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# Process and strategies of growth in medium-sized fast-growing firms

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**Abstract**
The study investigates the firm high growth phenomenon and its relationships with reorganization costs and external financial dependence. We use a sample of medium-sized Italian fast-growing firms. Fast-growth firms are structured enough to plan growth strategies and not depend on occasional external events. The paper provides insight into the lumpiness of the process of firm expansion accompanying its reorganization, conditional on the presence or not of a fast-growth event. Moreover, the analysis shed some light on the relationship between growth and performance and on the growth process of a subsample of young, fast-growing firms to check the presence of differences in the process or the strategy of growth. We find a positive and significant relation between present growth and proxy variables for resources organization, a lumpy growth process, and a positive association of growth and profit for almost the whole sample, i.e., a positive balance between costs and benefit of growth.

**Keywords** Fast growth · Persistence · Profitability · Growth trajectories

**JEL Classifications** L25 · D24 · M21

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## 1 Introduction

The fast growth of firms has gained attention in recent years due to its implications in terms of the growth of the systems. Indeed, the literature highlights a decline in business dynamism (Akcigit & Ates, 2021) and seems to be related to a decline in knowledge diffusion between the frontier and laggard firms. The study of the growth patterns of particularly successful firms, in this respect, could be relevant to understand the factors behind business dynamism designing accordingly public policies to sustain system dynamics. Policy analysts started to mention fast-growth firms as the possible objective of specific measures. Scholars empirically investigated the determinants of the fast-growing episodes and their distribution across countries and sectors. In this paper, we intend to study the growth process to check if and how some organisational key aspects (reorganization cost and dependence on external finance) have a significant impact on it and to shed some light on the lumpiness of the autoregressive structure of growth. We also look at what extent fast growth entails negative consequences for firms in terms of profitability due to the high adjustment costs and the increased dependence on external sources of finance.

To set our contribution, we rely on studies that explicitly consider growth as determined by, among others, some organizational factors (Bottazzi & Secchi, 2003; Ijiri & Simon, 1967). These models suggest that the firm growth enhances its ability to grow in the future. Nonetheless, growth can also create “imbalances” in the organization due to adjustments needed to accompany the growth process. The Penrose contribution goes in this direction, postulating that the curse of growth is the rise of adjustment costs to pay to sustain it (Penrose, 1959).

More specifically, the Penrosian model intends the firm’s effort to pursue growth as determined by deliberate and managed organisational changes. We intend to follow this perspective by looking at “how” firms grow, i.e., what goes on within the firm while it grows. We align our work with the Penrose approach that sees growth as a change process whose main limitation concerns the firm’s internal managerial capacity. We take into the picture considerations about the firm’s strategy to explain the firm’s growth and the diversity in growth trajectories that we observe in the market. We explore if there is a role (magnitude and sign) for firm strategies in the explanation of firm growth through two measures: external cost and external financial dependence. The external cost index is a proxy for the effort a firm must make to adapt the internal organization to acquire raw and intermediate materials and services (such as administrative or commercial activities) after variation in the amount of company activity. External financial dependence (EFD), as defined by Rajan and Zingales (1998), is an index of a firm’s necessity for external resources to finance expenditure for fixed assets (both material and immaterial). The growing risk linked to the financial position during the firm’s expansion could effectively represent a limit. Firms must follow a logic of permanent investment to survive firstly, be resilient to external adverse shocks, and compete in the long term. During firms’ growth, fixed capital investments occur, and as the investment scale increases, the need to resort to the external financial market increases and the financial risk premium too (Kalecki, 1937, 1954).

Based on the Penrosian model, we understand firm growth as a discontinuous, proactive, managed organisational change with time-varying costs. “The growing firm must draw in new resources to support growth, but it faces planning delays and coordination problems because it is impossible to synchronise resources to requirements precisely in a dynamic system. The need for internal coordination sets a brake on how market opportunities can be pursued” (Penrose, 1959, p. 44). When growing, firms need new managerial resources to manage internal coordination, control, and communication activities. For any given scale of operations, a firm must possess resources to obtain the effective service appropriate to the amount and type of products it intends to realise.

Moreover, firm expansion can present a degree of autocorrelation over time. To account for this aspect, we consider that our regression growth rate lags for 1, 2, and 3 years. In line with this observation, we also checked if the growth rate is altered by present and past fast-growth events. Lumpy growth does not mean occasional but rather a process of growth, characterised by short periods of plateau or slowdown, necessary to adapt the new resources to the firm’s internal environment. This character of the growth process is, to an extent, overlooked in the literature. In particular, the literature exploring the growth process through the rate of growth autocorrelation, when finding hostile relations, tends to simplify by interpreting the result as a sign of episodic growth.

Following this literature, we focus on fast-growing medium-sized firms (FGMFs) because they are of great interest in the Italian context, for which medium-sized firms constitute the “backbone” of the industrial sector. Related to this, we should remember that one problem of the Italian industrial structure is the low percentage of large firms (compared to other developed countries). The FGMFs are the “best” candidate for entering the group of large firms. Hence, studying their growth patterns and the relationship between these patterns and profitability can be crucial to understand if and how these firms can solve the Italian “dimensionality problem” in the future.

More specifically, we base our analysis on a sample of Italian medium-sized firms from CHEETAH dataset. This dataset contains information about medium firms across 30 countries in Europe that have all experienced at least one fast growth phenomenon between 2008 and 2013[1] according to the definition of fast-growth reported by OECD as an average growth rate equal to or higher than 20% per year in a 3-year cohort (Guerini & Mancuso, 2021). We use FGMFs as units of analysis in 2008–2013—during the international financial crisis—to determine what changes occur and how evolution unfolds. Focusing on FGMFs allows us to analyse an “elite” group of firms representing an important and well-performing component in the Italian industrial structure, which is under-investigated in the literature.

We also explore the relationship between growth and performance. We use the same data and the same model to investigate the effects of past growth values on Return on Assets as a proxy of a firm’s profitability to have a comparable point of view between the two fundamental aspects of FGMFs economic structure.

[1] At the time of the conclusion of this work, CHEETAH dataset presented complete data up to 2013, between 2021 and 2022 it was updated with further data.

Finally, we investigate the process of growth of young, fast-growing firms FGMFs that are often indicated as those firms that can profit more from fast-growth processes; we study both the growth's feedback through the magnitude and the sign of the growth autocorrelation coefficients and the relationship between return on assets and growth processes.

The contribution of our work is the analysis of the growth process of a less explored group of firms, the FGMFs, the use of time-varying explanatory variables, and the search for a significant role of organisational change in the process of a firm's growth.

## 2 Literature

The primary theoretical references for the study of a firm's growth is given by Gibrat (1931) and by Penrose (1959), who propose very different analytical approaches.

The theoretical framework linking growth to firms dates back to what has been characterized in the economics literature as Gibrat's Law (Audretsch, 2012). The assumption underlying Gibrat's Law is that firm growth is a stochastic process randomly distributed across firms and independent of firm-specific characteristics.

Following this approach, changes in firm size are driven by unexpected shocks with permanent effects on the firm's size; the size of a firm at any time is the sum of the entire history of shocks that the firm has experienced. However, the stochastic vision of firms 'growth failed against a large number of empirical studies showing a statistically significant relationship between firm growth and some other variables, such as firm size, age, geographical location, the market concentration of the specific industry and the characteristics of the industry to which the firm is associated.

The main focus and concern of Gibrat's Law is generally on the growth of firms and not necessarily on high-growth firms, which would be independent of firm-specific characters. However, the implication of an evolutionary interpretation linking knowledge to entrepreneurship and ultimately to economic growth, the so-called knowledge spillover theory of entrepreneurship (see Audretsch, 2012) is that high-growth firms would be expected to be dependent on firm-specific characteristics. In particular, high-growth firms would be expected to be younger and smaller when compared to the overall population of firms.

Dosi et al. (2019) found that the growth process of firms has much more structure than what would be postulated on the grounds of a purely random process; the presence of negative and positive tails is ubiquitous, and repetition and persistence of growth are rare but present. Growth persistence is "accruing some particular firms more than standing out as a widespread property (p. 24)". Negative and positive growth events are lumpy, and scholars refer to this characteristic as the result of the mix between growth opportunities and market competition.

Penrose's work appears to be the alternative leading theory of growth used by many studies (Garnsey et al., 2006; Macpherson & Holt, 2007; Mishina et al., 2004; Pettus, 2001). The Penrose perspective sees growth as a change process whose main limitation concerns the firm's internal managerial capacity.

Recently there has been a great interest in fast-growing firms, which can have an essential role in the macroeconomic growth of a country. They have been considered contemporary versions of Penrose's successful entrepreneurial firm that can embark on a process of resource accumulation (Coad et al., 2014), a phenomenon of autocorrelated self-reinforcing growth formalised by Bottazzi and Secchi (2003). However, the literature on fast-growing firms' dynamics has found a relevant lack of persistence in their growth performance (Daunfeldt & Halvarsson, 2015; Hölzl, 2014). Firms' fast growth can be temporarily associated with a decrease in productivity, as recognised by Penrose (1959), because the managers' focus on planning growth can temporarily reduce the time devoted to productive efficiency.

A further analysis element is the impact of the firms' need for external funds. Recent contributions have put in evidence how, despite the access to external funds may increase firm growth, its role is not univocal and is conditioned by factors such as age, size, quality of the reference credit system, and firm internal policies (Musso & Schiavo, 2008). Dependence on external funds can reduce the growing trend of smaller and younger firms, but these external limits can also incentive these firms to use more efficiently internal sources of financing, reducing negative effects on the firm expansion (Dhole et al., 2019; Oliveira & Fortunato, 2006). Moreover, the weight of external sources on the growth capacity of firms must be compared to the general economic conditions in terms of investment opportunities, idiosyncratic shocks, and overall quality of the financial system (Hubbard, 1998; Iwasaki et al., 2022; Musso & Schiavo, 2008).

The relation between profits and growth is open to further investigation. Several theories defend a positive relationship between growth and profitability. Firms' growth is considered to lead to a decrease in costs through economies of scale (Gupta, 1981), network externalities, outsourcing, and an increase in negotiation power with providers and clients (Markman & Gartner, 2002), learning curves (Coad, 2007a), first-mover advantage (Lieberman & Montgomery, 1988). Lee (2014) and Federico and Capelleras (2015) show evidence of a positive influence of growth on profits. However, Coad (2007b) finds an insignificant association between company growth and profitability for French manufacturing companies, consistent with Gupta (1969), who examined U.S. manufacturing companies. The scholar wrote that while there may be a statistically significant relationship between growth and profit, the effect's magnitude is so low that it would be valid to look at the two variables as independent.

A similar controversy is present if we consider fast-growing firms. The literature views the role of growth in the success of firms in two conflicting ways. From one side, firm growth is seen as anticipating competitive advantage and profitability. On the other side, rapid growth leads to problems that diminish a firm's ability to generate profits (Gartner, 1997). High growth might create numerous challenges (Churchill & Lewis, 1983; Greiner, 1972; Kazanjian, 1988; Shuman & Seeger, 1986) and internal obstacles to the standard operating procedures or failure (Hambrick & Crozier, 1985). A rapid growth in the number of employees hinders knowledge transfer, might alter a company's internal structure, and modify its original entrepreneurial culture. In a review of research on high-growth firms' strategies, Hoy et al. (1992) concluded that pursuing high growth might be minimally or even negatively correlated with firm profitability. In sum, addressing new needs, meshing fast changes into current operations, and coping with increased organizational complexity may increase costs (Covin & Slevin, 1997).

The research interest in new venture growth has risen in the '90s (Ardishvili et al., 1998; Davidsson & Wiklund, 2000; Delmar, 1997), but empirical evidence on the link between growth and profitability remains mixed. This literature suggests that operating and financial costs are important variables for studying the relationship between growth and profit.

Some scholars consider newness a more critical factor than small size (Bonaccorsi & Giannangeli, 2010; Henrekson & Johansson, 2010; Stam, 2010). The differences concerning young firms' growth confirm that the Gibrat Law does not hold. However, new firms that grow substantially are a small minority in the population of start-ups. Garnsey et al. (2006) provide an approach to new firm growth based on a Penrosian (1959) model and find that new firm growth is open to interruptions and setbacks. In the literature, young firms can have different behaviour: micro start-ups might survive on a small scale, perhaps due to the low growth aspirations and high nonmonetary income of their founders, while young firms have to expand to reach the minimum efficient scale of production in their industry (Gimeno et al., 1997; Stam & Wennberg, 2009).

## 3 Data and variables

We base our analysis on a sample of medium-sized firms in the CHEETAH database. CHEETAH has been developed in the context of the WP20 of the project "RISIS—Research Infrastructure for Research and Innovation Policy Studies", funded by the European Commission under the Seventh Framework Program. CHEETAH aims to study the long-term economic performance of Fast-Growing Firms, considered one of the main pillars of the European industrial and technological system. The database concerns medium-sized firms that experienced a fast-growth rate in terms of 3-year turnover growth (an average of 20% per year per cohort of observation according to the OECD definition of fast-growing firms) or the number of employees (again an average of 20% per year per cohort of observation) in at least one of the growth periods of 2008–2011, 2009–2012 and 2010–2013. Firms are located in 30 European countries in addition to Israel. The unit of observation is the firm. The database includes 42,369 firms. The primary source of information is ORBIS. We use the definition of medium-sized firms following the description of CHEETAH's curators: firms selected among those that present fast-growing characteristics are firms that, at the beginning of the cohort of observation, have a number of employees between 50 and 4999, a turnover non-exceeding €1.5 billion or a balance sheet total not exceeding €2 billion.

We selected a subsample of firms located in Italy, presenting a complete set of data for turnover, number of employees, total assets, total fixed assets, cash flow, and earnings before interest and taxes (EBIT) between 2008 and 2013. Starting from these data, we calculated the Return on Asset (ROA) by each firm's EBIT and Total Assets ratio each year. We use ROA as a measure of profitability. The growth rate is calculated as the ratio between the difference in the turnover rate of 2 years and the level of turnover of the first year. We prefer to use this measure because the logarithmic difference tends to be less accurate when the rate overcame 5%, an element that could be distortive in a sample where a relevant number of firms have experienced at least once a growth rate higher than 20%. For a similar reason, we do not use Haltivanger's formula to calculate turnover growth rate: despite its construction being oriented to limit the effects of outliers, this formula tends to underestimate growth rate compared to the classic formula for values that exceed 0.25, an element that is a relevant limitation for the definitory characteristics of FGMFs.

We exclude from the sample all the firms that present a lack of data for all the variables considered for two or more years, while we replace missing values in a single year using a linear interpolation technique (Zinilli, 2021). This correction involves 89 firms in the sample. After this selection, the total number of firms reduces from 3551 to 1666.

We have a complete series of growth rates between 2009 and 2013 for each firm. We exclude from the sample all the firms that present relevant positive and negative outliers in the growth rate series. We remove from sample firms that offer a value of growth rate higher than 1000% or lower than −100%.

We built the following indicators to focus on the potential factors that can explain how firms organize themselves to have the best structure to manage their growth:

- External cost (*Ext_Cost*): the ratio between the direct costs that a firm has to face to expand its activity, i.e. the operating expenses given by the sum of external costs of production and the turnover. External costs encompass expenses for raw and intermediate materials (and relative change in inventories) and other external operating expenses (industrial, administrative, commercial expenses, outsourcing, expenses for other services).
- External financial dependence index: (*EFD*) is defined as the ratio of the difference between capital expenditure and cash flow to capital expenditure (Rajan & Zingales, 1998). In this work, we consider a "dynamic" version of the index, where the summed values of cash flow and capital expenditure relate to all the years up to the observation in $t-1$. We have chosen this formula following Villani (2021), who underlines how a single value is not very incisive even in relatively short data series. It is not logical to insert a longitudinal regression element realized after observing the dependent variable. The index suggests if and how much the firm needs external funding to sustain its expansion.

To the explanatory variables, we add per capita labor costs (*LabCost_pc*), measured by the overall wage expenses of firms and the number of employees. This variable can be considered as a proxy of labor quality employed by the firm, and it is included in the model to check if the growth process is associated with a higher quality of labor force.

We also consider the lagged values of the growth rates (*growth*), and we have created a dummy variable (*Fast_Growth*) that indicates a growth rate above the

**Table 1** Definition of variables

| Variable | Description | Calculation |
|---|---|---|
| *Dependent variables* | | |
| *ROA* | Return on asset in year *t* for firm *i* | $\frac{EBIT_{it}}{Total\ Asset_{it}}$ |
| *Growth* | Turnover growth rate in year *t* for firm *i* | $\frac{Turnover_{it}-Turnover_{it-1}}{\lvert Turnover_{it-1}\rvert}$ |
| *Independent variables* | | |
| *Ext_cost* | Overall external cost sustained for the activity of the firm | $\frac{External\ costs_{it}}{Turnover_{it}}$ |
| *EFD* | External financial dependence index | $1-\frac{\sum_{j=0}^{t-1} Cashflow_j}{\sum_{j=0}^{t-1} Capital\ expenditure_j}$ |
| *LabCost_pc* | Labor cost per employees | $\frac{Employees\ cost_{it}}{Number\ of\ employees_{it}}$ |
| *Age* | Firm age (difference between the year of observation and the firm's foundation year) | |
| *Size* | Number of employees in year *t* for firm *i* | |

threshold of 20% to isolate those episodes that could generate fast-growing effects for the firm.

We include some controls: the size of firms, measured by the number of employees (*Size)*. bigger firms are more stable, and literature attributes them a higher propensity for positive profitability. We also consider the firm's age as the difference between the year of observation and the foundation year. Age is also used as a proxy for accumulated experience (*Age*). This variable entails firm stability: younger firms with higher profitability and turnover variations are usually less stable. Indeed, younger firms need to create their own space in a market where companies with more experience are present.

Table 1 summarises the variables considered, their description, and their calculation.

Table 2 presents descriptive statistics of the variables. Further specifications of the model are reported in the next section. This anticipation is functional to the presentation of the data: using a panel model with a maximum of three lagged values, the analysed values are reduced to the 2012–2013 2-year period. For this reason, Table 2 shows the descriptive statistics relating to the entire sample and those for the variables of the years of the panel only. The average value of the Turnover growth rate is 24%, over the value indicated as a flag for identifying FGMFs. The average number of employees is around 370 workers per firm per year: we have already seen that firm characteristics necessary to be considered Medium Firms and included in CHEETAH are significantly less stringent than the characteristics commonly considered by EUROSTAT; despite this, the statistics on firm size suggest that a huge part of the sample is contained, at the beginning of the observation period, within the limits that traditionally define medium-sized enterprises.

**Table 2** Descriptive statistics

| Variable | Whole sample | | | | | Years 2012–2013 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Obs | Mean | SD | Min | Max | Obs | Mean | SD | Min | Max |
| *ROA* | 7914 | 0.0323 | 0.1599 | −4.7703 | 1.0376 | 3,021 | 0.0255 | 0.1973 | −4.7703 | 1.0376 |
| *Growth* | 7971 | 0.2393 | 0.7247 | −0.9818 | 9.9731 | 3,078 | 0.0858 | 0.4351 | −0.9818 | 7.5192 |
| *Ext_cost* | 7971 | 0.6727 | 0.2783 | −0.4123 | 9.9494 | 3,078 | 0.6762 | 0.3032 | −0.4123 | 9.9494 |
| *EFD* | 3078 | 0.0291 | 13.7737 | −91.8860 | 95.3798 | 3,078 | 0.0291 | 13.7737 | −91.8860 | 95.3798 |
| *LabCost_pc* | 7971 | 80.3109 | 2243.134 | 0.0365 | 197,161 | 3,078 | 125.7315 | 3597.566 | 0.0365 | 197,161 |
| *Fast_Growth* | 7971 | 0.3638 | 0.4811 | 0 | 1 | 3,078 | 0.2092 | 0.4068 | 0 | 1 |
| *Age* | 7956 | 21.2386 | 17.2140 | 1 | 133 | 3,072 | 22.5671 | 17.0969 | 3 | 133 |
| *Size* | 7971 | 371.6023 | 984.7099 | 1 | 31,280 | 3,078 | 435.9756 | 1241.227 | 1 | 31,280 |

**Table 3** Bivariate correlations, years 2012–2013

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1 *ROA* | 1 | | | | | | | |
| 2 *Growth* | 0.1154* | 1 | | | | | | |
| 3 *Ext_cost* | −0.1526* | −0.0090 | 1 | | | | | |
| 4 *EFD* | 0.0130 | 0.0068 | −0.0365 | 1 | | | | |
| 5 *LabCost_pc* | −0.0008 | 0.0080 | 0.0099 | −0.0015 | 1 | | | |
| 6 *Fast_Growth* | 0.0761* | 0.5760* | −0.0153 | 0.0032 | 0.0340 | 1 | | |
| 7 *Age* | 0.0489* | −0.0234 | 0.1360* | 0.0148 | 0.0196 | −0.0334 | 1 | |
| 8 *Size* | 0.0514* | 0.0802* | −0.0565* | −0.0329 | −0.0770* | −0.0299 | 0.1996* | 1 |

*$p < 0.01$

Table 3 presents results for bivariate correlation on data limited to the years 2012 and 2013, those directly involved in our analysis. As expected, we have a negative correlation between the number of employees and the growth rate and a positive correlation between age and the number of employees. In all the cases, there are no high values of correlation that can mine regression results.

## 4 Methodology

We conduct a regression analysis based on two sets of longitudinal models to investigate, respectively, the role of organizational determinants of growth (*Growth*) and the effect on profitability (*ROA*) of our variables of interest, namely the external costs and the external financial dependence, and past growth patterns.

The first model—Eq. (1)—regresses the firm's growth rate against the external cost up to three lags (*Ext_cost*), the external finance dependence (*EFD*), the unit labor costs up to 3-year lags (*LabCost_pc*), the past growth rates (*Growth*) and the past fast growth episodes (dummy variable: *Fast_Growth*) up to 3 years lag and a vector of control variables (*X*) that includes: age and size of the firm. Finally, intercept ($\theta_i$) captures all time-invariant idiosyncratic heterogeneity:

$$\begin{aligned} Growth_{i,t} = \theta_i &+ \sum_{j=1}^{3} \alpha_{t-j} Ext\_cost_{i,t-j} + \beta EFD_{i,t} \\ &+ \sum_{j=1}^{3} \gamma_{t-j} LabCost\_pc_{i,t-j} + \sum_{j=1}^{3} \mu_{t-j} Growth_{i,t-j} \\ &+ \sum_{j=1}^{3} \delta_{t-j} Fast\_Growth_{i,t-j} + \sigma' X_{i,t-1} + \varepsilon_{j,t} \end{aligned} \tag{1}$$

Note that the choice of considering a 3-year lag reduces the analysis to the last 2 years of the panel (2012 and 2013). We also propose and discuss models in which only 1-year and 2 years lags are considered.

The second set of models employed—Eq. (2)—has as dependent variable the profitability of the firm *i* at the time *t* measured by the Return on Assets (*ROA*) and the same set of explanatory variables used in the model (1), together with the set of control variables (***X***), that include size and age of firm, and the firm-specific intercept ($\theta_i$). Also, for this model, all the independent variables are lagged by 1 year with respect to the dependent variable:

$$\begin{aligned} ROA_{i,t} = \theta_i + \sum\nolimits_{j=1}^{3} \alpha_{t-j} Ext\_cost_{i,t-j} + \beta EFD_{i,t} \\ + \sum\nolimits_{j=1}^{3} \gamma_{t-j} LabCost\_pc_{i,t-j} + \sum\nolimits_{j=1}^{3} \mu_{t-j} Growth_{i,t-j} \\ + \sum\nolimits_{j=1}^{3} \delta_{t-j} Fast\_Growth_{i,t-j} + \sigma' X_{i,t-1} + \varepsilon_{j,t} \end{aligned} \tag{2}$$

The models take the form of a fixed-effects panel data model. This allows us to control time-invariant firm-specific characteristics and sector and region of activity. The choice is also supported by the Hausman test that rejected the hypothesis of consistent results for the random effects model.

## 5 Results

We start analysing the impact on the growth of external operational costs and external financial dependence, labor quality, past growth, and past fast-growth episodes after controlling for age, size, and idiosyncratic characteristics.

Table 4 shows the regression model results. In columns (1)–(3), we present results for the model adding progressively lagged values of explicative variables. All these regressions are estimated using a fixed effect model given the result of the Hausman test ($H = 15$, $p < 0.000$), which indicates the fixed effect model is preferred to the random effect one. Column (4) presents results for the same variables using a Hausman–Taylor estimator (1981) to test the robustness of the results of our FE model.

The different models show similar results and similar goodness of fit statistics. Referring to the full model (Column 3), results for the external cost (*Ext_cost*) show that these costs at $t-2$ and $t-3$ (respectively 0.448 and 0.259) have a positive and significant impact on present growth, while the same variable at $t-1$ is negative (−0.886). This last result supports our "Penrosian" hypothesis that connects growth with a series of reorganisation costs and internal restructuring to exploit the benefit of its "new scale of production". The positive signs of coefficients at lags two and three suggest that, once the firms coped with short-run imbalances, further adjustments allow them to exploit more growth potential.

*EFD* presents no significant coefficients across regressions. As said before, we have added this variable to test the role of the balance between external and internal funding. However, we have no indication about the characteristics of the industry at the national and local level of the firm that we are analysing, nor do we have information about the access to external financing of the firm, all elements that, according to Kroszner et al. (2007) contribute to loss of significance of EDF's effects of firm growth. Our results suggest that EDF does not affect the pattern of growth. This could be due to the particular set of firms considered—the "elite firms" of

**Table 4** Effects of past adjustment costs on firm growth

| Dependent variable: $Growth_t$ | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $Ext\_cost_{t-1}$ | −0.90293*** | −0.94504*** | −0.88553*** | −0.87936*** |
| | (0.116) | (0.113) | (0.114) | (0.077) |
| $Ext\_cost_{t-2}$ | | 0.30003*** | 0.47762*** | 0.52597*** |
| | | (0.080) | (0.103) | (0.066) |
| $Ext\_cost_{t-3}$ | | | 0.25879*** | 0.28442*** |
| | | | (0.087) | (0.055) |
| *EFD* | −0.00203 | −0.00007 | 0.00205 | 0.00334 |
| | (0.008) | (0.008) | (0.008) | (0.006) |
| $LabCost\_pc_{t-1}$ | −0.00324 | −0.00197 | −0.00043 | −0.00137 |
| | (0.003) | (0.003) | (0.003) | (0.002) |
| $LabCost\_pc_{t-2}$ | | 0.04505 | 0.05973 | 0.06034** |
| | | (0.033) | (0.040) | (0.029) |
| $LabCost\_pc_{t-3}$ | | | 0.04744 | 0.02148 |
| | | | (0.064) | (0.046) |
| $Growth_{t-1}$ | −0.36556*** | −0.42565*** | −0.44007*** | −0.41007*** |
| | (0.026) | (0.027) | (0.027) | (0.020) |
| $Growth_{t-2}$ | | −0.09149*** | −0.11717*** | −0.09203*** |
| | | (0.017) | (0.020) | (0.015) |
| $Growth_{t-3}$ | | | −0.02469* | −0.00487 |
| | | | (0.013) | (0.010) |
| $Fast\_Growth_{t-1}$ | 0.01772 | 0.00289 | −0.05232* | −0.00611 |
| | (0.025) | (0.027) | (0.030) | (0.022) |
| $Fast\_Growth_{t-2}$ | | −0.07434*** | −0.13485*** | −0.12978*** |
| | | (0.026) | (0.031) | (0.023) |
| $Fast\_Growth_{t-3}$ | | | −0.09755*** | −0.15643*** |
| | | | (0.028) | (0.020) |
| *Age* | −0.11732*** | −0.15061*** | −0.14638*** | −0.00938*** |
| | (0.014) | (0.015) | (0.015) | (0.003) |
| $Size_{t-1}$ | −0.13254*** | −0.10988*** | −0.08943*** | −0.10072*** |
| | (0.030) | (0.030) | (0.031) | (0.019) |
| *Constant* | 3.04388*** | 3.73010*** | 3.46941*** | −0.21135 |
| | (0.330) | (0.346) | (0.359) | (1.393) |
| R-squared | 0.221 | 0.270 | 0.290 | |
| sigma_u | | | | 2.488 |
| sigma_e | | | | 0.343 |
| rho | | | | 0.981 |
| *N* | 3072 | 3063 | 3054 | 3054 |

Standard errors in italics below coefficients

***$p<0.01$, **$p<0.05$, *$p<0.1$

FGMF—for which it turns out that the expansion is not associated with the degree of external finance.

*LabCost_pc* variable is not significant at all lags. These results could be the effect of the noisy nature of the proxy of labour force quality we use.

Referring to variables related to past growth (*Growth* and *Fast_Growth*), a negative and significant effect emerges for all the variables considered. Fast-growth episodes present coefficients that are higher in absolute values and statistically more robust in $t-2$ and $t-3$ (−0.135 and −0.098) than in $t-1$ (−0.052), which suggests that there is a lumpiness in fast-growth episodes: past fast growth episodes are not followed by a similar present growth. This result confirms the impossibility of fast growth episodes repeated every year. This is coherent with Penrose (1959), which postulates some firm reorganisation periods after fast growth. Only after and if such adjustments occur can a firm open to experimenting again with fast growth.

For what concern *Age* and *Size*, both present negative coefficients (respectively, −0.146 and −0.089). Age result suggests that among FGMFs, younger firms tend to be more active in creating their market niche among more experienced firms. On the other hand, *Size* confirms that the expansion of companies leads to a slowdown in terms of turnover.

For what concerns profitability, Table 5 presents results for model (2): profitability, as measured by Return on Asset (*ROA*), is regressed for the same explicative variables included in the previous model to analyse the impact of the instruments used to reorganize the internal structure of the firm and past growth or fast growth episodes on current profitability. Column 3 reports the complete model, with all values included in the regression. In this case, external costs (*Ext-cost*) a $t-1$ has a negative and significant coefficient (−0.137), while previous values are not statistically significant. These results suggest that while higher unit costs of production affect a firm’s profitability negatively, the costs more distant in time, associated with the company’s reorganisation, have no direct effects on the current profitability. As for Model 1, *EFD* has no significant coefficient; considerations previously presented for growth about the unexplained role of external dependence are still valid for profitability.

As for the indicators related to the past growth in turnover, the only significant and positive coefficient is that related to the growth rate at $t-1$ (0.022). There is a robust relationship between growth and profitability in the short term, while growth reiterations and fast growth episodes present lacking effects.

For what concern *Age*, older FGMFs ceteris paribus show lower ROA (−0.013). *Size* seems beneficial for profit (0.028), suggesting that economies of scale could be present for this group of firms, and they seem to allow the companies to increase their profitability. In this respect, the past growth episodes can also be relevant, given that their accumulation determines the future size of firms.

At this stage of analysis, a related question is if and how younger FGMFs present different patterns, and we estimate models (1) and (2) for the subsample of FGMF younger than 10 years old.

Table 6 shows the results of the estimation of model (1) for the set of younger FGMF. Results have a structure similar to that of the full sample: growth is negatively related to *Ext_cost* at $t-1$ and positively related to *Ext_cost* values in the

**Table 5** Effects of past adjustment costs on firm profitability

| Dependent variable: $ROA_t$ | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $Ext\_cost_{t-1}$ | −0.13617*** | −0.13365*** | −0.13737*** | −0.15092*** |
| | (0.041) | (0.041) | (0.042) | (0.027) |
| $Ext\_cost_{t-2}$ | | −0.00354 | −0.01354 | 0.03717* |
| | | (0.029) | (0.038) | (0.021) |
| $Ext\_cost_{t-3}$ | | | −0.01265 | 0.02197 |
| | | | (0.032) | (0.017) |
| *EFD* | 0.00075 | 0.00080 | 0.00076 | 0.00105 |
| | (0.003) | (0.003) | (0.003) | (0.002) |
| $LabCost\_pc_{t-1}$ | 0.00190* | 0.00198* | 0.00186* | 0.00021 |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| $LabCost\_pc_{t-2}$ | | −0.01264 | −0.01119 | −0.00065 |
| | | (0.012) | (0.015) | (0.010) |
| $LabCost\_pc_{t-3}$ | | | 0.00479 | 0.00847 |
| | | | (0.024) | (0.017) |
| $Growth_{t-1}$ | 0.02126** | 0.02381** | 0.02179** | 0.02861*** |
| | (0.009) | (0.010) | (0.010) | (0.008) |
| $Growth_{t-2}$ | | 0.00480 | 0.00090 | 0.00350 |
| | | (0.006) | (0.008) | (0.006) |
| $Growth_{t-3}$ | | | −0.00531 | −0.00398 |
| | | | (0.005) | (0.004) |
| $Fast\_Growth_{t-1}$ | 0.00139 | −0.00146 | 0.00539 | 0.01512* |
| | (0.009) | (0.010) | (0.011) | (0.008) |
| $Fast\_Growth_{t-2}$ | | −0.00477 | 0.00541 | 0.01305 |
| | | (0.009) | (0.012) | (0.008) |
| $Fast\_Growth_{t-3}$ | | | 0.01536 | 0.01446** |
| | | | (0.010) | (0.007) |
| *Age* | −0.01066** | −0.01089** | −0.01260** | 0.00058 |
| | (0.005) | (0.005) | (0.006) | (0.000) |
| $Size_{t-1}$ | 0.03739*** | 0.03991*** | 0.03832*** | 0.00759* |
| | (0.011) | (0.012) | (0.012) | (0.004) |
| *Constant* | 0.41077*** | 0.42385*** | 0.46475*** | −0.06835 |
| | (0.118) | (0.128) | (0.135) | (0.224) |
| R-squared | 0.032 | 0.034 | 0.035 | |
| sigma_u | | | | 0.267 |
| sigma_e | | | | 0.126 |
| rho | | | | 0.819 |
| *N* | 3015 | 3006 | 2997 | 2997 |

Standard errors in italics below coefficients

***$p<0.01$, **$p<0.05$, *$p<0.1$

**Table 6** Effects of past adjustment costs on firm growth, firms founded from 2000 onwards

| Dependent variable: $Growth_t$ | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $Ext\_cost_{t-1}$ | −1.97279*** | −1.77114*** | −1.82300*** | −1.43483*** |
| | (0.179) | (0.181) | (0.181) | (0.113) |
| $Ext\_cost_{t-2}$ | | 0.78525*** | 0.47023* | 0.84958*** |
| | | (0.221) | (0.249) | (0.157) |
| $Ext\_cost_{t-3}$ | | | 0.44578*** | 0.64652*** |
| | | | (0.167) | (0.129) |
| *EFD* | −0.02667* | −0.02117 | −0.01857 | −0.01314 |
| | (0.016) | (0.015) | (0.015) | (0.012) |
| $LabCost\_pc_{t-1}$ | −0.47689* | −0.16145 | −0.14673 | −0.06591 |
| | (0.267) | (0.258) | (0.257) | (0.181) |
| $LabCost\_pc_{t-2}$ | | 0.12930 | 0.00100 | 0.02036 |
| | | (0.690) | (0.696) | (0.494) |
| $LabCost\_pc_{t-3}$ | | | −0.02548 | −0.03991 |
| | | | (0.244) | (0.199) |
| $Growth_{t-1}$ | −0.48905*** | −0.56424*** | −0.57190*** | −0.58797*** |
| | (0.038) | (0.038) | (0.038) | (0.032) |
| $Growth_{t-2}$ | | −0.10707*** | −0.11276*** | −0.08718*** |
| | | (0.025) | (0.028) | (0.024) |
| $Growth_{t-3}$ | | | −0.01098 | 0.00629 |
| | | | (0.016) | (0.014) |
| $Fast\_Growth_{t-1}$ | 0.08656** | 0.06610 | 0.03765 | 0.14780*** |
| | (0.042) | (0.045) | (0.049) | (0.041) |
| $Fast\_Growth_{t-2}$ | | −0.09148** | −0.11885** | −0.07638* |
| | | (0.043) | (0.051) | (0.043) |
| $Fast\_Growth_{t-3}$ | | | −0.05649 | −0.07831** |
| | | | (0.045) | (0.038) |
| Age | −0.14315*** | −0.20282*** | −0.20429*** | −0.04646*** |
| | (0.025) | (0.025) | (0.026) | (0.012) |
| $Size_{t-1}$ | −0.20284*** | −0.11082* | −0.09103 | −0.01728 |
| | (0.058) | (0.057) | (0.057) | (0.021) |
| Constant | 1.95331*** | 2.03593*** | 2.12330*** | 0.46864 |
| | (0.252) | (0.298) | (0.313) | (0.565) |
| R-squared | 0.455 | 0.516 | 0.526 | |
| sigma_u | | | | 0.827 |
| sigma_e | | | | 0.341 |
| rho | | | | 0.855 |
| *N* | 1097 | 1088 | 1,079 | 1,079 |

Standard errors in italics below coefficients

***$p<0.01$, **$p<0.05$, *$p<0.1$

previous years. Past growth has a negative effect on present growth, both as a growth rate and as an episode of fast growth.

However, values of the coefficient of *Ext_cost* for this subsample are on average bigger (in absolute value) than the whole sample: at $t-1$ negative value is more than double with respect to the other regression (−1.823). The coefficient at $t-2$ is comparable to the same for the entire sample (0.470), while the variable at $t-3$ is higher and more statistically significant (0.446), suggesting that a structured reorganization has a higher impact on the success of a younger FGMFs. Looking at the values of the external cost variables as a whole, we can see how for young FGMFs, the past choices of reorganization and adaptation are more important to continue growing, but the costs to be supported can represent an important limit in the short term. If young FGMFs can absorb this shock, they will have a strong return from the new scale of production. Even if macro-dynamics are similar for old and younger FGMFs, the latter must balance greater room for growth with a greater risk of default.

*EFD* is still not significant. However, compared with the whole sample, the coefficient is constantly negative (and significantly related to Column 1). These elements suggest that even if it is not possible to find a definite role of external finance dependence for the reasons reported before, these elements seem to have a role in the young FGMFs' development, in line with what is reported in the literature.

For what concern past growth, coefficients of *Growth* at $t-1$ and $t-2$ are both negative and significant (respectively −0.572 and −0.113), and the same is true for *Fast_Growth* at $t-2$ (−0.119), confirming the general evaluation reported for the whole sample about the effect of past growth on present results. Another interesting element is given by the coefficient for *Fast_Growth* at $t-1$: even if in column 3 it is not significant, it is constantly positive and has statistical significance in regression in column 1 and for Hausman–Taylor regression in column 4, elements that suggest that a recent fast growth could represent a push for young FGMFs expansion.

About *Age* we can notice that the coefficient is negative, significant, and higher in absolute value with respect to the whole sample (−0.204), an element that confirms the idea that youngest FGMFs are more fragile and more exposed to the risk of default.

Table 7 reports the estimation results for model (2) again for the subset of younger FGMFs. Few variables have statistically significant coefficients, among those reported only *Growth* at $t-3$ (−0.010) and *Age* (−0.019), suggesting that although past growth may have a weak influence on current profitability and that younger FGMFs are more fragile also in terms of profitability, the dynamics relating to turnover growth rates and ROA for this sub-sample of firms are significantly different.

**Table 7** Effects of past adjustment costs on firm profitability, firms founded from 2000 onwards

| Dependent variable: $ROA_t$ | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $Ext\_cost_{t-1}$ | 0.06363 | 0.07034 | 0.06896 | −0.05005 |
| | (0.060) | (0.064) | (0.064) | (0.044) |
| $Ext\_cost_{t-2}$ | | 0.03339 | 0.01214 | −0.06392 |
| | | (0.078) | (0.089) | (0.061) |
| $Ext\_cost_{t-3}$ | | | 0.02548 | 0.02652 |
| | | | (0.059) | (0.049) |
| *EFD* | −0.00065 | −0.00065 | −0.00046 | 0.00145 |
| | (0.005) | (0.005) | (0.005) | (0.005) |
| $LabCost\_pc_{t-1}$ | 0.13791 | 0.13983 | 0.14133 | 0.05765 |
| | (0.088) | (0.091) | (0.092) | (0.071) |
| $LabCost\_pc_{t-2}$ | | −0.10573 | −0.16650 | −0.17758 |
| | | (0.262) | (0.265) | (0.188) |
| $LabCost\_pc_{t-3}$ | | | −0.04353 | −0.05897 |
| | | | (0.087) | (0.079) |
| $Growth_{t-1}$ | 0.01078 | 0.01160 | 0.00850 | 0.01519 |
| | (0.013) | (0.014) | (0.014) | (0.013) |
| $Growth_{t-2}$ | | 0.00155 | −0.00618 | −0.00547 |
| | | (0.009) | (0.010) | (0.010) |
| $Growth_{t-3}$ | | | −0.01019* | −0.00967* |
| | | | (0.006) | (0.006) |
| $Fast\_Growth_{t-1}$ | 0.01772 | 0.01545 | 0.01670 | 0.03187** |
| | (0.014) | (0.016) | (0.018) | (0.014) |
| $Fast\_Growth_{t-2}$ | | −0.00690 | 0.00007 | 0.01049 |
| | | (0.015) | (0.018) | (0.014) |
| $Fast\_Growth_{t-3}$ | | | 0.00811 | 0.00728 |
| | | | (0.016) | (0.013) |
| *Age* | −0.01330 | −0.01464 | −0.01862** | −0.00194 |
| | (0.008) | (0.009) | (0.009) | (0.004) |
| $Size_{t-1}$ | 0.01771 | 0.01993 | 0.02243 | −0.00116 |
| | (0.020) | (0.021) | (0.021) | (0.007) |
| *Constant* | 0.08305 | 0.07988 | 0.11674 | 0.11567 |
| | (0.085) | (0.106) | (0.112) | (0.186) |
| R-squared | 0.031 | 0.033 | 0.040 | |
| sigma_u | | | | 0.206 |
| sigma_e | | | | 0.120 |
| rho | | | | 0.746 |
| *N* | 1074 | 1065 | 1056 | 1056 |

Standard errors in italics below coefficients

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

## 6 Discussion and conclusion

FGMFs are of great interest to policymakers and academics because their success could be an engine of growth for the whole economic system. Hence, understanding their characteristics of success can be crucial to design the right individual incentives to drive the economic system to the desired path of growth, especially in the Italian context, for which medium firms constitute a relevant element of the industrial sector.

The literature has made several advancements in understanding firms' growth patterns: regularities have been found in the structure of growth rates by identifying a group of firms that, in each period, grow fast and by finding negative autocorrelations for fastest-growing firms (Capasso et al, 2014; Coad & Holzl, 2009; Daunfeldt & Halvarsson, 2015).

To understand the cause of these results, we propose reconsidering the Penrosian perspective (Penrose, 1959), which suggests that the volatile nature of firm growth should be explained by looking at the structural characteristics of the scale of the firm's production process. More specifically, when a firm grows, it must pay additional costs –that we proxy with the external cost of production and external finance dependence to increase its scale of production. Moreover, we should consider that the process takes time: past growth episodes have an effect for more than 1 year lag. Under such circumstances, episodes of fast growth necessitate some time and some effort to be sustained. As the firm invests and adjusts its scale, it releases new resources and competencies, relaxing the "internal constraint" to the growth. As a result, fast growth cannot be a smooth process and, more importantly, cannot be sustained continuously without interruptions.

Our focus on FGMFs is dictated by the fact that the Penrose explanation should be more relevant for this class of firms. We also investigate how possible "imbalances" between growth and more structural aspects can harm firm profitability, making fast growth even more difficult to sustain.

We focus on Italian firms for the period 2009–2013 to understand if Italian firms confirm our hypotheses and to assess if, in this context, FGMFs can represent a target of policies aiming at stimulating: (i) a competitive level of firms and (ii) the employment level as suggested by the literature (Coad et al., 2014).

The empirical investigation is carried out using a series of regression models including time-varying variables: (i) an index of the external cost of production as a proxy of the yearly investments a firm must sustain to cope with growth in size; (ii) an external financial dependence index to capture the volatility over the firm's "financial efficiency" growth process. For this set of variables, we considered the lags of up to 3 years to capture the delayed effects of such characteristics on present growth.

The results show that growth at time $t$ is positively and significantly related to the external cost index at $t-2$ and $t-3$. While we find a negative sign of the coefficient at time $t-1$, both for the full sample and for the subsample of young FGMFs. These results can be interpreted as the "curse" of growth on possible future growth in the short run: more resources are needed internally for the firm, which becomes an advantage after 2 and 3 years, after the increased effort of the firm to acquire these resources from external sources.

We have found that the FGMFs' growth journey is characterised by lumpiness, represented by the break in the growth process probably due to the combination of internal resources availability and external factors such as windows of opportunities and demand expansion. Following Penrose, the critical aspects are internal and related to managers' task of modifying the organisation, which represents a temporary shock and entails costs. The capacity and speed in managing the organisational and financial costs differ across firms and depend on their life stories. In our sample of FGMFs, the reiteration regression reveals that growth persistence is a short-term episode. Past fast growth episodes have a temporarily disadvantageous effect on future growth perspectives. This is due to a trade-off between growth and efficiency dynamics. The dimensional leap capacity depends on the available organisational resources and their ability to deal with organisational adjustment.

As for the young FGMFs' external costs are positively related to present growth and have higher coefficients than the full sample ones. External costs have a significant negative impact on profitability.

Our contribution to the literature on firm growth is that of making visible the growth process of a specific and less studied group of firms, the elite of medium-sized firms, realising fast growth during a period of international crisis. Using two explicative variables linked to organisational aspects, such as the external cost and external financial dependence index, allows us to interpret the negative autocorrelation between past and present growth as a temporary break in the growth process due to the necessary reorganisation.

A cautionary remark should be underlined about the generalizability of the results. As noted above, we analysed the best-performing firms, in the system it could be that other firms follow different growth patterns and experiment with different relationships between growth and profitability. To some extent, we can expect that the results found for Italy can also apply to fast-growing firms in other European countries. Nonetheless, even this last implication should be checked further with empirical tests.

We can derive some policy implications from our results. FGMFs can be important to sustain system-level growth. Hence policy should make some effort to facilitate the adjustments of FGMFs. For instance, designing measures to develop the business service sector and to enhance the available resources at the system level. Since younger FGMFs seem more "lumpy" in their growth pattern, some support schemes should be introduced to accompany and shield them from the "curse" of fast growth.

For possible managerial implications, we suggest that managers should be aware of the curse of an extremely accelerated growth process in terms of additional external costs to be paid. When managers design strategies that aim at growth, they also have to think about how and when to adjust the organizational aspects to sustain growth. Moreover, managers should accept from the beginning and consider potential short-run imbalances when the firm grows. This is especially true if growth takes the form of exceptional big jumps in size-fast-growth episodes.

The future research perspectives include the extension of the analysis in different directions. First, we would extend the analysis to more than one European country to assess if and how different contexts spur different results. If yes, we should put some effort into understanding why. Secondly, we would match the sample of fast-growing firms with a sample of non-fast-growing ones to compare their—potential—differential dynamics, to study to what extent fast-growing firms present differential patterns and need specific attention from the policymakers and scholars.

From a methodological point of view, we intend to improve the explicative strength of our models through two advancements: an extended period of analysis and refinement of the variables used in the analysis to map more precisely the resources needed by firms in their process of growth.

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**Data availability** CHEETAH database has been developed in the context of the RISIS project and is available to all interested researchers, subject to approval by the project managers.



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