regressions because in previous studies, this test was not formulated in the case of high-growth firms. Thus, our fourth assumption is:

Hypothesis 4 – More productive firms have a greater probability of being a HGF.

It has frequently been claimed that access to credit and the availability of internal financial resources had a decisive impact on growth (Carpenter and Petersen 2002; Huynh and Petrunia 2010). More recently, Becchetti and Trovato (2002) have shown that financial constraints on growth only hinder small firms but not large ones. Bottazzi et al. (2008) found that severe financial difficulties might be compatible with high levels of productivity, profitability and growth. One stream of the literature has emphasised the importance of the degree of evolution and effectiveness of the financial system as a component of entrepreneurship dynamics (Rajan and Zingales 1995 and 1998) and a significant factor in firm growth (Demirgüç-Kunt and Maksimovic 1998). This topic is particularly critical where HGFs are concerned. Moreno and Casillas (2007) analyse some aspects of the capital structure of HGFs. They compare HGFs’ structures with those of firms with intermediate growth or that are in decline. The conclusions are that HGFs on certain occasions exhibit lower levels of solvency and initial liquidity than other firms. Cassia *et al.* (2009) indicate that rapid growth is correlated with a particularly high leverage ratio and a medium level of solvency. The explanation provided by these scholars is that the dynamics of HGFs are frequently accompanied by debt utilisation. The literature on this topic is still modest, and further tests must be conducted. Therefore, we include another hypothesis in our model:

Hypothesis 5 – The higher a firm’s profits and level of solvency (and leverage), the greater the likelihood that a firm is a HGF

Firm ownership impacts performance, with a particular influence on rapid size growth (Bjuggren et al. 2010). Furthermore, patterns of accelerated growth require particularly efficient structures of control and governance⁴. Independent firms have more adaptable strategies than those belonging to a group. Moreover, firms owned and managed by one or few persons tend to be more flexible than those with multiple owners. Therefore, both types of enterprises are generally more able to take advantage of possible growth opportunities (Parker, Storey and Van Witteloostuijn 2010). Conversely, firms belonging to a group have several opportunities to access a wide variety of technological, market and financial resources, and institutions, as the group as a whole makes these resources available to its members (Barney 1991; Cassia *et al.* 2009). Moreover, firms belonging to a group have greater access to resources, information and financial institutions compared to a single entrepreneurial firm. In addition, firms belonging

⁴ Different features of the board structure, as is well known, impact efficiency and firm performance. Among others see Tanna et al. (2011).

to a group are better able to share risk, and they show a greater risk-bearing ability than independent firms (Barringer et al. 2005). However, fast growth involves a rapid and stable decisional process towards strategic goals. These characteristics seem to be more fundamentally associated with a concentrated management structure, where there is no ambiguity in the attribution of control rights. Accordingly, our sixth hypothesis to be examined is:

Hypothesis 6 – The more concentrated a firm’s ownership, the greater the likelihood that a firm is a HGF

Growth involves complex processes that require high levels of human, entrepreneurial and managerial capital. Leaving aside studies on skills and managerial talent (Lucas 1978) and the educational level of the entrepreneur (Bates 1990) that address important but specific topics, we find that the literature on the influence of human capital on growth is fairly modest (the limited number of contributions include Acs and Audretsch 1990; Cooper et al. 1994; Kangasharju and Pekkala 2002; Pena 2004; Raffa and Zollo 1996; Colombo and Grilli 2005; Coad et al. 2011). The limited knowledge regarding the role of human capital in HGFs is also surprising. Previous studies have shown that there is a positive relationship between human capital and the performance of the firms. According to Colombo and Grilli (2005), human capital influences firm growth, not only via the ‘wealth effect’, but mainly through a ‘capacity effect’ consisting of the ability to select, mobilise, and exploit tangible and intangible firm resources to perform tasks efficiently. New firms achieve better results with respect to financial and growth indicators when the leading roles are assumed by entrepreneurs/managers possessing high formal education and prior professional experience. Individuals with greater human capital are likely to have better entrepreneurial judgment. In particular, managers with relevant endowments of human capital are able “to seize neglected business opportunities and to take effective strategic decisions that are crucial for the success of the new firm” (Colombo and Grilli 2005). The main assumption in the majority of existing studies is that a more highly educated and trained workforce allows the firm to utilise fixed capital, renders the firm more competitive and thus fuels growth (Lopez-Garcia and Puente 2011; see also Cooper, Gimeno-Gascon and Woo 1994). Considering these features, the need for further investigation of the relationship between growth and human capital appears justified. Therefore, we need to test the following:

Hypothesis 7 – Greater the firm’s human capital, the greater the likelihood of being a HGF

3. Data, definitions and descriptive analysis

Our empirical analysis relies on an original dataset obtained by matching and merging data from the VIII and IX waves of the Survey on Manufacturing Firms collected by Capitalia. The data span the 1998-2003 period. The survey provides detailed qualitative and quantitative information on a large, stratified sample of

Italian firms. After checking the data⁵, the final dataset includes more than 770 observations. There are several possible criteria to classify a firm as a HGF. A large number of prior studies identified HGFs by selecting a specific percentage of the fastest growing firms in an economy or by defining a threshold of growth above which growth is considered to be “high”. We decided to use the following definition: all firms belonging to the top 10% of the fastest growing firms in a 5-year period are HGFs. As suggested by Delmar, Davidsson and Gartner (2003), we examine two different measures of firm growth and have thus identified two categories:

- the “HGF-EMP” group includes all firms belonging to the top 10% of the fastest growing firms in terms of employment;
- the “HGF-SALES” group includes all firms belonging to the top 10% of the fastest growing firms in terms of sales.

Table 1 shows that in the 1998-2003 period, for all firms in the sample, the total increase in employment level is 1,271 jobs (approximately +2.5%). This change is, however, the result of a marked growth on the part of HGFs: an increase of 3,075 jobs (approximately +70%). For all of the other firms, the change in employment is negative, with a decrease of more than 1,800 jobs (approximately -4%).

Table 1 – Employment growth in all firms 1998-2003: absolute values and percentages

	Nr	Total employees 1998	Total employees 2003	Absolute change	Percentage change
HGFs	77	4,348	7,423	3,075	+70.7
Other firms	703	45,712	43,908	-1,805	-3.9
of which, growing	350	19,800	22,699	2,899	+14.6
of which, declining	353	25,912	21,209	-4,704	-18.2
Total	780	50,060	51,331	1,271	+2.5

Source: elaborations on VIII and IX CAPITALIA manufacturing firm survey data.

These data are confirmation of a stylised fact that is frequently reported in the literature (see Section 2): the contribution HGFs make to employment is very important. The figures in Table 1 indicate another important fact: a few firms are responsible for a very high proportion of overall job creation in the manufacturing sector. In Table 2, further descriptive statistics are reported. In this case, it is worth observing that the increase in sales for HGFs is nearly 73%, while for other firms the corresponding figure is only 14%. Additionally, HGFs exhibit, on average, a high level of profits (proxied by ROE). Moreover, the share of

⁵ In particular, the number of firms surveyed in both the VIII and IX waves of the survey is approximately 1,100. We exclude firms with initial sizes (year 1998) below 15 or over 2,000 employees. After dropping firms with missing data and other outliers, the final number of observations is 777.

graduates in the HGF work force is higher than the average, and the age is relatively low.

Table 2 – Descriptive statistics – sample for HGF-EMP models

	All firms		Other firms		HGF-EMP		T-test for mean differences
	Mean	StDv	Mean	StDv	Mean	StDv	
% change in employm. 1998-200	4.6	33.2	-2.9	19.9	73.9	48.0	-26.3***
% change in sales 1998-2003	19.8	43.2	14.0	39.3	72.9	41.4	-49.5***
Sales 1998 (€ x,000)	10.4	24.9	10.1	23.7	12.8	34.0	-0.8
ACQUISITION (dummy)	0.13	0.34	0.12	0.32	0.25	0.44	
AGE	29.0	15.9	29.9	16.2	20.9	10.1	4.7***
ROE	6.0	70.8	4.0	66.8	24.8	98.8	-2.4
% graduates in labor force	3.4	6.1	3.2	5.6	5.4	9.6	-2.9
TFP estimated (log)	1.3	0.1	1.3	0.1	1.3	0.1	-0.7
OWNERSHIP_CONTROL	53.7	26.3	53.2	26.0	58.0	28.0	-1.5

Source: elaborations on VIII and IX CAPITALIA manufacturing firm survey data.

Note: 777 observations for “All firms”, 700 observations for “Other firms” and 77 observations for “HGF-EMP”. The group “HGF-EMP” includes all firms belonging to the top 10% of fastest growing firms in terms of employment. ***= sig. 1%, **=sig. 5% and *= sig. 10%.

Similar assertions can be made regarding the figures presented in Table 3, where data on HGF sales growth are reported.

Table 3 – Descriptive statistics – sample for HGF-SALES models

	All firms		Other firms		HGF-SALES		T-test for mean differences
	Mean	StDv	Mean	StDv	Mean	StDv	
% change in employm . 1998-2003	4.6	33.2	1.3	31.0	35.4	36.9	-8.9***
% change in sales 1998-2003	19.8	43.2	9.7	30.0	111.3	37.2	-27.5***
Sales 1998 (€ x,000)	10.4	24.9	10.6	25.6	8.4	16.7	-0.7
ACQUISITION (dummy)	0.13	0.34	0.1	0.3	0.2	0.4	
AGE	29.0	15.9	29.5	15.7	24.9	17.0	2.4***
ROE	6.0	70.8	5.1	62.2	15.0	124.7	-1.1
% graduates in labor force	3.4	6.1	3.3	5.9	4.2	7.9	-1.1
TFP estimated (log)	1.3	0.1	1.3	0.1	1.3	0.1	-0.7
OWNERSHIP_CONTROL	53.7	26.3	52.8	25.9	61.4	28.4	-2.7

Source: elaborations on VIII and IX CAPITALIA manufacturing firm survey data.

Note: 777 observations for “All firms”, 700 observations for “Other firms” and 77 observations for “HGF-SALES”. The group “HGF-SALES” includes all firms belonging to the top 10% of fastest growing firms in terms of sales. ***= sig. 1%, **=sig. 5% and *= sig. 10%.

4 Econometric model and variables

As anticipated, we adopt a well-established definition of HGFs: a firm is classified as a HGF if it falls within the top decile of firms with respect to employment growth during the 1998-2003 period. HGFs defined in terms of sales have been identified similarly. The parameters of the econometric model are estimated using Probit techniques, as the dependent variable is a dichotomous

variable that takes the value of 1 if the firm is a HGF and zero otherwise.

The base equation to be estimated in models 1 and 2 is the following:

$$Pr(HGF_i = 1) = f(XSi + XFi + \varepsilon) \quad (1)$$

Where XSi indicates a vector of variables capturing a series of “systemic” or “exogenous” effects, while the variables of the group denoted XFi are included to detect effects of a strategic or internal nature to the firm. Almost all of the regressors are taken at their values at the beginning of the period considered to ensure that they are, in any case, predetermined with respect to the actual growth process.

The first group of regressors (XSi) includes, first, dummy variables corresponding to the Pavitt classification of technology level for the sector in which the firms are active. In particular, the coefficients for traditional sectors (D_PAVITT1), specialised suppliers (D_PAVITT2) and scale economies (D_PAVITT3) dummies were estimated. Then a dummy variable is included (ACQUISITION), that is equal to 1 for firms that had (in 2000) an active role in acquisitions or incorporations.

In the literature, three processes of employment growth are distinguished: organic (through internal growth), external (through acquisitions) and total (the sum of the two). Because by definition these effects cannot be taken into account for sales growth, the inclusion of the variable ACQUISITION enables us to ensure that our results (models 1 and 2) are not affected in a significant way by structural changes.

Another regressor included in the first group is the index of the industrial production for the sector in which firm operates (SECT_PROD_INDX) that approximates the demand tendencies in each specific market. When the growth of demand in industry A is higher than in industry B, the probability that firms operating in industry A are HGFs is higher than for firms operating in industry B; the introduction of this control can improve our understanding of the phenomenon, as in this way the role of strategic or internal factors (age, human capital, ownership, etc.) has been estimated more clearly. This type of control is rarely taken into account in the empirical literature on high-growth firms.

To capture the possible effect of new opportunities for the firm stemming from competitors' loss of market share, we elaborated a variable based on the sum of jobs lost in the industry during the 1998-2003 period (SECT_JOBS_LOST). The probability of being a HGF for firms operating in a sector where competitors are losing market shares might be higher than for firms operating in a sector where competitors are gaining market shares; the introduction of this control can improve our understanding of the phenomenon, as it allows us to identify any possible relationships between high growth at the firm level and the

expansion/contraction of employment at the industry level.

Our equation also includes a proxy for the degree of credit rationing (CREDIT_RATION) perceived by the firm. It was calculated as an interaction of two variables: the value of the ratio between liabilities and total assets and a dichotomous variable equal to 1 in cases where the firm answered “yes” to the following question: “In 2000, has the firm asked for a greater amount of credit without obtaining it?”. Through this variable, we intend to capture the possible effects of the credit market on opportunities for HGFs.

The first variable of the *XFi* group is the level of the sales in 1998 (as a logarithm, L_SALES), which is used to determine whether the initial size can be associated with phenomenon of rapid growth. Moreover, the estimated equation includes the logarithm of the age of the firm (L_AGE), as young firms are expected to be more likely to enter into a process of rapid growth.

In the literature on firm growth, the role of organisational factors is not frequently taken into account. Our data allow us to measure the effects of ownership concentration with a specific variable: the percentage of firm equity held by the primary individual shareholder (OWNERSHIP_CONTROL). We also compute a synthetic factor to capture the potential human capital contribution to rapid growth (HUMAN_CAPITAL_INDX). Our choice was to apply factor analysis⁶ using three variables as inputs: a) the staff ratio, namely the ratio between “white collar” workers (managers and administrative employees) and “blue collar” workers (manual workers), b) the percentage of employees engaged in R&D activity and c) the percentage of employees holding a university degree. The degree of correlation between the three variables is very high; therefore, the synthetic index is useful to capture the impact of the three different dimensions of human capital on rapid growth.

Finally, our model includes two additional variables. The first is a measure of initial profitability: the ROE (return on equity) in the year 1998. The second is a variable able to capture the differences in productive efficiency: the traditionally employed estimate of Total Factor Productivity (TFP)⁷.

5 Results

The overall scenario that emerges from our estimates (Table 4) permits us to evaluate which variables can significantly influence the probability that a firm is classified as a HGF. In Model 1 and Model 2, we introduced two different

⁶ Factor analysis was used to reduce the measured variables or indicators into the appropriate construct. The principal component analysis method was used with Varimax rotation. Factor scores using the regression method were retained for subsequent analysis. Thus, the three indicators that proxy human capital quality were grouped into a single factor that explained approximately 97% of the variance in the data. The Kaiser-Meyer-Olin (KMO) measure of sampling adequacy and Bartlett test of sphericity validated the appropriateness of using factor analysis.

⁷ We estimate TFP using the method of Levinsohn and Petrin (2003) with the data referring to the 1998-2000 period.

specifications. In the first specification (columns 1 and 3), only control variables are included. In the second specification (columns 2 and 4), endogenous factors (initial size, profitability, etc.) are added to the model.

We found that firms that have carried out mergers and acquisitions seem to have a greater probability of being a HGF, even if the coefficient of the relevant variable (ACQUISITION) is not always significant in Model 2 (sales growth)⁸.

Table 4 – Determinants of high growth: probit regressions on the probability of being a HGF.

	HGF-EMP [Mod.1] [1]	HGF-EMP [Mod.1] [2]	HGF-SALES [Mod.2] [3]	HGF-SALES [Mod.2] [4]
D_PAVITT1 (traditional prod.)	-0.202 (0.29)	0.1365 (1.35)	-0.3664 (0.30)	-0.2868 (0.47)
D_PAVITT2 (spec.suppliers)	-0.003 (0.32)	0.3023 (1.36)	-0.2173 (0.33)	-0.1623 (0.48)
D_PAVITT3 (scale intensive)	-0.1363 (0.30)	0.1088 (1.33)	-0.2254 (0.31)	-0.1437 (0.42)
ACQUISITION	0.5249*** (0.16)	0.3769** (0.19)	0.3306* (0.17)	0.3217 (0.21)
SECT_PROD_INDX	0.0167** (0.01)	0.0252*** (0.01)	0.0334*** (0.01)	0.0430*** (0.01)
SECT_JOBS_LOST	0.0222 (0.02)	0.026 (0.02)	-0.013 (0.03)	-0.0038 (0.03)
CREDIT_RATION	-0.0661 (0.31)	-0.4162 (0.68)	-0.2674 (0.37)	-0.293 (0.80)
L_SALES (log)		0.0631 (0.09)		-0.2843*** (0.11)
L_AGE (log)		-0.7124*** (0.13)		-0.4275*** (0.14)
ROE		0.2884 (0.28)		0.062 (0.26)
TFP (log)		-0.2939 (0.81)		2.2652** (0.93)
OWNERSHIP_CONTROL		0.0022 (0.00)		0.0074*** (0.00)
HUMAN_CAPITAL_INDX		0.1790** (0.07)		0.1191 (0.08)
Constant	-1.3762*** (0.32)	0.264 (1.57)	-0.8654** (0.38)	-0.6405 (0.96)
N. obs.	777	776	777	776
LogL	-241.3984	-218.6207	-237.5164	-220.7639
Chi2	19.6743***	59.2492***	23.0783***	49.5107***
PseudoR2	0.03	0.12	0.05	0.12
% Corr.Predict.	90.2	90.3	90.1	90.1

Note: ***= sig. 1%, **=sig. 5% and *= sig. 10%. Marginal effects are reported.

⁸ We run other regressions excluding firms that have undergone any type of acquisition, and our results are very similar. In other words, we find that one important factor for being a HGF is the occurrence of external growth, but even without this event, we found robust evidence for the role of age, human capital and all other regressors.

Moreover, the significant and positive effect reflected by the coefficient of the industrial production index (SECT_PROD_INDX) confirms that rapid growth is often tied to a favourable market trend. Alternatively, it could be argued that a downward trend in demand at the sector level can constitute a serious barrier to rapid growth

As in previous studies, HGFs are not found to be concentrated in specific industries. The coefficients of the Pavitt dummies (Table 4) are not significant. Moreover, the variable measuring initial size (L_SALES) was significant and had a negative sign, but only in Model 2 (HGFs in terms of sales growth).

A significant aspect to be discussed in light of the relevant literature is the role played by firm age. According to the estimates reported in Table 4, the probability of being a HGF (in terms of employment or sales) is significantly higher for younger firms. This finding is common to models 1 and 2.

For Italian HGFs, profitability at the beginning of the growth process (measured by the ROE) is not higher than the average firm, while a greater level of efficiency (approximated with TFP) is a factor that significantly contributes to the very rapid increase of sales. However, the presence of new market opportunities created by falling employment in the same industry (SECT_JOBS_LOST) does not significantly affect the rapid growth of firms. Finally, we do not find any evidence for credit rationing effects on the probability of being a HGF, as the coefficient of the variable CREDIT_RATION is never significant.

To complete the discussion of this first set of findings, we must focus on the estimated coefficients of ownership concentration (OWNERSHIP_CONTROL) and our proxy of human capital (HUMAN_CAPITAL_INDX). Regarding the former, we found that ownership concentration only has a positive and significant impact for fast-growing-sales firms. In the case of the latter, where HGFs in terms of employment are concerned, we found a positive and highly significant contribution for the human capital index. This result confirms that the growth of firms seems to be supported by managerial competence in managing changes and taking advantage of market opportunities.

6 Robustness

As emphasised by Moreno and Casillas (2007), the presence of high variability in the group of firms not classified as HGFs (in our case, 90% of the sample) may have implications for the results. As can be observed in Figure 1, the firms classified in deciles 6 through 9 show some positive growth dynamics between 1998 and 2003, although it should be noted that the magnitude of this growth (for a 6-year period) is fairly small compared to those of HGFs. However, for firms classified in deciles 1-5, the average growth rate is negative. Therefore, the group of firms not classified as HGFs is not homogeneous (see also Stam and Wennberg 2009).

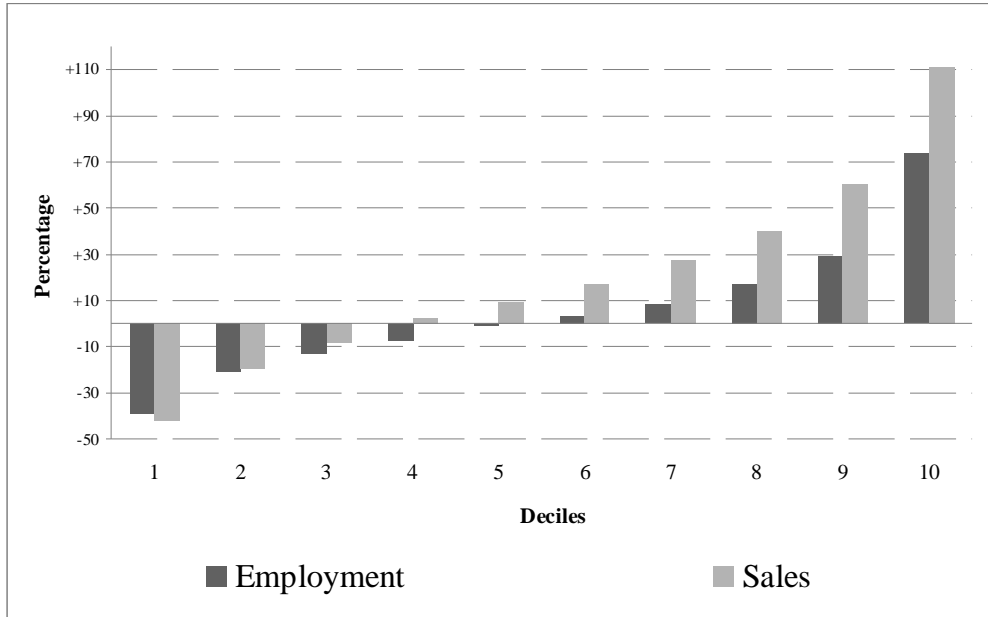


Figure 1. Average (employment in black, sales in gray) 1998-2006 growth in deciles.

To test the sensitivity of our estimates with respect to this possible “variability bias” in the counterfactual sample, we repeat the same regressions using two different subsets. In the first instance, the new coefficients are estimated for models 1A and 2A, aggregating HGFs with the group of firms with “under-the-median” growth performance, i.e., those classified in deciles 1 to 5 of the growth rate distribution. Subsequently, we estimate models 1B and 2B, aggregating HGFs with the group of firms with “above-the-median” growth performance, i.e., those classified in deciles 6 to 9.

The results for models 1A and 2A (Table 5) show that the only important difference concerns the role of the profitability index (proxied by the ROE) that has a positive and significant sign (Table 5, column 2).

When the analysis shifts to the comparison between HGFs and “medium growth” firms (models 2A and 2B, Table 6), the results are not substantially different from those previously discussed.

Using the same procedure employed to test the robustness of the previous results, it is possible to identify a new “homogenous grouping” of HGFs. In particular, we introduce a new definition of a high-growth firm: “HGF-TOT”. The new HGF-TOT group includes all firms exhibiting relatively high performance both in terms of employment and sales. With this choice, we are focusing on “accelerated growth” according to two different measures (employment and sales). The new HGF-TOT group is defined with the aid of cluster analysis⁹ using employment

⁹ In calculating the clusters, Ward’s minimum variance method is used. The clusters are then successively combined into groups until only a single cluster remains. The objective

and sales growth as input variables¹⁰ (Table 7).

Table 5 – Determinants of high growth: probit regressions on the probability of being a HGF vs “negative or very low growth” firms (1-5 deciles).

	HGF-EMP [Mod.1A] [1]	HGF-EMP [Mod.1A] [2]	HGF-SALES [Mod.2A] [3]	HGF-SALES [Mod.2A] [4]
D_PAVITT1 (traditional prod.)	-0.18 (0.33)	0.15 (0.44)	-0.38 (0.35)	-0.32 (0.46)
D_PAVITT2 (spec.suppliers)	0.18 (0.36)	0.51 (0.46)	-0.03 (0.39)	-0.02 (0.47)
D_PAVITT3 (scale intensive)	-0.03 (0.34)	0.21 (0.43)	-0.15 (0.36)	-0.11 (0.44)
ACQUISITION	0.6376*** (0.19)	0.4602** (0.22)	0.5072** (0.21)	0.4939** (0.24)
SECT_PROD_INDX	0.0244*** (0.01)	0.0361*** (0.01)	0.0407*** (0.01)	0.0527*** (0.01)
SECT_JOBS_LOST	0.03 (0.02)	0.04 (0.03)	-0.02 (0.03)	-0.01 (0.03)
CREDIT_RATIO	-0.02 (0.34)	-0.46 (0.38)	-0.39 (0.42)	-0.50 (0.45)
L_SALES (log)		0.06 (0.10)		-0.2948** (0.12)
L_AGE (log)		-0.8014*** (0.14)		-0.5846*** (0.15)
ROE		0.2649** (0.11)		0.04 (0.13)
TFP (log)		0.07 (0.87)		2.5558*** (0.98)
OWNERSHIP_CONTROL		0.00 (0.00)		0.0097*** (0.00)
HUMAN_CAPITAL_INDX		0.2207*** (0.07)		0.1983** (0.08)
Constant	-1.2236*** (0.36)	0.24 (0.97)	-0.53 (0.42)	-0.17 (1.04)
N. obs.	491	491	466	466
LogL	-201.07	-177.06	-189.87	-169.77
Chi2	25.2915***	68.0002***	31.2443***	68.9745***
PseudoR2	0.05	0.16	0.09	0.19
% Corr.Predict.	84.52	84.93	83.48	83.69

Note: ***= sig. 1%, **=sig. 5% and *= sig. 10%. Marginal effects are reported.

of Ward’s method is to join two clusters at each step such that the variance for the joined clusters is minimised.

¹⁰ Although it methodology is more frequently employed when there are many different variables, we decided to use it to obtain a two-dimensional classification to avoid any arbitrarily cut-off in the level of the growth rate with the respect to employment and sales growth.

Table 6 – Determinants of high growth: probit regressions on the probability of being a HGF vs “medium growth” firms (6-9 deciles).

	HGF-EMP [Mod.1B] [1]	HGF-EMP [Mod.1B] [2]	HGF-SALES [Mod.2B] [3]	HGF-SALES [Mod.2B] [4]
D_PAVITT1 (traditional prod.)	-0.28 (0.37)	0.06 (0.47)	-0.51 (0.39)	-0.37 (0.46)
D_PAVITT2 (spec.suppliers)	-0.22 (0.39)	0.09 (0.47)	-0.50 (0.41)	-0.38 (0.48)
D_PAVITT3 (scale intensive)	-0.33 (0.37)	-0.08 (0.44)	-0.45 (0.39)	-0.29 (0.45)
ACQUISITION	0.4980** (0.19)	0.34 (0.21)	0.21 (0.20)	0.26 (0.23)
SECT_PROD_INDX	0.01 (0.01)	0.0184* (0.01)	0.0306*** (0.01)	0.0404*** (0.01)
SECT_JOBS_LOST	0.02 (0.03)	0.02 (0.03)	-0.01 (0.03)	0.00 (0.03)
CREDIT_RATION	-0.15 (0.37)	-0.49 (0.40)	-0.10 (0.44)	-0.11 (0.44)
L_SALES (log)		0.10 (0.12)		-0.3399*** (0.12)
L_AGE (log)		-0.7518*** (0.18)		-0.3570** (0.17)
ROE		0.9012** (0.40)		0.07 (0.13)
TFP (log)		-1.18 (1.08)		2.5732*** (0.97)
OWNERSHIP_CONTROL		0.00 (0.00)		0.0070*** (0.00)
HUMAN_CAPITAL_INDX		0.1571** (0.07)		0.07 (0.08)
Constant	-0.7437* (0.40)	1.8658* (1.12)	-0.29 (0.44)	-0.27 (1.12)
N. obs.	362	361	388	387
LogL	-182.16	-164.11	-186.43	-174.91
Chi2	8.27	38.0404***	11.61	37.8833***
PseudoR2	0.02	0.12	0.04	0.09
% Corr.Predict.	79.01	79.22	80.15	80.62

Note: ***= sig. 1%, **=sig. 5% and *= sig. 10%. Marginal effects are reported.

Table 7 – Average values of measures of growth in 3 clusters.

	% change in employm. 1998-2003	% change in sales 1998-2003
Cluster 1 - HGF-TOT	44.2	84.7
N. obs.	148	148
Cluster 2	-0.4	12.8
N. obs.	522	522
Cluster 3	-25.6	-36.1
N. obs.	107	107
Total	4.6	19.8
N. obs.	777	777

Source: elaborations on VIII and IX CAPITALIA manufacturing firm survey data.

We found that Cluster 1 includes 148 firms that have high values for both employment growth (on average over +40%) and sales growth (on average above +80%). All firms belonging to Cluster 1 were identified as HGF-TOT firms. Moreover, for 522 firms classified in Cluster 2, average values of the two indexes denote a tendency towards stability. Finally, for Cluster 3, the 107 firms considered are characterised by negative growth rates for employment (approximately -20%) and sales (approximately -30%). All firms belonging to clusters 2 and 3 were identified as non-HGF-TOT firms.

We elaborated an additional series of estimates in which the same regressors affect the probability that a firm is classified as HGF-TOT, i.e., belonging to Cluster 1. To compare the new results to those previously obtained, in the first phase we use the entire sample (Table 8), adopting as the dependent variable a dummy equal to 1 if a firm is HGF-TOT and zero if it belongs to clusters 2 or 3. As a further robustness check, we repeat the same exercise using two different subsets: i) including only the firms belonging to Cluster 1 (i.e., HGF-TOT) and Cluster 2; ii) including only the firms belonging to Cluster 1 (i.e., HGF-TOT) and Cluster 3.

The results reported in Table 8 confirm that the effects of mergers and acquisitions (ACQUISITION) and the presence of a favourable demand trend in the sector (SECT_PROD_INDX) are significant drivers of rapid growth. Initial size (L_SALES) is not significant in this new estimation, whereas the effect of age (L_AGE) is confirmed. Lastly, firms classified as HGF-TOT are characterised by a greater ownership concentration (OWNERSHIP_CONTROL) and higher human resources quality (HUMAN_CAPITAL_INDX) than average.

Further results are reported in Table 9, where the comparison between HGF-TOT firms and those of Cluster 3 (negative growth rates in employment and turnover) is examined. Note that only two variables (ACQUISITION and OWNERSHIP_CONTROL) do not have significant coefficients. This result could be interpreted in the following way: the differences in the growth performance between the HGF-TOT firms and the “less good” group are broadly associated with the characteristics of age and the role of human capital.

Table 8 – Determinants of high growth: probit regressions on the probability of being a HGF-TOT (Cluster 1).

	HGF-TOT [Mod.1-TOT] [1]	HGF-TOT [Mod.1- TOT] [2]
D_PAVITT1 (traditional prod.)	-0.23 (0.27)	0.00 (0.34)
D_PAVITT2 (spec.suppliers)	0.16 (0.29)	0.36 (0.34)
D_PAVITT3 (scale intensive)	-0.01 (0.28)	0.12 (0.32)
ACQUISITION	0.4564*** (0.15)	0.3527** (0.17)
SECT_PROD_INDX	0.0298*** (0.01)	0.0376*** (0.01)
SECT_JOBS_LOST	0.02 (0.02)	0.03 (0.02)
CREDIT_RATION	-0.27 (0.30)	-0.42 (0.30)
L_SALES (log)		-0.08 (0.08)
L_AGE (log)		-0.5215*** (0.11)
ROE		-0.02 (0.09)
TFP (log)		0.87 (0.70)
OWNERSHIP_CONTROL		0.0055** (0.00)
HUMAN_CAPITAL_INDX		0.1730*** (0.06)
Constant	-0.9663*** (0.31)	-0.32 (0.77)
N. obs.	777	776
LogL	-359.58	-336.25
Chi2	38.3060***	74.7598***
PseudoR2	0.05	0.11
% Corr.Predict.	80.95	81.06

Note: ***= sig. 1%, **=sig. 5% and *= sig. 10%. Marginal effects are reported.

Turning to the comparison between the HGF-TOT firms and those of Cluster 3 (negative growth rates in employment and turnover), we found more similarities with respect to base results. In Table 10, all of the original results are confirmed (see Table 8). Moreover, two new issues seem to emerge. On the one hand, the role of SECT_JOBS_LOST is associated with being a HGF-TOT. On the other hand, the negative effect related to credit rationing (CREDIT_RATION) is a factor that significantly reduces the probability of being a HGF-TOT.

Table 9 – Determinants of high growth: probit regressions on the probability of being a HGF-TOT (Cluster 1) vs firms belonging to Cluster 3 (low employment and sales growth).

	HGF-TOT [Mod.1A- TOT] [1]	HGF-TOT [Mod.1A- TOT] [2]
D_PAVITT1 (traditional prod.)	-0.57 (0.43)	-0.55 (0.46)
D_PAVITT2 (spec.suppliers)	-0.11 (0.46)	-0.17 (0.48)
D_PAVITT3 (scale intensive)	-0.19 (0.44)	-0.17 (0.45)
ACQUISITION	0.37 (0.24)	0.26 (0.26)
SECT_PROD_INDX	0.0638*** (0.01)	0.0742*** (0.01)
SECT_JOBS_LOST	0.01 (0.03)	0.02 (0.03)
CREDIT_RATIO	0.16 (0.50)	0.11 (0.40)
L_SALES (log)		-0.14 (0.14)
L_AGE (log)		-0.5010*** (0.17)
ROE		-0.08 (0.06)
TFP (log)		1.46 (0.96)
OWNERSHIP_CONTROL		0.00 (0.00)
HUMAN_CAPITAL_INDX		0.1962** (0.09)
Constant	0.67 (0.43)	1.24 (1.01)
N. obs.	255	254
LogL	-147.49	-137.10
Chi2	40.3072***	54.2286***
PseudoR2	0.15	0.21
% Corr.Predict.	43.53	73.62

Note: ***= sig. 1%, **=sig. 5% and *= sig. 10%. Marginal effects are reported.

Table 10 – Determinants of high growth: probit regressions on the probability of being a HGF-TOT (Cluster 1) vs firms belonging to Cluster 2 (medium employment and sales growth).

	HGF-TOT [Mod.1B- TOT] [1]	HGF-TOT [Mod.1B- TOT] [2]
D_PAVITT1 (traditional prod.)	-0.22 (0.29)	0.09 (0.36)
D_PAVITT2 (spec.suppliers)	0.17 (0.31)	0.47 (0.37)
D_PAVITT3 (scale intensive)	-0.02 (0.30)	0.16 (0.35)
ACQUISITION	0.4926*** (0.16)	0.3759** (0.18)
SECT_PROD_INDX	0.0261*** (0.01)	0.0345*** (0.01)
SECT_JOBS_LOST	0.03 (0.02)	0.0406* (0.02)
CREDIT_RATIO	-0.31 (0.30)	-0.5115* (0.30)
L_SALES (log)		-0.07 (0.09)
L_AGE (log)		-0.5542*** (0.12)
ROE		-0.01 (0.09)
TFP (log)		0.78 (0.75)
OWNERSHIP_CONTROL		0.0060*** (0.00)
HUMAN_CAPITAL_INDX		0.1813*** (0.06)
Constant	-0.9325*** (0.32)	-0.28 (0.81)
N. obs.	670	669
LogL	-338.61	-315.04
Chi2	30.7011***	70.2530***
PseudoR2	0.04	0.11
% Corr.Predict.	78.21	78.03

Note: ***= sig. 1%, **=sig. 5% and *= sig. 10%. Marginal effects are reported.

7 Discussion

Overall, the results in sections 4 and 5 provide new empirical evidence on high-growth-facilitating factors. First, in line with earlier research, we found that the industry explains relatively little of the distribution of HGFs (Hypothesis 1). Our results also offer some empirical support for Hypothesis 2; the probability of being HGFs is significantly influenced by initial firm size. However, we observe this result only when growth is measured in terms of sales.

Drawing on previous work, we expected that HGFs would be younger than the average firm (Hypothesis 3). Our empirical findings confirm this expectation and

extend the long stream of results on the negative effect of age on firm growth: older manufacturing firms have a lower probability of being HGFs. Another assumption we tested is that more productive firms are more likely to be HGFs (Hypothesis 4), and we found that this relationship is partly supported by Italian manufacturing data. However, we do not find evidence that more profitable enterprises or those with more solid finances are more likely to be HGFs (Hypothesis 5).

Finally, the important results found in this paper are those associated with the roles of ownership (Hypothesis 6) and human capital (Hypothesis 7). First, we found evidence supporting a positive correlation between concentrated ownership and rapid sales growth. This finding suggests that HGFs rely on rapid and prompt decision-making processes to a greater extent than other firms. Moreover, this result suggests that dispersed ownership may have a moderating effect on a firm's "commitment to growth". Second, our empirical analysis confirms that HGFs tend to have more highly educated and trained workforces than other firms. On the one hand, human capital gains for HGFs may be interpreted in terms of a firm's ability to recognise market opportunities and exploit them. On the other, it could also be argued that having a higher-than-average level of education in the workforce permits HGFs to cope with radical organisational changes and limit the negative consequences of internal turmoil. In sum, this set of findings supports the necessity of public measures to increase capabilities through an improved educational system that increases the skills of both the entrepreneurs and the labour force. The robustness of these findings is sustained by the results of the sensitivity analysis.

8 Concluding remarks

Firm growth is a selective and heterogeneous phenomenon. Few firms seem to grow rapidly, but their contribution to employment growth is disproportionately large. A special interest has emerged in the literature regarding the study of these high-growth firms (HGFs).

The purpose of this work is to analyse the Italian manufacturing sector and seek empirical support regarding two specific research questions. First, we wish to assess high-growth firms' contributions to overall (employment and sales) growth in the 1998-2003 period. Second, our econometric analysis aims to identify the most important factors associated with the probability of being a HGF in Italy.

To summarise, the results of our analysis confirm that HGFs make a sizeable contribution to economic growth, both in terms of employment and sales. With respect to the determinants of rapid growth, we found that HGFs are on average young firms and are present in different sectors, but the role of demand is important for understanding their performance at the sectoral level. Moreover, our findings demonstrate that financial constraints and productivity gaps do not seem to explain the probability of being a HGF. The profitability of HGFs, on average, is not higher than those of other firms.

The most novel results of this paper regard the endogenous determinants of rapid

growth, which have yet to be adequately examined in the literature. First, we found that the concentration of ownership is important for HGFs that grow in sales. Second, the quality of human capital is a strength of firms experiencing rapid employment growth.

The results of this study confirm that HGFs represent a small proportion of all active firms, therefore it seems to be worthwhile to discuss what policies, regulations, incentive designs and programmes might be adopted to increase the number of these successful experiences (Parker et al. 2010). Recently, the OECD (2010) found that in many countries a high priority is given to supporting access to financing and the promotion of innovation. However, few programmes exist that specifically target firms with growth potential. We believe that additional efforts are necessary to design adequate support policies to “enlarge the club” of growth-oriented firms. This outcome could be accomplished by lowering the “barriers to new firm entry and firm exit to support an experimental process increasing the number of trials (new firms) from which potential Gazelles can be recruited, and not hindering the closure of failures” (Henrekson and Johansson 2010). Shane (2009) suggests reducing general public support to startups with a low potential of generating employment and enhancing economic growth. The effect should be to strengthen the performance of the residual portion of new firms. Thus, reducing the cost of investments in employment training, hiring highly educated personnel, and managerial and organisational consultancy, as the results of this paper seem to show, could incentivise a larger share of firms to adopt more dynamic and growth oriented behaviour.

While this study has contributed to the understanding of the determinants of high-growth processes, further explorations must be conducted to improve our comprehension of these phenomena. In particular, future works should employ datasets that enable one to include other measures or proxies of knowledge resources and capabilities. This approach could provide additional insights on the role of intangible factors as key drivers of firm growth.

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