

Venture Capital and High Growth Firms: developing a predictive model.

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Abstract. The purpose of this paper is to establish what balance-sheet ratios enable us to predict which firms are more candidate to an high-growth path. Following the intuition behind credit scoring model (i.e. z-score model), we consider idea that balance sheet at prior time the high growth affects balance sheet at time of the exceptional growth. To this end, we used a quantile regression and TOBIT analysis that discriminates on the financial data of two groups of firms, for a defined threshold (High growth and Non High Growth firms), selected from a population of approximately 22,000. The results of the analysis pointing out a relevant of firm size, firm's age, more important, of internal cash flows (in spite of bank loans) to the growth and success of a firm.

Keywords: high-growth firms, financial ratios, discriminant analysis

JEL: L21, C25, O39

1. Introduction

The purpose of this paper is an attempt to provide a selection model for firms candidate to be owned or financed by venture capital investors.

As the success of a venture capital fund stems from the profitability of firms where it has invested, the supply of tools that trying to enhance the predictability of firms' performance constitutes a key factors to improve the return of a venture capital investor.

Usually, the good performance of venture capital may be explained by two alternative pathways: 1) the fund has invested in a number of companies all of which characterized by a good (but not exceptional) performance, 2) the fund has invested in a number of firms the most of whom have recorded a very poor, or negative, performance while just few of them have achieved an extremely positive performance. The latter case is likely the most experienced by Venture Capital Funds and it is strictly linked to the ability of general partner of the fund to selects firms that will experience an high growth in the immediate future (commonly named High Growth Firms, HGF or, when they are very young, gazelles). In this perspective, since venture capital investors should be more sensitive to pick this type of business firm, they should be much interested to understanding how and why exceptional growth occurs, as well as the entrepreneurial, organizational, and strategic factors that mainly affect the firm's ability to realize a rapid and significant economic development.

The economic literature contains a bulk of empirical approaches and theories dealing with firm's rapid growth, and its related factors. The empirical part has mainly focused on the detection of firm-specific factors and, to a lesser extent, general industrial, national as well as regional factors contributing to the growth of firms.

Using a panel of firm-level data, this study adds to the literature on high growth firms for the Italian market, adopting an innovative approach that consists in a reversal of the rationale related to the theoretical prediction of credit risk model (see section 3). Credit risk models based on accounting data (i.e. Z-score model) forecasting the probability of default through a linear combination a discriminant probability of default through a linear combination of financial ratio that best discriminate between two *a priori* groups of firms: distressed and solvent. Financial ratio are in this case extracted from the last financial statement before the default. This is consistent with the idea that balance sheet at the time $t-1$ affect balance sheet at time t (Sampagnaro, 2012). The same rationale is adopted here, with the not negligible difference that the analysis is extended to the firm's growth rather to the firm's default.

The rest of the paper proceeds as follows. In section. 2 we discuss the theoretical background and related literature of High Growth Firms. In section. 3 we describe the rationale of the model and the related hypothesis. In section 4 we defining HGF and providing an illustration of the dataset, the sample and variables. In section 5 we describe the empirical model. Section 6 contains our econometric results, followed by our conclusions in section 7.

2. Theoretical background and related literature.

The analysis of the literature on the subject of High Growth Firms (HGF), as well as highlight a variety of purposes and methods of investigation, indicates the absence of a unique definition of HGF. Basically, the opinions diverging with respect to (i) the measures of "growth" with which to classify a firm as HGF or LGF (Low Growth Firm) as well as to (ii) the use of an absolute or relative measurement of growth (compared to the industrial sector to which they belong, for example) and (iii) the time window preferred.

In general, the variety of indicators adopted by empirical studies on firm's growth include: asset size, quantity of output, market share, profits, number of employees, and sales (see the reviews proposals Ardishvili et al. 1998 and Delmar 1997).

The list of indicators demonstrates quite clearly the degree of heterogeneity that characterize the choice of an ideal "growth rate" metric. This heterogeneity is basically referred to the complexity and specificity of a firm, so that its growth can be captured by a plurality of phenomena and of related indicators, none of as definitive.

In any case, the most common indicators in the literature appear to be no doubt: the sales and the number of employees.

The choice of one or the other indicator is explained by various reasons, among these also include the purpose of the investigation: the rate of change in employment is, for example, the preferred indicator as part of research aimed at measuring the social externalities of HGF, since it is interpreted as a good proxy of the ratios of the interaction with the social context¹.

To this type of investigation belongs those studies directed to measure the job creation effect arising from firms with high growth potential² or the one dedicated to the optimization of government policies aimed at supporting businesses with high growth potential (see Fisher and Reuber, 2003).

The number of employees is an indicator, however, very common in more traditional areas of research such as that pursued by studies aimed at identifying determinants of firm growth; among them, some are also related to the Italian small and medium enterprises (SMEs) market (see Becchetti and Trovato, 2002).

However, although the rate of growth in employment is considered a good approximation of the growth rate of the pool of resources that together characterize a firm (in line with the fundamental theoretical contribution of Penrose), its inclination to stand as a proxy of firm's business perspectives is hindered by a plurality of factors including, for example, its dependence on: a change in labor productivity, the level of automation, the degree of organizational integration, to make or buy decisions and, last but not least, the recurrence of flexible forms of employment. As noted before, the use of variables with a "social" quality (e.g. the number of employed per firm) represents, however, one but not the only one of the most popular methods in the literature on the firms' performance. In most cases, the variables over which discriminate the intensity of firm's

¹ A study of National Commission on Entrepreneurship classified as *High Growth Firms*, firms with an employment growth rate of 15%.

² See the review in Henrekson e Johansson (2008), and the works of Birch, (1987 and 1995), where the author classified three groups of businesses: elephants (large businesses quoted on the stock market), mice (small slow-growing start-up firms) and gazelles (small fast-growing start-up firms).

growth are strictly accounting variables; among them, a role of absolute pre-eminence is given by the annual rate of sales growth (see Hoy et al, 1992).

Many factors contribute to recognize this role to the sales growth rate: it represents an indicator easily detectable and representative of all types of firms, regardless of industry membership; it is also insensitive to the vertical or horizontal integration of production as well as being the indicator at which entrepreneur's strategic choices are naturally oriented. Further, even more convincing is the argument that sales growth rate is a sort of explanatory variable from which depends on all others (except in some cases³).

While emerges a general consensus around the choice of sales as a proxy of growth's firm, there is not a convergence of ideas about the value of intensity variation (vertical amplitude) and the length of time interval (horizontal amplitude) with which to measure the growth.

Focusing on the most incisive studies on the subject, Birch et al. (2000) considering as HGF firms with a growth rate come at least equal to 25% per year.

Barringer et al. (2005) attributed to the HGF category of companies with a three-year growth rate at least equal to 80% placing in the group of Low Growth Firms, companies with a growth rate below 35%.

With reference to the width of the temporal interval, the literature shows a divergence of approaches, although the three-year and five-year horizon, appear the most common choice (see for example, Dunne and Hughes, 1994 and McCann, 1991).

As regards, finally, the nature of absolute or relative metric, it should be noted that the use of the absolute rate of change is the most common. The choice of an absolute metrics implying to select an arbitrary threshold levels for both growth rate based on convention more than on evidence (for example: "*HGF are ...all enterprises with an average annualized growth greater than 20% per annum, over a three year period [...] Eurostat-OECD 2007*"). This approach has the drawback of not controlling for industry life cycle. Furthermore, it doesn't consider differences in growth rates among different industries or the inflation influence. To solve this inconvenience, it might be useful to employ a relative approach, as followed by this study, where the definition of HGF is related, for example, to the comparison between the sales growth of the firm and the median sales growth of the industry.

The issue of HGF definition represents, however, an ancillary argument to that, much wider, of the investigation about the factors triggering virtuous firm's growth cycles. By a closer inspection, the identification of the factors underlying the company's growth is the main topic of High Growth Firms studies.

To the best of our knowledge, studies o HGF conducted up to now consisting of investigations on the discriminating factors between HGF and NHGF firms; in most of cases, two classes of potential explanatory variables of growth are identified. The first class consists of two quantitative variables: the size and age of the company, the second class, much larger, is completed of variables both quantitatively and qualitatively, such as: business strategy, the contribution and the personality of the entrepreneur, the organizational and territorial cultures, corporate governance (for the Italian case see for example Destefanis and Sena, 2007).

Studies about the influence of size and age are usually focused on the proof of the so called Gibrat's Law, which states that: *i*) the proportionate growth of a firm is independent of its size, *ii*) two firms within an industry have the same probability to growth at a certain growth rate in a specific time interval. In other terms, Gibrat's Law consider the growth as a random effect.

The empirical validity of Gibrat's Law is mostly discredited, as well an inverse relation between firm's size and age is well documented in many studies (se, for example, the results of: Evans,

³ The case of high-technology firms is, for example, an exception to this pattern as the increase of workers is, in general, temporally prior to the sales growth. These firms growing only if the use of the ideas implemented by new workers will be profitable.

1987; Hall, 1987, Dunne et al. 1989, Becchetti and Trovato, 2002;). With reference to the size, in most cases these results indentifying a Minimum Efficient Size (MES, minimum efficient scale) at which the firm maximizes the probability of survival on the market: in this perspective, small firms in mature industry with high MES, tend to show more pronounced growth dynamics (see for example the results in Audretsch, 1995 and Correa et al. 2003).

With regard to the firm's age, its inverse relationship with growth can be explained with the theory of learning according to firm growth has been increasingly modeled as a learning process to explain why small and young firms grow faster, once they discover in confronting the market that they can stand up to competition.

In his seminal paper, Jovanovic (1982) proposes a model in which firms younger, because having less experience and, consequently, a low control of production costs, tend to favor a strategy of accelerated growth, underestimating the impact on balance internal efficiency. By contrast, older firms, while characterized by significant growth potential, tend to show lower growth rates because, being aware of their optimal size, they are oriented to maximize internal efficiency.

This is consistent with the idea that young firms are more proactive, innovative and risk-orientated than others, because they emerge with the purpose of taking advantage of a new opportunity, previously unexploited, by means of an innovating, proactive, and somewhat risk-taking behavior (Shane and Venkataraman 2000).

With reference to the other explanatory variables of growth than the size and age, emerge a diversity of views about the order of magnitude to be assigned to each of them.

In any case, the founder's personality and entrepreneurial strategies representing the most common areas of investigation (see review in Barringer et al., 2005).

Much less attention is devoted to firm's financial structure and to how it can be recognized as a crucial element underlying the explanation of the High Growth Firms phenomenon.

In their work, Moreno and Casillas (2007) focused on the identification of the factors distinguishing the HGF out of a population of around 6800 small and medium-sized enterprises, and they show that rapid growth firms are characterized by a lower availability of financial resources in the years immediately prior to their growth. This finding is consistent with the proposition that searching for and exploiting opportunities contribute to accelerated growth more than efficiently managing acquired financial resources (Stevenson and Jarilla, 1990, Baum et al. 2001).

This view is also shared by Cassia et al (2009) although the authors observe empirically higher leverage relationship and a medium level of solvency of rapid growth firms than the other firms.

3. Model and hypothesis

While the purpose of the main works on rapid growth firms are generally focused on the investigation of the determinants of the growth, the aim of our work is different because it focuses on the issue of predictability of growth.

Analyzing financial information of an original population of 21.182 domestic firms, we tried to extract a model able to detect the characteristic features of firms with a track record of revenues particularly satisfying (High Growth Firm, HGF) and, in this way, to proceed with the identification of a set of indicators that can predict, in probabilistic terms, the ability to replicate these performance out of sample.

To this end, we use three regression models (quantile regression and Tobit model with random and fixed effects), able to provides a more complete estimation of the growth distribution of firms conditional on different attributes. The purpose of the investigation is, hence, to check whether it is possible to build a scoring model of the potential firm performance.

In general, we follow an approach very similar to those implicit to the credit scoring model and, in particular, we adapt our model to the basic idea behind the z-score model (Altman ,1968).

As is well known, the Z-score models à la Altman, discriminate healthy firms from insolvent ones, through a discriminant function calculated on financial ratios extracted from the last financial statement before the default. The immediacy of calculation, straight interpretation of the outputs and the logical path that leads to them, represent the most prominent success factors of such credit risk model although it shows some limitations (e.g. the lack of consideration about qualitative information other than financial statement data).

With reference to our case, the underlying argument that motivate us to use an adaptation of the Altman approach, is to conduct a selection, for each firm, of two distinct time periods: the year where the firm achieve high growth, and the previous one.

Financial conditions that characterize the company along the first period (no growth period), are then considered as factors explaining the conditions of the growth in the following sub-period (high growth period).

In other words, if a firm had been in the first time-period average performance and remarkably good performance in the second, then the financial data between the first and second sub-period are considered as the input set from which to extract the optimal combination of ratios with the greatest ability to discriminate between high-growth companies and others.

Once established the structure of the model, its hypothesis are essentially related to the contribution to growth given by the following two variables: the size of the firm and its level of indebtedness. With reference to the first variable, the assumption 1 predicts that growth and size are inversely related because to the tendency of small firms to engage more dose of risk for the challenges of the market. It can therefore be formally described as:

Hp. 1: firm's growth is an inverse function of firm's size

This study also analyze the link between financial constraint and exceptional growth. The association between external debt and firm's growth is ambiguous. From one hand, in the presence of asymmetric information and transaction costs, theoretical studies predict that leverage could be correlated both negatively and positively with a firm's profitability and growth prospects (Jensen and Meckling 1976; Ross 1977; Stulz 1990). At the same time, empirical studies have found negative, positive and non significant correlations between external debt and growth (Opler and Titman 1994; Lang et al. 1996; Heshmati 2001; Becchetti and Trovato 2002; Honjo and Harada 2006).

However, many studies addressing the issue of financial constraints, find that some measures of internal finance affect firm investment in fixed capital, R&D, or inventories, which can be seen as fundamental components of firm growth. This paper is connected to these studies, in the sense that, using firm level data to analyze firm growth, we trying to assess the extent to which firm growth is positively affected by the availability of internal finance (proxied by cash flow) and negatively affected by the intensity of external finance:

Hp. 2: firm's growth is an inverse function of debt and positively correlated with internal cash flows.

Further, this assumption is consistent with theoretical literature that states that risky firm, as for example, innovative firms, find it more difficult to obtain external finance. Furthermore, it is consistent with our previous hypothesis. As the assumption I indicate that small growth are more likely to being considered as HGF, it appears clear to expect a negative relation between external finance and growth because of the highest asymmetric information of small firms.

4. Data and sample

The data set at hand was collected from Aida is AIDA a large Italian financial information provider. The database contains accounting data for more than 500,000 Italian small- and medium-sized firms over the years 1994-2010. We limit our analysis to the 2001-2008 period. .

All firms considered for drawing the sample must respect the following criteria. First, we focus our analysis only on 24 manufacturing industries, from 10 to 33 classes of Ateco 2007 classification. To improve the reliability of data, we deleted from the population those firms with suspect data (for example, we dropped firms with negative equity or negative debt).

To fasten on SME definition, we have also cut firms with less than 3 million and more than 50 million euro of total sales, and with less than 10 and more than 250 workers. To avoid that growth is due to a wrong measure of sales we also dropped all firms with less than a year of age⁴. Even if the period of our analysis (2001-2008) was characterized by low inflation, we correct measures of values for production price index different for each Ateco 2007 two digits categories to avoid that growth was not imputed to firms but to a rise in price level of a particular industry. Firms with these characteristics included in the AIDA database were 21,182.

4.1. Definition of High Growth Firms (HGF)

The measure of growth employed in this study is the rate of sales growth, considering it as the most accepted value to measure firm growth. Other studies have applied also the number of employees or income. The former is not completely reliable in AIDA database, because data are not immediately available in balance sheets and it is extrapolated or imputed. The latter is weakly significant in the Italian case because there is a long tradition to not reveal real income to avoid tax payment in family ownership. Following a widely accepted approach (Coad, 2009), firm growth (dependent variable) is defined as:

$$growth = [\ln(sales_{t+1}) - \ln(sales_t)]$$

In line with the predictions of portfolio theory, we attempt to define HGF for each of 24 industry classes. In this way, an hypothetical venture investors will select HGF among the sectors and then he (she) will identify those firms with the highest expected reward to risk ratio. This means that we analyzing HGF for each industry.

In order to define HGF, we rank firms for each industry according a descending order for sales growth for each year from 2001 to 2008; then, we called HGF as firms with a rate of sales growth that lies within the highest decile.

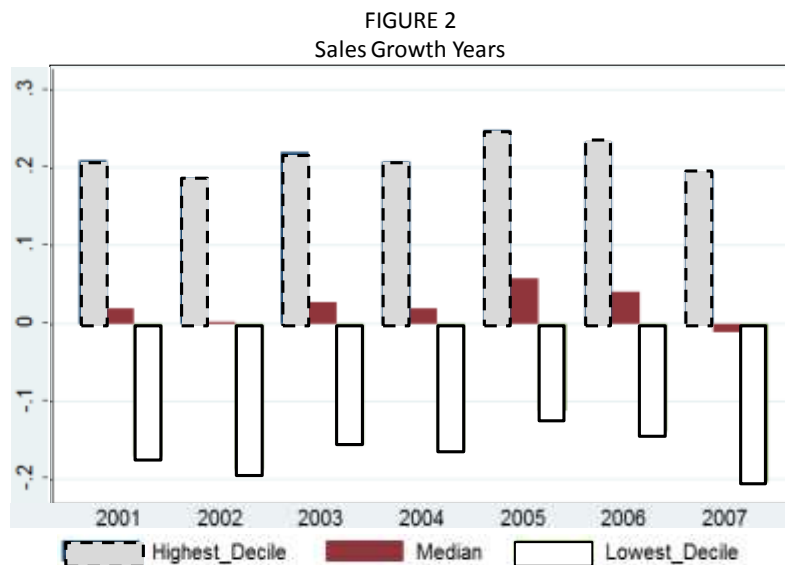
Thus, as in other studies (Arrighetti and Lasagni, 2010 and Duschl et al., 2011), we do not limit the definition of HGF to a strict arbitrary criterion based on a minimum level of growth. We believe that the use of a flexible and within-industry criterion should be capable to avoid a strong a priori industry bias and, at the same time, to extend the analysis also in a time of crisis. This flexible approach, in fact, do not expose the analysis to the negative effect of economic recession on balance sheet as would have happened with a rigid definition of HGF.

The Figure 1 shows the box-plots of the variable growth for each industry (2 digits Ateco 2007) in all the sample. While it is possible to note how the positive value for the median is predominant, on the other hand the graph shows wide differences in dispersion for industries. This finding is consistent with the portfolio risk theory, to the extent that the higher the dispersion (risk) the higher is the potential return of the industry.

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It is quite difficult that a firm begins its first year the first of January. As a consequence of that a measure of growth do not take an homogeneous value for years in analysis if the first period is less than a year.

To have a complete view of data in Figure 2 are shown the median the highest and the lowest deciles for each year in the sample. It is easy to note that those measures follow the same path. That is, when the median increases there is an expansion of the highest deciles and a contraction of the lowest, and *vice versa*.



Independent variables employed in this study consist of the main financial ratios and accounting values of balance sheet collected between 2001 and 2008. The list and some descriptive statistics of these variables is shown in Table 1. Even if the number of observations is over one hundred thousand in some cases, we cleaned data cutting the first and last millile, we canceled out less balance sheet plausible values. After that, and counting for missing values, the sample is reduced to almost a half.

Table 1: Descriptive statistics of variable

<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
<i>LnSales</i>	108,986	9.119423	0.646779	8.006396	10.81973
<i>LnAge</i>	105,285	2.917308	0.704003	0.693147	4.682131
<i>Ln Age^2</i>	105,285	9.006301	3.758663	0.480453	21.92235
<i>BankLoan/TA</i>	105617	.0.205033	.0.1806338	0	.0.9265943
<i>BankLoan/Equity</i>	105,086	195.967	463.0932	0	13289.08
<i>Liquidity ratio</i>	108,830	1.099394	0.745529	0	9.96
<i>Short Debt/Debt</i>	108,977	0.870341	0.154122	0	1.31
<i>Interest Coverage Ratio</i>	100,397	19.98472	44.97352	0	399.95
<i>Equity/TA</i>	108,986	27.87641	18.65979	0.23	100
<i>Equity/Debt</i>	108,902	0.684505	1.234689	0.01	101.59
<i>NetDebt</i>	106,074	2094.87	21769.53	-82778.9	5257644
<i>Debt/Equity</i>	106,074	2.182565	5.188719	0	136.62
<i>DEBT/EBITDA</i>	106,074	1.655886	588.9613	-178866	50695.14
<i>Inventory period</i>	97,141	68.58442	58.34369	0	499.62
<i>OperWorkCap/Sales</i>	105,575	27.29158	25.84496	-210.54	989.75
<i>Receivables period</i>	106,132	109.2759	61.16988	0	1218.63
<i>Payable period</i>	102,747	168.2719	94.62365	0	499.95
<i>ROA</i>	108,986	6.317708	8.07748	-307.55	120.09
<i>ROS</i>	108,242	4.881336	6.178715	-49.56	30
<i>Cost of employee p.c.</i>	108,816	34.11133	10.3086	0	99.99
<i>Employee return</i>	108,949	8.598971	6.835944	0.7	100
<i>OperWorkCap</i>	108,986	1713.693	13868.1	-3611568	293063.1
<i>Cash Flow (CF)</i>	108,986	645.5692	4394.205	-1395740	101853.3

Notes: Liquidity ratio follows the quick ratios version (without inventory and prepayment); the Interest Coverage Ratio divides interest expense for sales; *FinDebt* stay for Financial Debt while *OperWorkCap* stays for Operating Working Capital. The variable *Cost of employee p.c.* (per capita) is calculated as total personnel expenses divided for the number of workers. *Employee return* is total personnel expenses divided for sales.

5. Empirical Strategy

As previously explained, the rationale of our model is clearly inspired to the key principle of credit scoring model based on accounting data. Particularly, we take into consideration the case of the z-score model (Altman, 1968) where the probability of default is straightly computed from accounting data of the year before the distress. There are some points in common with Altman model but also some differences. To match with the z-score model we have to bear in mind differences in the capacity of reaching a high level of growth and the probability to fail. Both Altman model and HGF want to distinguish a sub-sample in the distribution, but they are on the opposite tail of the distribution of sale growth for all firms. It follows that sub-sample selection should be central in the model. Among others, it is possible to fail only once, meanwhile firm can grow in different moments for different reasons and continuously or only for a period. As a consequence of that, it is not rational to consider only a latent dependent variable, but we need a

continuous one that has to incorporate only a part of the distribution, that is the part of High Growth Firm. Moreover, our definition of HGF is linked to a part of the distribution of the growth variable. Considering this two attributes of growth we decide to use a censored model Tobit with random effects (Cameron and Trivedi 2005) as a wide used model for problems of censored dependent variable and it can be of interest in our case. In terms of formulas we have that:

$$y_{it+1} = \begin{cases} y_{it+1}^* & \text{if } y_{it+1}^* > y_L \\ y_L & \text{if } y_{it+1}^* \leq y_L \end{cases} \quad \text{with} \quad y_{it+1}^* = \alpha_i + \beta \cdot x_{it} + u_{it}, \quad u_{it} \approx N(0, \sigma_\varepsilon^2)$$

Dependent variable, growth, is considered censored at the level L of the highest deciles but its distribution is observed for the whole sample. Tobit permits to correct, with Mills' ratio, the inconsistency of estimates deriving from focusing on a limited part of distribution of the error u_i . Mills' ratio permits to correct estimates for the probability of be a HGF firm. That means to introduce indirectly the problem of the discrimination in our regressions. A central point in this regression is that y_{it+1} represents the firm's growth at time $t+1$ meanwhile all the independent variables are taken at time t . This was due to the will of predicting at time t what should be the growth at time $t+1$.

On the other hand there are other sort of problems in this case, over all the fact that is exposed by the greatest part of studies on firm growth the distribution of the variable can be far from the Gaussian distribution. Even if the number of observations is wide it is showed that this can be misleading in estimates. It follows that we joint to the Tobit (Wooldridge, 2010) estimates, that are fully parametric, other two estimates that are not parametric and should support also different results. Moreover results of a panel Tobit random effects can suffer of endogeneity.

To overcome the problem of endogeneity and partially face the problem of a distribution of not normal distribution of u_i , we added a second regression analysis based on a semi-parametric formulation of the problem with a panel data fixed effects Tobit (Honore 1992; Honore et al. 2000). From an estimation point of view the method applied is not based on distributional hypotheses, and it proofs that distribution is \sqrt{n} consistent and asymptotically normal. Fixed effects can attenuate the problem of the endogeneity issue even if fixed effects is eliminated by differencing.

To have a complete view on different methods of estimate, we added another regression that is fully non parametric estimation, this try to overcome the problem of non normality of the sample. We applied the quantile regression (Koenker 2005). This methods has already applied to the same kind of problems (Duschl et al. 2011; Helmers and Rogers 2009) (Hölzl 2009; Hölzl and Friesenbichler 2010). This methodology try to capture all those cases in which distribution is far from normality also in cases of huge sample dimensions. In quantile regression there is an hypothesis on independence of distribution of observations but there is not a functional form for errors. The main idea is to minimize the distance between observations and the quantile in analysis, in this case the last deciles.

In our opinion choice only a method of estimation can underestimate the predictive power of balance sheet ratios and can weight more some aspects obscuring others. To bet all on a unique methods can hidden a sort of trap because it can not consider an endogeneity or a distribution issue.

6. Main Results

Main results are exposed in Table 2. In the first step we used all available balance sheet ratios in AIDA, for all three kind of regression we have exposed before. In the second step only significant effects of predictors are calculated. We left only significant variables because they can only influence the value of growth. Main results show that for different methods of estimation there are different ratios of relevance. This finding shown that to have more than an unique regression can focus on different appearance even if there are some common results that are on line with past literature on firm growth in general and on HGF in particular.

The variable $\ln Sales$ controls for size of firms. As expected, its sign is negative and highly statistically significant due to the straight relationship between the high growth at the time $t+1$ and the low level of sales at time t . However, it captures a first attribute of growth to the extent that it concerns more small than large firms as predicted by assumption I and its theoretical background. The value and the sign of Operating Working Capital (that controls both for size and for finance) also seems confirms this insight. The role of the firm's age is also clearly predominant, and it seems to confirm the inverse relationship with growth as predicted by the theory of learning according to which younger firms will have higher growth rates, as they have less understanding of the costs related to their activities and of how these change with the passage of time (Moreno and Casillas, 2007).

The map of results for all the financial ratios related to the leverage, shows a unambiguous inclination of finance-growth relation: the high growth is mainly explained by internal than external finance. During the period previous their extraordinary growth, HGF shows a low exposition to loan banks ($BankLoan/TA$) especially for short terms debt ($Short\ Debt/Debt$). The negative and statistically significant value $Equity/Debt$, $Net\ Debt$ and $Debt_Fin/Equity$ compared to the correlation between growth and internal cash flow (proxied by $Cash\ Flow$) definitely allow us to consider as highly plausible the assumption II that considering the exceptional growth as an inverse function of debt while it is positively correlated with internal cash flows.

Finally, Liquidity and efficiency ratios seems to show a strategic relevance of the cash management from one hand and of operating working capital from the other. In particular, the sign of $OperWorkCap$ is fully in line with the link between itself and the capability of the firms to generate internal finance (the lower the operating working capital, the higher is the internal cash flows generated by the business).

To be completed.

Some extensions and robust proof we want to approach in the next steps. First we want to compare predictions of models on data of forward years. Moreover, we want to correct our estimates for attrition that can bias results. Finally, we want to stress results under different hypotheses over all, geographical differentiation.

Table 2
Main results: growth and financial ratio

<i>Dep Var: Sales Growth</i>	<i>QREG90</i>	<i>XTOBIT</i>	<i>PANTOBIT</i>	<i>QREG90X</i>	<i>XTOBITX</i>	<i>PANTOBITX</i>
LnSales	-0.047*** (0.004)	-0.113*** (0.007)	-0.201*** (0.031)	-0.050*** (0.003)	-0.137*** (0.005)	-0.234*** (0.027)
LnAge	-0.040*** (0.010)	-0.036* (0.017)	-0.091 (0.063)	-0.026*** (0.002)	-0.053*** (0.003)	-0.142* (0.067)
BankLoan/TA	-0.001*** (0.000)	-0.003*** (0.000)		-0.001*** (0.000)	-0.002*** (0.000)	
Liquidity Ratio	0.073*** (0.009)	0.153*** (0.018)		0.074*** (0.009)	0.157*** (0.014)	
Short Debt/Debt	-0.065*** (0.013)	-0.118*** (0.022)		-0.059*** (0.011)	-0.063*** (0.017)	
Int. Cov. Ratio	0.000* (0.000)	0.000* (0.000)		0.000* (0.000)		
Equity/TA	-0.001*** (0.000)	-0.002*** (0.000)		-0.001*** (0.000)	-0.001*** (0.000)	
Equity/Debt	0.020*** (0.004)	0.026** (0.008)		0.017*** (0.004)		
Net Debt	-0.000* (0.000)	0.000 (0.000)		-0.000* (0.000)		
FinDebt/Equity	-0.004* (0.002)	-0.007* (0.003)		-0.002* (0.001)		
DEBT/EBITDA	0.000*** (0.000)	-0.000 (0.000)	0.000** (0.000)	0.000*** (0.000)		
Cash Flow (CF)	0.000*** (0.000)	0.000*** (0.000)	0.000* (0.000)	0.000*** (0.000)	0.000*** (0.000)	
OperWorkCap/Sales	-0.002*** (0.000)	-0.003*** (0.000)		-0.002*** (0.000)	-0.003*** (0.000)	
OperWorkCap	-0.000** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000*** (0.000)		
Inventory period	-0.000*** (0.000)	-0.000 (0.000)		-0.000*** (0.000)		
Receivables period	0.001*** (0.000)	0.001*** (0.000)		0.001*** (0.000)	0.001*** (0.000)	
Payable period	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)			
ROA	-0.002** (0.001)	-0.004** (0.001)	0.002 (0.003)	-0.002*** (0.001)	-0.002*** (0.000)	
ROS	0.003** (0.001)	0.003 (0.002)	-0.000 (0.003)	0.003*** (0.001)		
Cost of employee p.c.	0.001*** (0.000)	0.002*** (0.000)	0.000 (0.001)	0.001*** (0.000)	0.001*** (0.000)	
Employee return	0.002*** (0.000)	0.003*** (0.000)	0.005** (0.002)	0.002*** (0.000)	0.003*** (0.000)	0.006** (0.002)
_cons	0.719*** (0.041)	0.999*** (0.073)		0.720*** (0.030)	1.138*** (0.045)	
Sigma(u) [Constant]		0.147*** (0.004)			0.162*** (0.004)	
Sigma(e) [Constant]		0.261*** (0.003)			0.272*** (0.003)	
Number of Obs	63,956	63,956	6,724	65,431	73,211	7,120
Loglikelihood		-12243.3			-14708.5	

The dependent variable is measured as: $Sales\ Growth = Ln(Sales_{t+1}) - Ln(Sales_t)$. Independent variables are related to the time t (the period previous the high growth). *QREG90* is quantile regression, *TOBIT* is the panel data Tobit random effects model and *TOBITFE* is tobit with fixed effects with all ratios. The reduced variable is indicated with an X at the end of the name of the regressions. In the first column are indicated the independent variables and values indicate coefficients with their significance: * a < 5%; ** a < 1%; *** a < 0.1% and the relative standard deviation. Standard errors are in parenthesis. Sigma(u) is the standard deviation of the residuals inside (within) each group of individuals i.

Conclusions

The object of this paper has involved the construction of an algorithm able of grasping the characteristic features of a sample of companies marked by a particularly satisfactory historical performance (High Growth Firm, HGF), and in this way, candidates fully to become the target of venture capital operations. The success of a business venture is due to a multiplicity of factors related both to skills and culture of the entrepreneur, and to industry forces. Analysts devoted to scouting out companies with high growth potential such as, for example, Venture Capital funds, should be introduced to a dashboard of tools capable of measuring the quality and intensity of the numerous warning signs of potential growth. Consequently, the indication of the set of financial ratios better suited to provide information about the likelihood of a firm to embark itself in accelerated a growth path, represents a matter of absolute centrality.

We use a database containing the financial statements of 21.052 domestic manufacturing firms for the years 2001-2008, and initially processed to the identification of a series (three) multivariate models to identify the sign and the significance of the contribution of different areas budget to the phenomena of extraordinary growth. By adopting the logic underlying the model of Altman z-score for credit risk, the principle that inspired the three econometric models is to consider the balance at time $t-1$ as explanatory of the budget at time t , which coincides with the extraordinary growth.

As remarked in literature, our results shows a clear propensity for accelerated growth of young companies and small size firms. Internal financing sources also promotes an accelerated firm growth. Our findings, in particular, show the small contribution of external financing (especially bank loans) to generate extraordinary growth. The implications of these results can not, however, be simply traced and aligned to the interpretation used in the traditional debate on the bank-SMEs relationships. Since we're dealing with a special nature of firms (firms with extraordinary growth) is reasonable to argue that a complete assessment of the role of credit in firm growth should be consider also a credit demand and supply analysis.

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