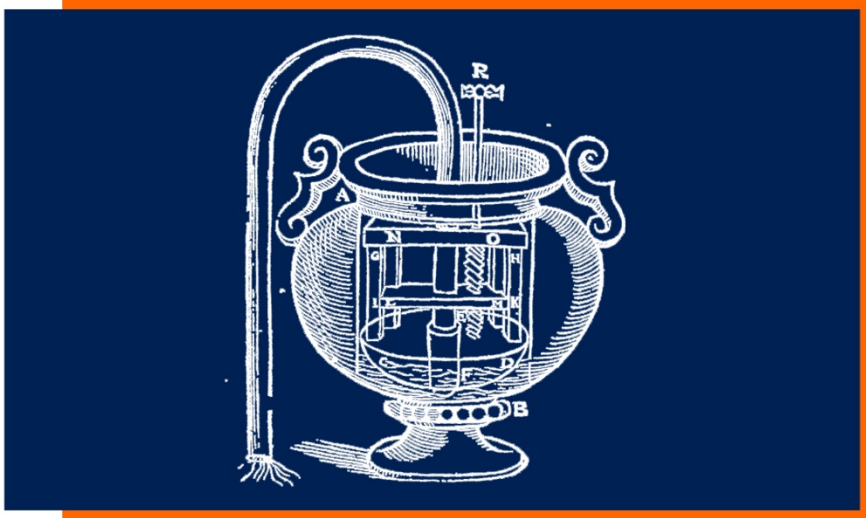
CNR-IRCrES Working Paper

Persistent fast growth and profitability



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Persistent fast growth and profitability

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ABSTRACT
Fast growth firms are a recent political objective given their impact on economic dynamics. Notwithstanding this, there is no unanimity in the literature on their determinants and impact and many aspects remain open questions. Several analyses consider growth and fast growth a random event, without possibility of prediction and policy action. This paper intends to contribute to the current large debate, looking at the characters of growth episodes (spell), type and persistence, and how they impact on firms' profitability. We focus on a sample of medium-sized firms included in CHEETAH database, whose main characteristics is to have experienced at least one episode of fast growth, according to the OECD definition, in at least one of the cohorts of three years considered of 2008-2011, 2009-2012 and 2010-2013. We develop a descriptive analysis of how firms evolve over time from their starting level of turnover growth and the estimation of how different trajectories of growth (more persistent versus episodic) influence firm's profitability through a panel regression. Our hypothesis that fast growth persistence makes a positive difference in terms of firms' profitability is confirmed.

KEYWORDS: fast growth, persistence, profitability, growth trajectories

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1. INTRODUCTION

Since 2000, firms able to increase their size considerably in a short time have attracted growing attention. Indeed, the so-called fast growing firms (FGFs), has become relevant for academic scholars and policymakers because of their impact on market dynamics (Vértesy et al, 2017) and their capacity to create new jobs positions. High growth firms and especially high growing SMEs figure high on the European public policy debate (Hölzl, 2014). The reason is the delay of Europe in generating new large firms (Cohen and Lorenzi, 2000; Philippon and Veron, 2008) and the presence of an average firm dynamics lower in most European countries than in the USA (Bartelsman et al., 2005; Hoffmann and Junge, 2006; Bravo-Biosca, 2010). This debate influenced the Europe 2020 strategy, which explicitly mentions the support of high-growth SMEs as a political objective (EC, 2010).

Despite this interest, there is no unanimity in the literature regarding the elements of the firms that can explain the growth performance, nor if and how firms' profitability is related to firms' fast growth or have indicators been identified that can signal the conditions for a rapid growth path of the firms (Coad et al. 2014).

While previous studies have documented the highly skewed nature of firm growth rates, we know far less about the persistence of growth rates over long periods. Many analyses consider high growth firms an episodic element. If growth is a random phenomenon (Marsili, 2001, "*growth is affected by purely stochastic shocks"*), there are weak possibilities of policy suggestions and predictions.

Only recently, some authors have analyzed the persistence of growth, with ambiguous results. Daunfeldt and Halvarsson, 2015) show how high growth is episodic among Sweden firms between 1997 and 2008, the highest point in the dynamics of growth modulated as a wave. On the other hand, Dosi et al. (2019) analyze data related to American firms between 1959 and 2015, founding that persistence of high growth is a rare case, but not a random process). Esteve-Perez et al. (2020) analyze persistence in terms of probability of transition between two periods of high growth for Spanish firms between 1991 and 2005, founding that probability of high growth persistence increase with the number of successive periods in which there is a high growth.

This paper aims to contribute exploring the following research questions (Dosi et al., 2019): Do 'fast growers' tend to maintain their relative growth rates advantages over long-periods or is superior growth a transitory phenomenon? Is, as predicted by evolutionary and capability-based theories of the firm, the process of firm growth path-dependent, or is it more akin to a random walk?

We focus on a sample of medium-sized firms included in CHEETAH database, whose main characteristics is to have experienced at least one episode of fast growth, according to the OECD definition, in at least one of the cohorts of three years considered (see below for a more detailed description) over the period considered.

We base our analysis on:

- A descriptive analysis of how firms evolve over time from their starting level of turnover growth, looking at the growth spell volatility or persistence. We can identify which is the percentage of our population with persistent positive growth and fast growth, which are the

followed trajectories from different points of departure and the possibilities of individual firms to move from one category of growth to another one.

- A multifactor regression to analyze how different trajectories of growth (more persistent versus episodic) influence a firm's profitability.

Our hypotheses are that fast growth and its persistence make a positive difference in terms of firms' profitability.

We also follow the Penrose lesson on the relevance of internal firm capabilities for growth, which we approximate with two variables: one-year lagged firm's growth and its survival capacity.

Finally, we devote specific attention to a subsample of young firms to check if fast growing is more probable for this group of firms, and if it has a more relevant effect than the average on profitability.

The paper is organized as follows: section 2 introduces literature and theoretical background, section 3 presents data used, section 4 contains descriptive analysis, section 5 presents econometric results, section 6 discussion and section 7 concludes.

2. THEORETICAL BACKGROUND

The literature on firm growth is extensive. There are three main streams of studies (Mc Kelvey, Wiklund, 2010): some empirically or conceptually view growth as a dependent variable and use a set of independent variables to explain variance in the growth as an outcome. Within this line, there are several works about the determinants of growth. The second stream of literature deals with how growth leads to economic or organizational effects. In this case, that we follow, growth is treated as an independent variable that influences some outcomes. The third stream is interested in the growth process.

If we focus our attention on the outcome of growth, which is a crucial choice for paying attention to growth as a way to reach economic dynamism, and in particular, if we look at if growth and fast growth have a positive impact on firm's profitability, we find a considerable controversy and a low convergence in the literature.

Several theories defend the 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, 2007), first-mover advantage (Lieberman and Montgomery, 1988). Lee (2014), Federico and Capelleras (2015) show evidence of a positive influence of growth on profits.

However, Coad (2007) finds an insignificant association between companies' growth and profitability for French manufacturing companies, which was consistent with Gupta M.C. (1969), who examined U.S. manufacturing companies. While there may be a statistically significant relationship between growth and profit, the magnitude of the effect is so low that it would be valid to look at the two variables as independent. Therefore, the question on the relation is open to further investigation about the expected relationship between profits and growth.

A similar controversy is present if we consider fast-growing firms. The question is if extraordinary growth is profitable. Markman and Gartner (2002) tested whether remarkable high growth (e.g., sales growth rates of 500 percent to 31,000 percent over five years) was correlated to firm profitability. Using longitudinal data from three separate cohorts (from 1992 to 1996; 1993 to 1997; and 1994 to 1998) and controlling for the sector, they found that extraordinary high growth was not related to firm profitability. Firm age, however, was significantly, and inversely, related to profitability: younger firms experience slightly higher profitability rates.

The role of growth for the success of firms is viewed in two conflicting ways by the literature. From one side, firm growth is seen as anticipatory of competitive advantage and profitability. Larger firms have higher rates of survival compared to smaller firms (Aldrich & Auster, 1986), and firm size is often associated with economies of scale (Porter, 1985). On the other side, the

process of rapid firm growth is seen as leading toward a series of 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 lead to 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 the strategy of high-growth firms, Hoy, McDougall, and D'Souza (1992) concluded that the pursuit of 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 managerial complexity, may lead to an upsurge in costs (Covin & Slevin, 1997). The scope of research on new venture growth has increased in recent years (Ardishvili et al., 1998; Davidsson and Wiklund, 2000; Delmar, 1997), but empirical evidence on the link between growth and profitability remains mixed.

An approach to the study on a firm's growth deals with the non-linearity of this process, the ups, and downs that occur within the time frame (Mc Kelvie and Wiklund, 2010). Numerous studies have found that the size of firms varies in a non-linear fashion over time (Delmar et al., 2003; Zook & Allen, 1999). This erratic growth patterns also include the most rapidly growing firms (Markman & Gartner, 2002). Only few firms can engage in linear, stable growth (e.g., Garnsey et al., 2006). Limitations to linear growth, such as increasing capacity, or adding large numbers of managers, demanding substantial capital outlays, would suggest that growth is not sustainable or undeviating over time (Mc Kelvie and Wiklund, 2010).

Esteve-Perez et al. (2020) put forward that scholars interested in high growth firms should complement firm-level analyses with episode (spell)-level investigations, in particular, to study determinants or effect of persistence in high growth. Spells (or events) of growth and high growth can be considered in terms of duration (lasting longer) or repetition (to repeat a high-growth episode over succeeding years).) Esteve-Perez et al. (2020) investigate these aspects of the high-growth phenomenon in a sample of Spanish manufacturing firms with more than ten employees in the period 1991-2015. They spot the episodes (spells) of high-growth (HG) and non-high-growth (NHG, which include both low and negative yearly growth episodes), together with the transitions that occur between these two statuses and use multi-spell discrete-time duration functions to model the transitions (from NHG to HG, as well as the transitions from HG to NHG). The timing of the transition, as well as the time between transitions that is survival in a particular state, matter. The scholars find that a reduced number of spells of HG last for multiple (3 or more) years and show a probability of lasting longer, as their length increases.

Growth is also influenced by the structural elements of a company, such as age, under the assumption that an older company is more rigid in their routines and, therefore, less able to adapt to market changes. While being an HGF is a rare event, being a persistent high growth firm is an even much rare event, but high firm growth seems to be affected by size and age dependency more than mean growth (Hölzl, 2014). The Gibrat's Law, establishing that the growth rate of a given firm is independent of its size at the beginning of the period examined, seems rejected ex-ante since smaller firms tend to grow faster than their larger counterparts (Lotti et al., 2009). However, in the long term, Lotti et al. (2009) find a convergence toward Gibrat-like behavior and suggest that this comes from the market selection so that the resulting industrial core does not depart from a Gibrat-like pattern of growth.

Finally, the literature suggests that firms' profitability also depends on external sectoral contingencies, i.e., the innovation content and the growth trend of the sector in which firms are embedded. Delmar et al. (2013) suggest that the innovation intensity of the industrial environment moderates the impact of an increase in growth on a firm's profitability. The higher the innovation intensity of the firm's sector, the greater the effect of the increase in growth on profitability.

3. DATA DESCRIPTION

We base our analysis on a sample of medium-sized firms included 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 FGF, considered as one of the main pillars of the European industrial and technological system. The database includes medium-sized firms that experienced fast-growth rate in terms of three-years turnover growth (an average of 20% per year per cohort of observation according to OECD of fast-growing firms) or in 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 and are located in 30 European countries in addition to Israel. The main unit of observation is the firm. The database includes 42,369 firms. The main source of information is Orbis.

The main characteristics of the database –a sample of firms that have experienced at least an episode of strong expansion during the periods observed– allow us to analyze which effect has constant vs. episodic form of growth on the profitability of each firm.

We selected a subsample of firms located in Italy (and only in Italy) that present a complete set of data for turnover, the number of employees, total assets, and earnings before interest and taxes (EBIT) between 2008 and 2013. We include in our sample also firms founded after 2008 and firms that went out of business before 2013 for which we have direct information in the original dataset even if there is no indication about causes of activity stop.

Starting from these data, we calculated the Return on Asset (ROA) by the ratio of EBIT and Total Assets for each firm in each year, and we use ROA as a measure of profitability, the dependent variable of our analysis.

We use data on turnover to calculate growth rate as the ratio between the difference in the level of the turnover of two 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%. 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. Particularly we remove from sample firms that present value of growth rate higher than 1000% or lower than -100%. After this exclusion, the number of companies included in the sample is 1666, not all of which are present in all the years observed (see Table 1).

We use data to create an index of the persistence of growth. As first step, we classify the firms in growth classes for each year of activity: the first class includes firms with a negative growth rate of less than -10%, the second class contains companies that have a negative growth rate of between -10 % and 0, the third class firms with a moderately positive growth rate between 0 and 10%, the fourth class includes firms with a growth rate between 10% and 20%, the fifth class includes firms with a growth rate over 20% (see Table 1). Based on these classes, we build the persistence index. For each year, starting from 2010, we observe the sequence of growth levels defined above and classify them into four groups: persistent degrowth includes firms that present only negative growth rates (i.e., firms included in classes 1 and 2), persistent growth includes firms that present only positive growth rates (i.e., firms included in classes 3, 4 and 5), persistent fast growth includes firms that present only growth rate higher than 20% rates (i.e., firms included in class 5), finally mixed includes firms that present both positive and negative growth rates or that present a growth close to zero. (see Table 2).

Table 1. Firms distribution per level of turnover growth rate. Number of firms

		Year					
Class of growth	**Description**	2009	2010	2011	2012	2013	Total
1	Lower than -10%	616	130	118	302	330	1496
2	Between -10% and 0	175	147	134	329	347	1132
3	Between 0 and 10%	205	210	294	371	445	1525
4	Between 10% and 20%	135	207	287	226	211	1066
5	More than 20%	500	963	833	416	269	2981
Total		1631	1657	1666	1644	1602	8200

The classification of turnover growth rates into five classes, that can be defined as 1) severe de-growth, 2) moderate de-growth, 3) moderate growth, 4) sustained growth and 5) fast growth is useful also to analyze the dynamics of variation of turnover of each firm along time, to verify the existence of regularity in succession of classes.

Table 2. Index of growth persistence per year

	Year				
Type of persistence	**2010**	**2011**	**2012**	**2013**	**Total**
Persistent degrowth	791	127	20	8	946
Mixed paths	0	814	1028	1205	3047
Persistent growth	340	424	467	350	1,81
Persistent fast growth	500	292	129	50	971
Total	1631	1657	1644	1613	6545

One-year lagged growth rate and persistence index are the primary explicative variable of our analysis. We add some controls that allow us to have information about each firm.

We have said that the sample includes firms that are no more active in 2013. We have only information about firms that went out of business in 2011 and 2012 (last year of activity). Still, we have not information about the cause of this stop that could be both bankruptcy and acquisition from a larger group. Turnover data are in negative trend for a large majority of firms before the stop marked, hence our assumption is that firms that stopped activity before 2013 did it for financial problems. We add two dummies, signaling if the last year of activity is, respectively, 2011 or 2012, and we expect that the coefficients of these dummies are negative because they present a negative trend in the firm financial measure before the final stop.

We include the size of firms, measured with the number of employees. Bigger firms are more stable, and literature attributes them a higher propensity to have positive profitability.

We also consider the age of the firm as the difference between the year of observation and the year of foundation. We consider age as a proxy of experience accumulated. Nonetheless, this variable entails firm stability: younger firms are usually less stable with higher variation in profitability and turnover. Indeed, younger firms need to create their own space in a market where companies with more experience are present.

Control variables include the sector of activity. In particular, we consider those sectors that could be included in Pavitt taxonomy to check if firms in more innovative sectors have particular advantages in terms of growth. Technically, we add a dummy for each one of the Pavitt sectors: Science based, Specialized suppliers, Scale and information-intensive and Suppliers dominated.

Finally, we add a geographical control, related to the Italian regions where firms are located. Note that, given the nature of the sample –medium size firms– all the firms are single location firms.

Table 3 summarizes the variables considered and their calculation.

Table 3. Definition of variables

Variable	***Description***	***Calculation***
Dependent variable		
Profitability: Return on Asset	ROA in year t for firm i	$ROA_{it} = \frac{EBIT_{it}}{Total\ Asset_{it}}$
Main explicative		
Growth: Turnover Growth Rate	Growth rate in year t-1 of firm i	$Growth_{it} = \frac{Turnover_{it} - Turnover_{it-1}}{\lvert Turnover_{it-1} \rvert}$
Persistence of growth	The succession of the class of growth rate until year t-1 for firm i	Not applicable, see table 2
Control variables		
Cessation of activity	Dummies for firms that cease their activity during the observed period	
Firm age	Difference between the year of observation and the firm's foundation year	
Size	Number of employees in year t for firm i	
Pavitt sectors	Reclassification of the sector of activity of each firm according to Pavitt's Taxonomy[1]	
Territorial control	Control related to the Italian region where the firm is located	

Table 4 reports descriptive statistics of continuous variables and their bivariate correlation. The partial correlation table shows that no "pathology" is present in the variables used in regressions. It is interesting to note some data reported. The average value of Turnover growth rate is 24%, over the value indicated as a flag for identifying Fast Growth. In addition, the average number of employees is pretty high, with more than 300 workers per firm per year: CHEETAH dataset includes data on SME according to the limit related to the number of employees, the

[1] According to Pavitt's taxonomy:
Science Based sector includes firms operating in Manufacture of chemicals and chemical products, Manufacture of basic pharmaceutical products and pharmaceutical prep, Manufacture of computer, electronic and optical products, Telecommunications, Computer programming, consultancy and related activities and Scientific research and development.
Specialized suppliers sector includes firms operating in Manufacture of electrical equipment, Manufacture of machinery and equipment n.e.c., Manufacture of other transport equipment, Repair and installation of machinery and equipment, Real estate activities, Legal and accounting activities, Management consultancy activities, Architectural and engineering activities; technical testing and analysis, Advertising and market research, Other professional, scientific and technical activities, Rental and leasing activities, Office administrative, office support and other business support activities.
Scale and information intensive sector includes firms operating in Manufacture of paper and paper products, Printing and reproduction of recorded media, Manufacture of coke and refined petroleum products, Manufacture of rubber and plastic products, Manufacture of other non-metallic mineral products, Manufacture of basic metals, Manufacture of motor vehicles, trailers and semi-trailers, Publishing activities, Audiovisual activities, Broadcasting activities, Information service activities, Financial service activities, except insurance and pension funding, Insurance, reinsurance and pension funding, except compulsory social security, Activities auxiliary to financial services and insurance activities.
Suppliers dominated sector includes firms operating in Manufacture of food products, Manufacture of beverages, Manufacture of tobacco products, Manufacture of textiles, Manufacture of wearing apparel, Manufacture of leather and related products, Manufacture of wood and of products of wood and cork, except furniture, Manufacture of fabricated metal products, except machinery and equipment, Manufacture of furniture, Other manufacturing, Wholesale and retail trade and repair of motor vehicles and motorcycles, Wholesale trade, except of motor vehicles and motorcycles, Retail trade, except of motor vehicles and motorcycles, Land transport and transport via pipelines, Water transport, Air transport, Warehousing and support activities for transportation, Postal and courier activities, Accommodation and food service activities, Veterinary activities, Employment activities, Travel agency, tour operator reservation service and related activities Security and investigation activities, Services to buildings and landscape activities.

turnover and balance sheet information, with the peculiarity that firms must have one of these characteristics in the first year of cohort of observation. A negative correlation between the number of employees and growth rate seems to suggest that firms included in the sample could be oversized respect to financial indicators. This element appears to be also confirmed by the correlation of age with the number of employees and growth: the first one is positive, the second one is negative, a result that seems to suggest that the size of firms increases on average quickly than turnover.

Tabella 4. Descriptive statistics and bivariate correlations

	Variable	Mean	Std dev	1	2	3
1	ROA	0.0328	0.1601			
2	Growth	0.2435	0.7389	0.0513*	1	
3	Age	21.1308	17.2784	0.0201	-0.1150*	1
4	Number of employees	368.0721	973.0783	0.0055	-0.0182	0.0844*
Notes: Firm year observation= 8152 * Correlations are significative at p<0.001						

4. DESCRIPTIVE ANALYSIS

Presenting the classification of turnover growth rate into five classes, we have prospected the possibility to analyze the dynamics of growth variation for each firm. We report the results of analysis in Table 5 that contain the transition matrix between classes of growth between 2009 and 2013 (see Table 1 for the definition of classes). The values of the transition matrix represent the general probability of transition between two growth classes spanning two years, for the entire period considered. These probabilities were obtained by observing the frequencies of the pairs of values with respect to all possible combinations of the sample.

Among the noteworthy results, we can note that the firms that are in the first class (that of severe degrowth) will have a greater than 50% probability of passing to the fifth class (i.e. to the fast growth). In contrast, the steps towards the other classes (or confirmation in the first class) will have a decreasing probability from the first to the fourth. This factor seems to suggest the idea that the transition between first and fifth class is not a real growth but a “rebound” of firm’s turnover after a net fall in a given year and, in essence, that growth of over 20% could represent a reduction in the loss recorded the previous year.

On the other hand, firms that start in the fifth class have the highest probability of staying in their class (42%). The evidence suggests, however, that even fast-growing firms are not immune to “falls”. They can stop growing in one – or more – periods.

As far as the fourth class is concerned, this seems to be a state of intermediate passage in a situation of economic stability. A low probability of staying in the same class, corresponds to higher probabilities of passing upwards (fifth class) or downwards (third class). Finally, the move is directed towards classes that represent revenue growth, no matter if it is slight or sustained.

A similar probability distribution is also present for the third class. This seems to suggest that for moderate growth firms, 3 and 4 classes, beyond the reconfirmation in the same class, it is easy to experiment faster growth (fifth class) and sustained growth (fourth class).

In general, firms that start from intermediate classes (from second to fourth) tend to redistribute themselves between third and fifth class with enough similar probability rates. At the same time, they are differentiated in the probabilities of passing into the degrowth area (first and second class).

Table 5. Transition matrix

	2013					
2009	**1**	**2**	**3**	**4**	**5**	**Total**
1	214 18.42	130 11.19	129 11.10	98 8.43	591 50.86	1163 100
2	125 15.78	155 19.57	216 27.27	105 13.26	191 24.12	792 100
3	133 12.10	206 18.74	340 30.94	145 13.19	275 25.02	1099 100
4	92 10.59	134 15.42	220 25.32	141 16.23	282 32.45	869 100
5	346 12.32	360 12.82	447 15.91	458 16.30	1198 42.65	2809 100
Total	910 13.52	985 14.63	1352 20.09	947 14.07	2537 37.69	6731 100

We are interested in the identification of the growth persistence pattern and we started by checking the presence of regularities in the number of changes of status by firm. The entropy calculation is based on the transition probability among subsequent status changes, normalized for the asymptotic distribution of Markov chain of the sequence of distributions. In simple words, it means that in the calculation of entropy what matters is the number of status changes more than their layout or the value assigned to the class.

Once the entropy values are obtained, we have reclassified them into four categories: zero entropy for companies that never change their class all the period considered; low entropy i.e. <1, for the companies that have had only one change. Medium entropy with a value <1.6 groups the firms which had 2 or 3 status changes over the considered period. Finally, high entropy concerns firms with a high number of status changes (Table 6).

Table 6. Sample Distribution among entropy levels

Entropy level	Frequency	Percentage	Cumulative freq.
Zero Entropy	33	1.92	1.92
Low Entropy	318	18.53	20.45
Medium Entropy	838	48.83	69.29
High Entropy	527	30.71	100.00
Total	1716	100	

Most of the sample has a medium or high level of entropy, suggesting a marked mobility among classes over the time.

Then we cross-checked the entropy values with the initial growth classes (the 2009 classes) to check the correlations between the starting growth level class and entropy (Table 7).

Table 7. Correlation between turnover growth class in 2009 (first observations of the series) and measured classes of entropy

	Level of entropy				
2009	**Zero Entropy**	**Low Entropy**	**Medium Entropy**	**High Entropy**	**Total**
I	0 0.00	80 4.78	294 17.55	250 14.93	624 37.25
II	1 0.06	17 1.01	96 5.73	62 3.70	176 10.51
III	6 0.36	41 2.45	99 5.91	61 3.64	207 12.36
IV	0 0.00	18 1.07	78 4.66	40 2.39	136 8.12
V	24 1.43	149 8.90	251 14.99	108 6.45	532 31.76
Total	31 1.85	305 18.21	818 48.84	521 31.10	1,675 100

Companies that start in the first class (low level of yearly growth) have the higher level of entropy, and this seems a confirmation that the changes from the first class of growth to the fifth one are only temporary situations. Firms starting in the third and fourth classes of yearly growth give the main contribution to the medium entropy. Companies starting with a high yearly growth (5 class) show the lower mobility (low and zero entropy) and are therefore the firms with longer lasting growth spells.

5. ECONOMETRIC RESULTS

We test our hypotheses using a random effects panel data model, where: the dependent variable is the profitability of the firm *i* at the time *t* as measured by the ROA (Return on Assets), the explanatory variables are all delayed by one year with respect to the dependent variable. Among these, the most important for our analysis is the turnover growth rate and the persistence of growth index. To these variables, we add a vector of variables D, which includes the characteristics of the firm in terms of age, size, sector of activity, possible cessation of activities and territorial controls.

$$ROA_{i,t} = \alpha \cdot Growth_{i,t-i} + \beta \cdot Persistence_{i,t-i} + \gamma \cdot D_{i,t-1} + \delta$$

Table 8 presents results for estimations of panel regression for the whole sample (columns 1, 2, and 3) and the subsample of firms founded after 2003 (i.e., firms with ten years or less of activity; columns 4, 5 and 6).

Column 1 presents basic regression that puts in correlation the ROA with the growth rate of the previous year. There is a significant correlation, and each point of growth in year t-1 explains about 1.09% of the profitability rate in year t.

In column 2 we add discrete variables related to the succession of past growth of each firm, subdivided into four categories according to the type of sequence: full series of degrowth (in the years previous to the observation firms have always presented negative rate of growth), mixed series (in the years before the observation firms have presented both positive and negative rates of growth or growth near to zero, used as a benchmark), persistent growth (in the years previous to the observation firms have always shown positive rate of growth), persistent fast growth (in the years before the observation firms have always presented rate of growth higher than 20%). We added these variables to test if persistence of results in terms of growth has a direct effect on profitability: we hypothesize that as steady is the persistence of previous economic results as high is the effect on profitability.

Results show that firms that present persistence in growth and fast growth have profitability higher more than 2% (respectively 2.28% and 2.24%). This result confirms our hypothesis that persistence in growth has a positive effect on profitability.

This result is confirmed and reinforced when we add some variables that help to describe the general structure of firms. In this set of variables are included: the number of years of activity, as a proxy of the experience of the firm, the number of employees as a measure of firm size, dummies for firms that stop their activity in 2011 and 2012 to control whether the stop is linked to poor performance of the financial indicators, dummies for Pavitt sectors as a proxy of innovation activity that could influence positively the profitability, and territorial controls related to the region where the firm is located (not reported in the table).

Results show that even with this specification, the positive effect of persistence is confirmed and reinforced, with the persistence of fast growth that explains more than 3% of profitability. In addition, the delayed growth rate has a positive and significative coefficient, but now each point of past growth explains 0.8% of current profitability.

About the other variables, the coefficients of dummies for the cessation of activity are relevant: both are negative and significant, a result that seems to confirm that firms that go out of business in 2011 and 2012 present a critical situation in the years before the stop. Among the other variables, it is interesting that among dummies related to Pavitt sectors, the only significant and with a positive coefficient are the sectors: “Science based” and “Specialized suppliers”, i.e., the two sectors considered more innovative, this suggests that innovation is an element of support for profitability.

In column 4 we present the results of Hausman-Taylor (HT) estimation that allows to relax the assumptions behind RE estimator without losing the opportunity to study time invariant variables. Results confirm those of the RE model. From a quantitative point of view, the coefficients of the two of our variables of interest, i.e. those signaling persistent growth and persistent degrowth, are bigger and still significant strenghting the result. The only relevant difference between HT and RE models is the exclusion in HT of the dummy that indicates cessation of activity in 2012 because of collinearity.

We make the same regression on the subsample of firms founded after 2003, i.e., firms that have less than ten years of activity, to test if persistence has the same effect on firms that could be considered incumbent on the market.

Column 5 report results for basic regression that shows how past growth affects “young” firms as strong as the others: past growth explains 1.04% of current profitability.

However, if we add a persistence variable, we can observe that these variables have a substantial effect on profitability, while past growth is still positive but no more significant. If we add further control variables (Column 7), this result does not change: coefficient of past growth is not significant, while the coefficient of persistence is higher and highly significant. Firms that have persistence of growth present an increase of profitability 4.8% while for persistence of fast growth, the increase is equal to 5.7%.

About the other variables, the only significant coefficients are those related to the cessation of activity that is negative and stronger than those for the whole sample, an element that seems to suggest that young firms that present problems are more fragile and more prone to failure.

As for the whole sample, we report in column 8 results for the HT estimation, that confirms results of RE regression. Like in model (4) the only difference between RE and HT model is the exclusion of the dummy related to cessation of activity in 2012 in HT model.

Table 8. Panel estimations results. Dependent variable: ROA

		Full sample				Firms founded after 2003			
		1	2	3	4	5	6	7	8
		OLS	OLS	RE	HT	OLS	OLS	RE	HT
Growth$_{t-1}$	Coef. Std. Err. P>|Z|	0.011*** (0.0022) (0.000)	0.008*** (0.0025) (0.001)	0.008*** (0.0025) (0.001)	0.009*** (0.0025) (0.000)	0.010*** (0.0037) (0.005)	0.00581 (0.0041) (0.158)	0.00604 (0.0041) (0.140)	0.00554 (0.0044) (0.5209)
Persistent degrowth	Coef. Std. Err. P>|Z|		-0.0007 (0.0053) (0.898)	-0.0002 (0.0053) (0.969)	-0.004 (0.0051) (0.438)		0.0242 (0.0164) (0.140)	0.0251 (0.0164) (0.126)	0.0111 (0.0176) (0.527)
Persistent growth	Coef. Std. Err. P>|Z|		0.028*** (0.0056) (0.000)	0.028*** (0.0058) (0.000)	0.043*** (0.0076) (0.000)		0.046*** (0.0131) (0.000)	0.0484*** (0.0129) (0.000)	0.0498*** (0.0168) (0.003)
Persistent fast growth	Coef. Std. Err. P>|Z|		0.024*** (0.0065) (0.000)	0.031*** (0.0068) (0.000)	0.049*** (0.0079) (0.000)		0.051*** (0.0130) (0.000)	0.057*** (0.0130) (0.000)	0.069*** (0.0158) (0.000)
Cessation of activity in 2011	Coef. Std. Err. P>|Z|			-0.09*** (0.0280) (0.001)	-0.089** (0.0393) (0.024)			-0.17*** (0.0545) (0.002)	-0.199*** (0.0549) (0.000)
Cessation of activity in 2012	Coef. Std. Err. P>|Z|			-0.11*** (0.0230) (0.000)				-0.16*** (0.0435) (0.000)	
Age	Coef. Std. Err. P>|Z|			0.001*** (0.0002) (0.006)	0.001** (0.0002) (0.028)				
Number of employees	Coef. Std. Err. P>|Z|			0.0000002 (0.000002) (0.928)	0.0000002 (0.000003) (0.938)			0.0000008 (0.000005) (0.867)	0.000001 (0.000005) (0.829)
Science based	Coef. Std. Err. P>|Z|			0.0275** (0.0133) (0.039)	0.0342* (0.0203) (0.093)			0.0240 (0.0365) (0.510)	0.0332 (0.0368) (0.366)
Specialized suppliers	Coef. Std. Err. P>|Z|			0.0226** (0.0089) (0.011)	0.0155** (0.0068) (0.021)			0.0075 (0.0206) (0.716)	0.0093 (0.0102) (0.365)
Scale and information-intensive	Coef. Std. Err. P>|Z|			-0.0069 (0.0106) (0.514)	-0.0005 (0.0162) (0.976)			-0.0372 (0.0259) (0.151)	-0.0297 (0.0262) (0.258)
Suppliers dominated	Coef. Std. Err. P>|Z|			0.0030 (0.0081) (0.71)	0.0063 (0.0123) (0.607)			-0.044** (0.0183) (0.016)	-0.038** (0.0185) (0.039)
Cons	Coef. Std. Err. P>|Z|	0.033*** (0.0029) (0.000)	0.024*** (0.0036) (0.000)	-0.0167 (0.0792) (0.833)	-0.0075 (0.0125) (0.550)	0.020*** (0.0072) (0.005)	-0.0076 (0.0096) (0.429)	-0.1300 (0.138) (0.347)	0.0029 (0.017) (0.868)
Geographical controls		N	N	Y	Y	N	N	Y	Y
Obs		6488	6488	6472	6476	1753	1753	1749	1753
R-sq	Within Between Overall	0.0072 0.0037 0.0013	0.0146 0.0505 0.0034	0.0145 0.0505 0.0284		0.0084 0.0035 0.0017	0.0228 0.002 0.0108	0.0229 0.1786 0.0919	
Note: *** p<0,01, ** p<0.05, * p<0.1									

6. Discussion

From an overall point of view, the results of the regressions seem to provide insights that point in one direction: the past growth has a role in shaping present profitability. In addition, more than the level of past growth, it is important the stability of growth. Firms that have repeated events of fast growth have higher profitability than the firms that persistently growth at smaller rates. Nonetheless, both groups of firms have a surplus of profitability respect to all the other firms.

Focusing on younger firms –firms that started their activity after 2003– we see that past growth is not relevant, while the persistence of growth presents a positive and large coefficient (almost double than the equivalent coefficient for the whole sample). This result suggests that the persistent growth for younger firms is the primary determinant of profitability. This can be rationalized, assuming that a possible path of survival for this class of firms passes through a sustained growth path along the time. Indeed, the literature finds that young firms unable to grow in the first years of their lives are forced out of the market.

Our results suggest an additional explanation to this interpretation, calling into the picture the ability of young firms to earn profits as a function of their size. In this respect, the repeated events of growth allow young firms to enhance their probability of catching up with incumbent firms' size. This, in turn, increases their chances of survival.

7. Conclusion

This paper contributes to the current massive debate about the characteristics of growth, by focusing on the growth spell (type and persistence), and how they impact firms' profitability. Using a sample of medium-sized firms included in the CHEETAH database, whose main characteristics are to have experienced at least one episode of fast growth we, first present a descriptive analysis about firms' evolution in terms of growth trajectories of turnover. Using a series of panel data regression models, we test the hypotheses that fast growth and its persistence make a positive difference in terms of firms' profitability. The analysis confirms the hypotheses. Moreover, we explored the heterogeneity of results concerning the age of the firm. Young firms seem to benefit more from persistent growth. This last is the result of self-selection in the sample. Namely, younger firms unable to experiment with persistent growth exit the market and the sample lend support to the hypothesis.

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9. Bibliografia/References

Aldrich, H., & Auster E. (1986). Even dwarfs started small: liabilities of size and age and their strategic implications. *Research in Organizational Behavior*, Vol. 8, Staw BM, Cummings LL (eds). Greenwich, CT: JAI Press, pp. 165-198.

Ardishvili, A., Cardozo, R.N., Harmon, B., & Vadakath, S. (1998). Towards a theory of new venture growth. In P.D. Reynolds, W.D. Bygrave, N.M. Carter, S. Manigart, C.M. Mason, G.D. Meyer, & K.S. Shaver (eds.). *Frontiers of entrepreneurship research*. Wellesley, MA: Babson College

Bartelsman, E., Scarpetta, S., & Schivardi, F. (2005). Comparative analysis of firm demographics and survival: Evidence from micro-level sources in OECD countries. *Industrial and Corporate Change, 14*(3), pp. 365-391. https://doi.org/10.1093/icc/dth057

Bravo-Biosca, A. (2011). *A look at business growth and contraction in Europe* (NESTA Working Paper No. 11/02). London.

Churchill, N.C., & Lewis, V. (1987, January). The Five Stages of Small Business Growth Article, *Harvard business review*.

Coad, A. (2007). *Firm Growth: A survey, Papers on Economics and Evolution* (0703, Max Planck Institute of Economics). Jena.

Coad, A. (2007). Testing the principle of "growth of the fitter": the relationship between profits and firm growth. *Structural Change and Economic Dynamics*, 18, pp. 370-386

Coad, A., Daunfeldt, S-O., Hölzl, W., Johansson, D., & Nightingale, P. (2014). High-growth firms: introduction to the special section. *Industrial and Corporate Change*, 23 (1), pp. 91-112.

Cohen, E., & Lorenzi, J. (2000). *Politiques Industrielles pour l'Europe*, Conseil d'Analyse Economique

Covin, J.G., & Slevin, D.P. (1997). High growth transitions: Theoretical perspectives and suggested directions. In D.L. Sexton and R.W. Smilor (eds.) *Entrepreneurship 2000*, pp. 99-126. Chicago: Upstart Publishing Company.

Daunfeldt, S-O., & Halvarsson, D. (2015). Are high-growth firms one-hit wonders? Evidence from Sweden. *Small Business Economics*, 44, pp. 361-383.

Davidsson, P., & Wiklund, J. (2000). Conceptual and empirical challenges in the study of firm growth. In Sexton, D., & Landström, H. (Eds.), *The Blackwell handbook of entrepreneurship* (pp. 179-199). Oxford, MA: Blackwell.

Delmar, F. (1997). Measuring growth: Methodological considerations and empirical results. In Donckels, R., & Miettinen, A. (Eds.), *Entrepreneurship and SME Research: On its Way to the Next Millenium* (pp. 190-216). Brookfield, Aldershot

Delmar, F., Mc Kelvie, A., & Wennberg, K. (2013). Untangling the relationships among growth, profitability and survival in new firms. *Technovation*, http://dx.doi.org/10.1016/j.technovation.2013.02.003i

Dosi, G., Grazzi, M., Moschella, D., Pisano, G., & Tamagni, F. (2019). *Long-term firm growth: An empirical analysis of US manufacturers 1959-2015* (LEM Papers Series 2019/13). Laboratory of Economics and Management (LEM), Sant'Anna School of Advanced Studies, Pisa, Italy.

Euroepan Commission (2010). European Commission Europe 2020. https://ec.europa.eu/eu.2020/index_en.htm

Esteve-Pérez, S., Pieri, F., & Rodriguez, D. (2020). One swallow does not make a summer: Episodes and persistence in high-growth. *Studies on the Spanish Economy*, eee2020-03, FEDEA.

Federico, J., & Capelleras, J.L. (2015). The heterogeneous dynamics between growth and profits: the case of young firms. *Small Business Economics*, *44*(2).

Gartner, W.B. (1997) When growth is the problem, not the solution. *Journal of Management Inquiry*, 6(1), pp. 62-68.

Garnsey, E., Stam, E., & Hefferman, P. (2006). New firm growth: Exploring processes and paths. *Industry and Innovation*, 13, pp. 1-20.

Greiner, L.E. (1972). Evolutions and revolutions as organizations grow. *Harvard Business Review*, 50, pp. 37-46.

Gupta, M.C. (1969). The Effect of Size, Growth, and Industry on the Financial Structure of Manufacturing Companies. *Journal of Finance*, *24*(3), pp. 517-529.

Gupta, V. K. (1981). Minimum efficient scale as a determinant of concentration: A reappraisal. *Manchester School*, *49*(2), pp. 153-164. https://doi.org/10.1111/j.1467-9957.1981.tb00943

Hambrick, D.C., & Crozier, L.M. (1985). Stumblers and stars in the management of rapid growth**.** *Journal of Business Venturing*, *1*(1), pp. 31-45.

Hoffmann, A.N., & Junge, M. (2006). Documenting Data on High-growth Firms and Entrepreneurs across 17 Countries. *Fora Working paper*, available at www.foranet.dk

Hoy, F., McDougall, P.P., & Dsouza, D.E. (1992). Strategies and environments of high growth firms. In Sexton, D.L. & Kasarda, J.D. (Eds.). *The state of the art of entrepreneurship* (pp. 341-357). Boston: PWS-Kent Publishing.

Hölzl, W. (2014). Persistence, survival and growth: a closer look at 20 years of fast-growing firms in Austria. *Industrial and Corporate Change*, *23*(1), pp. 199-231.

Kazanjian, R.K. (1988). Relation of Dominant Problems to Stages of Growth in Technology-Based New Ventures. *The Academy of Management Journal*, *31*(2), pp. 257-279.

Lee, S. (2014). The relationship between growth and profit: Evidence from firm-level panel data. *Structural Change and Economic Dynamics*, 28, pp. 1-11.

Lieberman, M.B., & Montgomery, D.B. (1988). First-Mover Advantages. *Strategic Management Journal*, 9. Special Issue: Strategy Content Research.

Lotti, F., Santarelli, E., & Vivarelli, M. (2009). Defending Gibrat's law as a long-run regularity. *Small Business Economics*, 32, pp. 31-44.

Marsili, O. (2001). *The Anatomy and Evolution of Industries: Technological Change and Industrial Dynamics*. Cheltenham, U. K.: Edward Elgar Publishing Ltd.

Markman, G.D., & Gartner, W.B. (2002). Is extraordinary growth profitable? A study of Inc. 500 high–growth companies. *Entrepreneurship Theory and Practice*, 27, pp. 65-75.

Mc Kelvie, A., & Wiklund, J**.** (2010**).** Advancing Firm Growth Research: A Focus on Growth Mode Instead of Growth Rate. *Entrepreneurship Theory and Practice, 34* (2), pp. 261-228.

Penrose, E. (1959). *The theory of the growth of the firm*. New York: Oxford University Press.

Porter, M.E. (1985). *The Competitive advantage*. New York: The Free Press.

Philippon, T., & Veron, N. (2008). Financing Europe's Fast Movers. *Bruegel Policy Brief*, 2008/01.

Shuman, J.C., & Seeger, J.A. (1986). The Theory and Practice of Strategic Management in Smaller Rapid Growth Firms. *American Journal of Small Business*, *11*(1), pp. 7-18.

Vértesy, D., Del Sorbo, M., & Damioli, G. (2017). *High-growth, innovative enterprises in Europe* (EUR 28606 EN). Luxembourg: Publications Office of the European Union.

Zook, C., & Allen, J. (1999). *The facts about growth*. New York: Bain and Company.

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ABSTRACT

Fast growth firms are a recent political objective given their impact on economic dynamics. Notwithstanding this, there is no unanimity in the literature on their determinants and impact and many aspects remain open questions. Several analyses consider growth and fast growth a random event, without possibility of prediction and policy action. This paper intends to contribute to the current large debate, looking at the characters of growth episodes (spell), type and persistence, and how they impact on firms' profitability. We focus on a sample of medium-sized firms included in CHEETAH database, whose main characteristics is to have experienced at least one episode of fast growth, according to the OECD definition, in at least one of the cohorts of three years considered of 2008-2011, 2009-2012 and 2010-2013. We develop a descriptive analysis of how firms evolve over time from their starting level of turnover growth and the estimation of how different trajectories of growth (more persistent versus episodic) influence firm's profitability through a panel regression. Our hypothesis that fast growth persistence makes a positive difference in terms of firms' profitability is confirmed.

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