Routledge
Taylor & Francis Group

Entrepreneurship and Regional Development

ISSN: 0898-5626 (Print) 1464-5114 (Online) Journal homepage: https://www.tandfonline.com/loi/tepn20

High-growth SMEs versus non-high-growth SMEs: a discriminant analysis

Ana M. Moreno & José C. Casillas

To cite this article: Ana M. Moreno & José C. Casillas (2007) High-growth SMEs versus non-high-growth SMEs: a discriminant analysis, Entrepreneurship and Regional Development, 19:1, 69-88, DOI: 10.1080/08985620601002162

To link to this article: https://doi.org/10.1080/08985620601002162

ENTREPRENEURSHIP & REGIONAL DEVELOPMENT, 19, JANUARY (2007), 69–88

High-growth SMEs versus non-high-growth SMEs: a discriminant analysis

ANA M. MORENO and JOSÉ C. CASILLAS
Departamento de Administración de Empresas y Marketing
Universidad de Sevilla, Avda. Ramón y Cajal 1, 41018 Sevilla, Spain;
e-mail: ammoreno@us.es; casillas@us.es

The purpose of this paper is to analyse the main variables that allow one to distinguish between high-growth firms and non-high-growth firms. Theoretically, we discuss such differences through a combination of economic (external approach) and strategic (internal approach) visions. Empirically, this paper provides two differences with regard to previous literature: (1) the primary goal of our work is not to provide an outright explanation of firm growth; rather, we aim to establish what characteristics enable us to distinguish between high-growth and non-high-growth firms. This aspect determines the methodology used (discriminant analysis with dichotomic dependent variable); and (2) firm high growth is understood as an extraordinary growth in comparison with the average growth of other firms in the same industry, and not in absolute terms. The results show that in the main high-growth firms are different from moderate-growth firms or declining firms because of their smaller size (which is contrary to Gibrat's Law), their higher availability of idle resources (consistent with the theory of resources and capabilities), and in some cases, their lower availability of financial resources (consistent with the existing literature on entrepreneurship).

Keywords: high-growth firms; gazelles; entrepreneurship; discriminant analysis.

1. Introduction

Several reasons explain the expanding interest in understanding and analysing the determinants of growth within small and medium-sized enterprises (SMEs), especially as regards the so-called high-growth firms. Various studies uphold that these firms are the ones that generate more new jobs in net terms (Birch *et al*. 1994, Littunen and Tohmo 2003), and that rapid growth is an indicator of the firm's overall success (Fisher and Reuber 2003). The need to generate new business ventures and initiatives (whether or not they involve new firms) explains the extensive literature on entrepreneurship. However, these new entrepreneurs will not contribute much to the social and economic developments of their environment if, within a few years, they fail to reach a size that allows them to face the challenges derived from today's intense international competition with a certainty of success.

Many research papers have recently highlighted the need to distinguish between the general phenomenon of growth, and the particular 'high-growth' (Smallbone *et al*. 1995, Delmar *et al*. 2003, Barringer *et al*. 2005). High growth tends to be associated with a firm's entrepreneurial behaviour (Stevenson and Jarillo 1990, Brown *et al*. 2001), and high-growth firms prioritize growth over profitability.

Entrepreneurship and Regional Development ISSN 0898–5626 print/ISSN 1464–5114 online © 2007 Taylor & Francis
http://www.tandf.co.uk/journals
DOI: 10.1080/08985620601002162

First, high-growth firms are usually identified without taking account of existing differences in growth rates among different industries. In this way, most empirical works consider that a firm grows rapidly when it is able to double its initial size within a short period of time, normally 4 years (Littunen and Tohmo 2003). Similarly, economic approaches to growth tend to focus only on the validity of the well-known Gibrat's Law, according to which a firm's growth is irrespective of its size, and on how firm age influences such relationships (Almus and Nerlinger 2000, Bechetti and Trovato 2002, Correa *et al*. 2003). On the other hand, unlike the aforementioned external approaches, the theory of resources and capabilities provides an endogenous explanation of firm growth, according to which firm growth can be explained through the existence of excess resources that the firm seeks to put to use (Penrose 1959, Pettus 2001). Excess resources arise because of their indivisibility, which forces the firm to acquire larger quantities than it actually requires.

In keeping with previous studies (Wiklund 1998), this paper addresses both internal and external characteristics to explain the differences between high-growth and non-high-growth firms. There is no agreement as to the definition of high-growth ventures. Thus, according to Storey (2001), high-growth firms are firms that have achieved a sales growth of at least 25% in each of the 4 years for businesses with current sales of £5–10 million, or of at least 15% for businesses with current sales amounting to £10–100 million. According to the National Commission on Entrepreneurship (2001), rapid-growth firms are firms with an increase in headcount by at least 15% per year. According to Birch *et al*. (1994), high-growth firms are firms with sales growth of at least 25% per year. Finally, other studies use different, albeit similar, indicators (Moreno and Casillas 2000, Barringer *et al*. 2005). For the purposes of this paper, high-growth firms are firms that are able to grow more rapidly than the other firms in the same industry group. In this sense, this paper shows three differences with regard to the existing literature.

First, our primary goal is not to provide an outright explanation of firm growth, but to determine what characteristics enable us to better differentiate between high-growth firms and non-high-growth firms. This is all the more important when it comes to designing the methodology that best suits our goal (Davidsson and Wiklund 2000), especially as to the nature of the dependent variable to use (dichotomic versus continuous), and the type of statistical model to apply (discriminant analysis versus regression analysis). Second, firm's high growth is understood as an extraordinary growth in comparison with the average growth of other firms in the same industry, and not in absolute terms. High growth can therefore be considered irrespective of the life cycle of the industry to which the firm pertains. Finally, our conceptual approach combines the economic (external approach) and strategic (internal approach) visions to explain the differences between high-growth and non-high-growth firms.

In sum, the main contributions of this paper are the following: (1) Gibrat's Law is challenged through empirical research based on a large sample of SMEs; (2) the present research takes into account the industry influence on growth rates, not by computing industry dummies (as in previous research), but by defining high-growth firms in relation to the industry in which the firm operates; and (3) high-growth firms are compared not only with a unique category of non-high-growth SMEs, but with different categories of non-high-growth firms (classified by their different growth rates).

The paper is organized in six sections, including the introduction and the conclusions. The second section outlines the theoretical foundations for the selection of the variables that explain the differences between high-growth and non-high-growth firms; it proposes four hypotheses as to size, age, financial structure and existence of idle resources in the firm. The third section describes the methodology used, and includes the description of the data source and the refinement process used to get a final sample of nearly 6700 SMEs, the measurement of both the dependent and independent variables, and the statistical method employed. The results are summarized in section 4, and analysed in section 5. Finally, section 6 draws the main conclusions, addresses the limitations of the study, and points to avenues for future research.

2. Literature review and hypotheses

2.1 Theoretical background

From the middle of the 1990s, many studies have examined high-growth firms (Birch *et al*. 1994, Bidhe 2000, Storey 2001, Barringer *et al*. 2005). More interestingly, since these firms generate a large number of new jobs (Storey 1984, Birch *et al*. 1994, Barkham *et al*. 1996). For instance, in the USA, these high-growth ventures account for approximately 70% of the total increase in the employment rate in recent years (Birch *et al*. 1994). Based on previous literature (Bidhe 2000, Storey 2001, Barringer *et al*. 2005), we take as a starting point the idea that high-growth ventures are a particular type of business, which are substantially different from the other businesses (Davidsson and Delmar 1997). This is no new idea, as it was already addressed in previous works of Birch *et al*. (1994) on 'gazelle' firms, Storey (1994) on 10 percenters and Bidhé (2000) on the Inc 500 companies, etc. (Moreno and Casillas 2000, Barringer and Jones 2004, Barringer *et al*. 2005).

Moreno and Casillas (2000) state that high-growth enterprises show two main characteristics: (1) they experience a strong growth in size, which in most cases leads them to increase by as much as twice their initial dimension; and (2) this strong growth is concentrated in a very short period of time, which ranges between 4 and 5 years (irrespective of what indicators have been used to measure this growth rate, i.e. sales growth, duplication of employees, etc.). The large magnitude of growth means that we can consider it as a pivotal change, and a revolution (insofar as it is a non-gradual evolution) in the organizational life of the enterprise. This rapid growth can occur under two different circumstances. First, it can be a new venture. In this case, the company is in a process of searching for a minimum size that favours its survival (Barkham *et al*. 1996). What is especially relevant is the case of entrants created with a view to exploiting a new technological/marketing opportunity that has been neither detected nor met by other firms – entrepreneurial firms (Bidhé 2000).

The second circumstance concerns existing enterprises (firms with a history). The growth of these enterprises is derived from a change in their strategies, actions, behaviour, etc. These dramatic changes allow for the rapid concentrated growth of the firm. This situation is a clear example of strategic renewal (Markides 1998). In order

to grow the company has to reshape its product-market position, and modify the structure of resources and capabilities developed so far. This kind of rapid, high growth involves a dramatic change, a qualitative shift in a firm's evolution, like those defined by Tushman and Romanelli (1985) – punctuated equilibrium – or Miller and Freiesen (1984) – quantum structural change.

Many different theories have attempted to identify the main factors underlying firm growth. They can be divided into two main schools: the first addresses the influence of firm size and age on growth, while the second deals with the influence of variables such as strategy, organization and the characteristics of the firm's owners/managers.

The first approach has examined the impact of firm size on growth through the well-know Gibrat's Law (1931). Nevertheless, the empirical results are very confusing: while some works do find a positive relationship between the variables (Samuels 1965, Prais 1976, Acs and Audretsch 1990), the majority of investigations identify a negative relation (Dunne and Hugues 1994, Bechetti and Trovato 2002). In contrast, other works suggest that the relationship between size and growth depends on the size measure considered (Mansfield 1962, Hart and Oulton 1996, González and Correa 1998, Correa *et al*. 2003). In keeping with the above, the Theory of Learning has tried to explain this rejection by adding new factors such as firm age and industry (Jovanovic 1982). Nevertheless, over the last few years, various authors have attempted to find statistical regularities (Sutton 1997, Caves 1998), and have analysed if the contradictions found in the extensive existing literature are due to the need for adding further explanatory dimensions or to methodology issues (McCloughan 1995, Bechetti and Trovato 2002).

These empirical models, however, pay little attention to the causes that justify size influence on growth. It is precisely in this sphere that other approaches can provide new explanations. This is the case of the resource constraints literature (Baker and Nelson 2005) and the slack resources argument (George 2005). Resource constraints literature states that firms with fewer resources are likely to leverage them more efficiently, and because of this, most entrepreneurial private firms have higher growth rates than other firms (Baker and Nelson 2005, George 2005). The slack resources argument proposes that slack resources influence performance because slack provides that cushion of actual or potential resources that allows an organization to adapt successfully to internal pressures for change as well as to initiate changes in strategy (George 2005: 663). Both arguments are consistent with the combination of entrepreneurial and resource-based views of the firm (Penrose 1959, Wernerfelt 1984, Barney 1991). The resources-based view of the firm suggests that a firm can be seen as a set of resources and that business growth can be explained through the availability of idle resources (Penrose 1959). Such idle resources arise as a consequence of their indivisibility, which forces the firm to acquire larger quantities than it actually requires. If a firm is entrepreneurial, the existence of these resources promotes firm growth (Penrose 1959). In this way, firm growth can be understood as a sequential process in which the firm combines new resource exploitation with new resource development (Pettus 2001). Also, it can be observed that the smaller the firm, the greater the indivisibility of resources and, as a consequence, the availability of slack resources. In fact, resources are available in discontinuous quantities in the marketplace, so smaller firms are more encouraged to grow, in order to reach their optimal size.

Therefore, we will propose a series of hypotheses related to the influence of four types of high-growth explanatory factors: (1) firm size; (2) firm age; (3) availability of financial resources; and (4) existence of slack (non-financial) resources.

2.2 Firm size

As it has been previously stated, the simplicity of Gibrat's Law (1931) or the Law of Proportionate Effect, according to which the growth rate of the firm is irrespective of its size, has favoured the development of an extensive empirical literature, which uses different methodology and various samples in different countries, such as Sweden (Davidsson *et al*. 2002), Italy (Bechetti and Trovato 2002), Japan (Wijiwardema and Cooray 1995, Goddard *et al*. 2002), Austria (Weiss 1998), Australia (Wijiwardema and Tibbits 1999), UK (Dunne and Hugues 1994, Storey 1994), Finland (Littunen and Tohmo 2003), the USA (Evans 1987, Friar and Meyer 2003), Germany (Harhoff *et al*. 1998, Almus and Nerlinger 2000) and Spain (Fariñas and Moreno 1997, Correa *et al*. 2003).

Despite their contradictory results, the majority of works tend to reject the basic postulates of Gibrat's Law (1931), in such a way that smaller firms seem to exhibit higher growth rates than their larger counterparts (Evans 1987, Wagner 1992, Dunne and Hugues 1994, Reid 1995, Weiss 1998, Bechetti and Trovato 2002, Goddard *et al*. 2002, Correa *et al*. 2003). Nevertheless, other works either find a positive relationship between both variables or fail to find any relation at all (Samuels 1965, Prais 1976); finally, other studies suggest that the influence of size on growth depends on the size stratum under study. Thus, works such as those of Mansfield (1962), Hart and Oulton (1996), and González and Correa (1998) seem to point that, for small and medium-sized companies, Gibrat's Law does not appear to be valid. Nevertheless, from a given level onwards, size and growth do not seem to be connected. These analyses usually apply a methodology that consists in dividing the samples into different size strata, and then studying the existing size-growth relationship for each individual stratum on the one hand, and between the different strata, on the other (Correa *et al*. 2003).

Nevertheless, more important than the results is determining why size can – or cannot – be an explanatory factor of firm growth. Most of the authors who have found a negative relation between both variables hinge on the idea that small firms pursue growth as a means to reach a minimum efficient size (Correa *et al*. 2003). Thus, firms, when small, want to grow in order to attain higher levels of efficiency and competitiveness, which are normally linked to larger firms (McCloughan 1995). In this regard, economies of scale may play an important part in explaining small firm growth. In this connection, Penrose (1959) underlines that small firms need to grow in order to be able to take full advantage of existing idle resources and capabilities. This idle capability therefore constitutes an incentive to grow (Penrose 1959) in such a way that, as it was mentioned above, it seems reasonable to say that the indivisibility of assets, at least proportionately, has more implications on smaller firms than on their larger counterparts. All these reasons should explain the lack of validity of the independence between size and growth advocated by Gibrat (1931), and based on this premise we can make the following hypothesis:

Hypothesis 1: There are size differences between high-growth firms and non-high-growth firms, in such a way that the former will be smaller than the latter.

2.3 Firm age

For decades, firm size and age have been considered to be the determinants of firm growth. Two theories support this idea. On the one hand, the Theory of Learning (Jovanovic 1982) puts the stress on the part played by organizational learning, through the firm's managers, in the making up of perceptions and expectations relating to the best performance of the firm. Jovanovic's (1982) model proposes that 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. For this reason, younger firms will exhibit much more variable growth rates, while older firms, as they know the optimal size that allows them to maximize their levels of efficiency, will show fewer size changes (Fariñas and Moreno 1997). A similar argument is proposed by Shafman *et al*. (1988) when they stated that young firms tend to be resource-constrained and to suffer from 'liability of newness'. Therefore young firms are likely to make less efficient use of resource slack than older firms, because older firms have had the opportunity to experiment with different types of resources and select the ones that best fit their demands (George 2005). Various empirical studies seem to support this negative relation between firm age and size (Evans 1987, Dunne and Hugues 1994, Fariñas and Moreno 1997), although other recent works state that the influence of firm age depends on the size stratum of the firm (Correa *et al*. 2003).

On the other hand, literature on the entrepreneurship view of the firm tends to assume a negative relationship between age and entrepreneurial orientation of the firm (Lumpkin and Dess 1996, Lumpkin 1998). Young firms are more innovative, proactive and risk-orientated than older firms, among other reasons because young firms emerge with the purpose of taking advantage of a new opportunity, previously unexploited, by means of an innovating, proactive, and somewhat risk-taking behaviour (Shane and Venkataraman 2000). Furthermore, young firms are more flexible and have developed fewer rigid routines than older firms. This allows them to discover and exploit new growth opportunities than older firms.

Both the Theory of Learning and the entrepreneurial models coincide at proposing a negative relation between firm age and growth, which can be extrapolated to the case of high-growth firms. For all of the reasons set forth above, we propose the following hypothesis:

Hypothesis 2: There are differences in age between high-growth firms and non-high-growth firms, in such a way that the former will be younger than the latter.

2.4 Financial structure

Although the financial structure of SMEs is an essential point to understand their behaviour (Reid 2003), few works have examined the relationship between availability of financial resources and firm growth (Harrison *et al*. 2004). Different theoretical and empirical arguments support the existence of a relationship (whether of a negative or of a positive nature) between the availability of financial resources and the growth rate of the firm. Most of the works on growth in small and medium-sized firms consider that the accessibility to sufficient financial sources is either a handicap or a brake to growth (Bechetti and Trovato 2002).

According to the literature on the financial constraints of entrepreneurial activity, the lack of financial resources negatively affects both the self-employment choice of individuals and the growth of new firms (Holtz-Eakin *et al*. 1994, Cooley and Quadrini 2001, Cabral and Mata 2003). From this perspective, as firms need financial resources to be able to grow, those that are less likely to receive funds will grow more slowly. According to the resource and capability-based approach, the financial resources are fully divisible and transferable. Therefore, if resources exist but are not fully utilized, they can be used to grow, either within the same business or in other activities (Penrose 1959). In this regard, Bechetti and Trovato (2002), in a recent study based on more than 5000 Italian SMEs, found that, although the financial structure does not seem to influence the growth rate of firms with more than 100 employees, the availability of financial resources in smaller firms is a determinant to explain their growth.

Entrepreneurial high-growth firms are characterized for being capable of raising funds to finance their growth decisions (Harrison *et al*. 2004). In this regard, Brown *et al*. (2001) uphold that entrepreneurial-oriented firms are also growth-oriented, and that they focus more on opportunities than on the efficient use of their resources. In other words, entrepreneurial firms identify the opportunities, decide to exploit them, and seek the necessary resources to do so. Growth requires substantial financial resources, so rapid-growth firms are typically cash starved. For this reason, we propose the following hypothesis:

Hypothesis 3: There are differences as to the availability of financial resources between high-growth firms and non-high-growth firms, in such a way that the former will have a higher availability of financial resources than the latter.

2.5 Slack resources (non-financial)

According to Penrose's theory (1959), growth can be explained in terms of the existence of useless resources in the firm, which – because of their indivisibility – have been acquired in higher quantities than those actually needed. To the resources available at the marketplace in discontinuous amounts, we should add the amounts that are different for each one of the resources that the firm requires.

These slack resources are the main incentive for growth. The firm's wish to grow is explained because that firm tries to put these resources to use, thus enhancing its efficiency. Furthermore, the existence of specific slack resources will foster growth within the same industry, while the availability of general resources will enable growth in industries other than the traditional field of activity of the firm (growth via diversification). Penrose (1959) distinguishes between tangible resources (whether physical resources, usually indivisible, or fully divisible financial resources), and intangible resources (among which the human and managerial resources are to be highlighted).

Recently, George (2005) analyses the influence of slack resources on performance of privately-held firms. Slack is a potentially utilizable resource that can be diverted or redeployed for the achievement of organizational goals. Slack enhances experimentation and risk-taking (Nohria and Gulati 1996), may insulate the firm from exogenous shocks (Thompson 1967), and provides more flexibility for managers to develop strategic options – managerial discretion – (Bourgeois 1981). As George (2005) states,

if managers perceive that their absolute level of slack far exceed those of competitors, they are likely to be more optimistic about courses of action. This optimistic view of the firm probably influences their growth decisions.

Most works on growth do not even consider the existence of idle resources for two main reasons. First, because the stochastic approaches predominate in growth analyses. Second, because it is difficult to have information on the existence of idle resources, when the main data source is based on the annual accounts of the firms. Nevertheless, the loss and profit account does provide relevant information on firm resources. Thus, the asset turnover (quotient of firm sales divided by total assets) can be used to ascertain the firm level of efficiency in the use of resources. Asset turnover is therefore a suitable indicator of the amount of slack resources in the firm, in such a way that the greater the turnover, the higher the level of efficiency of the assets and, as a consequence, the lower the amount of idle resources. For all of the reasons set forth above, we propose the following hypothesis:

Hypothesis 4: There are differences as to the availability of slack (non-financial) resources between high-growth firms and non-high-growth firms, in such a way that the former will have a lower availability of slack resources than the latter.

3. Methodology

3.1 Sample

Our empirical research is based on a sample of 6692 SMEs, selected after refining a homogeneous database of firms from Andalusia (Spain). This database comprises 7752 firms and includes their economic and financial information for the years 1998, 1999, 2000 and 2001. The process of refinement was divided into two stages: (1) firms were eliminated if there was a lack of sales volume data during any of the 4 years under study, i.e. 147 firms; (2) 'large' firms were excluded. For the purpose of determining which firms were to be considered 'large', we applied a criterion based on the average operating income, in such a way that firms with average operating incomes higher than 6 million euros in 1998 were deleted from the sample. According to this criterion, we deleted 791 firms. After the refinement process, the sample included a total of 6814 SMEs.

3.2 Measurement

3.2.1 High-growth firms

There is no unique method to measure firm growth throughout a given period (Delmar *et al*. 2003). There has been an important debate about how to measure firm growth – objective versus subjective approaches; single versus multiple indicators; through sales, assets, employments, and so forth (Weinzimmer 2000, Delmar *et al*. 2003). Since our source of information was based on the annual accounts, we have used sales growth, consistent with previous works (Baum *et al*. 2001, Lumpkin and Dess 2001), and with the recommendations of Delmar *et al*. (2003) on the high correlation among the differents objective indicators available (correlation among growth of sales, assets, and employments was higher than 0.5 ($p > 0.001$). We have

determined the percentage of sales growth between 1998 and 2001. Nevertheless, this indicator posits a problem because of existing differences in growth rates among different industries owing to the different lifecycle stage that each industry undergoes or the inflation influence. To solve this inconvenience, we have set forth a relative growth indicator:

$\Delta SALESIND$: Difference between the percentage of sales growth of the firm throughout the period 1998–2001 and the median of growth for its relevant sector.

High-growth firms are mainly characterized as follows: (1) they are firms with a high growth (higher than 100%); and (2) this growth takes place in a relatively short period of time (normally a period of 3 to 4 years). For the purpose of our study, we have catalogued firms as 'gazelle firms' bearing in mind the above factors relevant to the different growth pace of the various sectors. Thus, we have defined the following dependent variable.

High-growth: Dichotomic variable that exhibits a value of 1 for high-growth firms and a value of 0 for non-high-growth firms. A firm is considered to be a high-growth firm if its percentage of growth (1998–2001) is more than 100% higher than the median of its sector. That is, the value of the high-growth variable is 1 when $\Delta SALESIND$ is equal or higher than 1, and 0 when it is not.

According to this criterion, we have identified 723 high-growth firms (10.6% of total firms). Table 1 summarizes the distribution by sector of those firms. Table 1 shows

Table 1. Industry distribution of high-growth firms (HGFs).

Industry code	*Description*	*Number of firms*	*Median of Growth (%)*	*Number of HGFs*	*% of HGFs*
5-Jan	Agriculture, fishing, ...	168	15.01	20	11.90
14-Nov	Mining and energetic products	53	37.82	5	9.43
15	Foods, beverages & tobacco	382	11.26	24	6.28
17, 18 & 19	Textile and shoe manufacturers	179	14.71	21	11.73
20	Wood manufacturers	85	25.82	10	11.76
21 & 22	Paper and graphics manufacturers	102	25.60	7	6.86
24 & 25	Chemical industry	122	37.16	14	11.48
26	Mineral products	175	31.82	17	9.71
27 & 28	Metal industry	235	29.23	32	13.62
29	Other metal industry	82	26.12	6	7.32
31, 32 & 33	Electric, electronic and optic manufacturers	46	38.45	7	15.22
34 & 35	Transport materials	47	32.10	8	17.02
36	Other manufacturers	204	20.47	21	10.29
40 & 41	Electricity, gas and energy distribution	38	17.21	2	5.26
45	Building	832	42.52	136	16.35
50	Distribution activities	406	16.05	24	5.91
51	Commercial activities (retailing)	1623	19.33	147	9.06
52	Commercial activities (other)	624	16.84	58	9.29
55	Hotels & restaurants	219	27.33	20	9.13
60–64	Transport & communications	339	21.97	31	9.14
67	Financial activities	17	54.43	2	11.76
70	Real estate activities	327	22.16	47	14.37
71–75	Service for firms, consulting, ...	312	34.48	44	14.10
80	Education	22	15.01	2	9.09
85	Medical and assistance activities	44	22.12	5	11.36
90, 92, 93 & 99	Other service activities to civil society	131	18.47	13	9.92
Total		6814	22.82	723	10.61

that percentage of high-growth firms varies among sectors for several reasons – differences in lifecycle stage, technological intensity, short-term macro-economic factors, etc.

3.2.2 Firm size

For measuring firm size, we have used the sales relevant to the first year of the period under study, 1998. This variable was logarithm-transformed to correct its deviation from normality. Thus, the initial firm size was measured with the following variable:

LgSALES98: Logarithm of the firm sales volume in 1998.

3.2.3 Firm age

Firm age was determined by the difference between 1998 (initial year) and the year of start-up. Again, this variable distribution exhibits a deviation from normality; therefore, consistent with most of the previous researches (Baum *et al*. 2001), it is recommended to use its logarithm. Thus, the variable representing firm age is as follows:

LgAGE98: Logarithm of the difference between 1998 and the year of start-up.

3.2.4 Availability of financial resources

We have determined the availability of financial resources using three different indicators, which are employed in traditional financial management and relate to the debt level and the level of funds that are available to the firm in the short-term.

SOLV98: Solvency of the firm in 1998. It measures the capacity of the firm to meet all of its debt obligations. It is determined by dividing total assets by borrowed resources (data corresponding to year 1998).

TOTLIQ98: Total liquidity of the firm in year 1998. It measures the capacity of the firm to meet its payment obligations in the medium term. It is determined by dividing the operating assets by the current liabilities (data corresponding to year 1998).

INMLIQ98: Immediate liquidity of the firm in 1998. It measures the capacity of the firm to meet its most immediate payment obligations. It is the quotient of available assets plus receivables divided by current liability (data corresponding to year 1998).

3.2.5 Existence of idle (non-financial) resources in the firm

This last dimension is difficult to measure with the economic and financial data that are available in the annual accounts. Nevertheless, the concept of assets turnover, understood as the quotient of the sales volume of the firm divided by its level of assets, can be a suitable approach to the amount of idle non-financial resources of the firm. Assets turnover is an indicator of the level of efficiency with which firms use their assets. Nevertheless, assets turnover is a parameter that can be affected by factors such as differences in the applied technologies, market power or other factors linked to the sector of activity. Therefore, we have changed this measure, taking account of the median of the industry assets turnover, like the one for the sales growth variable, as follows:

ROTIND98: Difference between the asset turnover of the firm in 1998 and the median of the asset turnover in its relevant sector.

3.3 Statistical methodology

The goal of this paper is to understand the existing differences between groups of firms, in particular, high-growth firms and non-high-growth firms. Given the nature of this objective, discriminant analysis is a better statistical instrument than other similar tools like logit or probit models, which are more oriented to find what independent variables influence a dichotomic dependent variable. Specifically, discriminant analysis has two basic aims: (1) *identification or characterization* – it consists in determining whether two or more groups of individuals are sufficiently characterized, according to a series of variables. It analyses which are the variables that better contribute to discriminating among groups. Our study attempts to identify the variables that enable us to better differentiate between high-growth and non-high-growth firms; and (2) *classification*: based on the characterizing variables, the classification consists in assigning each individual to one of the groups, without knowing in advance the group to which it pertains. This paper aims at predicting a firm's likelihood to be high-growth throughout a given period of time, on the basis of the information relevant to the first year of the period.

In our sample, 10.31% of the firms are gazelle firms versus 90% of non-high-growth firms. This gap gives rise to two types of problems: the first relates to the statistical methodology for, according to the discriminant analysis, the number of cases in each category of the dependent variable should be more or less similar. The second refers to the heterogeneous nature of the firms included in the second group. Thus, while some firms grow above the median of their sector, others grow below it or are on a stability stage, and there are still other firms that show a decrease in absolute terms.

To solve both problems, we proceeded as follows: as the group of high-growth firms accounts for approximately 10% of the total, we have segmented the group of non-high-growth firms into nine groups of equal size, according to the variable $\Delta SALESIND$. Thus, the sample is divided into ten deciles, each decile including firms with similar growth rates, as shown in table 2.

The table shows that the 0 decile represents high-growth firms; 1 to 4 deciles include moderate growth firms, that is to say, firms with growth rates higher than most of the firms in their sector, but not as high as high-growth firms; and 5 to 9 deciles include firms with growth rates below the median of their relevant sectors.

Table 2. Groups of firms according to $\Delta SALESIND$.

Decile	*Growth above the median*	*Average (%)*	*Standard deviation (%)*	*Median (%)*
0	$\Delta SALESIND > 100\%$	195.4	90.3	167.1
1	$100\% > \Delta SALESIND > 50\%$	70.2	13.2	65.4
2	$50\% > \Delta SALESIND > 26\%$	37.0	6.3	36.1
3	$26\% > \Delta SALESIND > 11\%$	18.3	4.5	17.6
4	$11\% > \Delta SALESIND > 0\%$	4.7	3.4	4.7
5	$0\% > \Delta SALESIND > -11\%$	−5.1	3.1	−5.2
6	$-11\% > \Delta SALESIND > -22\%$	−15.8	3.6	−17.0
7	$-22\% > \Delta SALESIND > -38\%$	−28.6	4.3	−28.1
8	$-38\% > \Delta SALESIND > -63\%$	−48.9	7.5	−47.5
9	$63\% > \Delta SALESIND > 141\%$	−87.2	16.4	−83.2
	Total	14.6	79.4	0.0

After distinguishing the ten groups, we have applied the discriminant analysis by comparing the high-growth group with each of the other nine groups.

4. Results

In the following section, we show the results organized into three parts. The first part deals with the significance of the discriminant functions. The second concerns the significance of the independent variables, and the third relates to prediction, that is, the classification of each one of the firms according to the previously estimated discriminant function.

4.1 Significance of the discriminant functions

The importance of the discriminant function is analysed through Wilks' Lambda. This measures the proportion of the total variance in the discriminant scores not explained by differences among groups. We have calculated the chi-square (χ^2) for the mentioned value; on this basis, it is possible to determine the level of significance. Table 3 shows the main parameters of the nine discriminant functions. In all cases, we have estimated one discriminant function only. It can be observed that the discriminant functions are sufficiently significant, with values of $p < 0.001$ in all of the cases.

Table 3. Parameters, coefficients and centroids of the discriminant functions.

Discriminant function	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Deciles									
	0–1	0–2	0–3	0–4	0–5	0–6	0–7	0–8	0–9
L de Wilks	0.965	0.935	0.939	0.919	0.886	0.908	0.895	0.894	0.852
Canonical Correlation	0.186	0.255	0.248	0.285	0.337	0.303	0.324	0.325	
Chi-square	44.99	85.38	80.18	105.38	152.87	121.55	139.56	211.71	
Significance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Standardized coefficients of the canonical discriminants								
LgSALESS98	1.00	0.891	0.851	0.880	0.845	0.807	0.847	0.791	0.756
ROTIND98	–	0.381	0.445	0.351	0.465	0.513	0.456	0.526	0.551
SOLV98	–	–	–	0.214	–	–	–	–	0.153
INMLIQ98	–	–	–	–	0.184	0.271	0.179	–	–
	Structure matrix (canonical correlations)								
LgSALES98	1.000	0.925	0.897	0.914	0.871	0.823	0.873	0.853	0.824
ROTIND8	0.096	0.461	0.533	0.460	0.528	0.577	0.524	0.619	0.648
INMLIQ98	−0.100	−0.082	−0.063	−0.015	0.098	0.146	0.119	−0.059	−0.079
LgAGE	0.065	0.004	0.021	0.040	0.042	0.035	0.041	0.032	0.037
TOTLIQ98	−0.100	−0.076	−0.073	−0.009	0.005	0.040	0.005	−0.047	−0.068
SOLV98	−0.039	−0.048	−0.046	0.163	−0.018	−0.016	−0.020	0.003	0.134
	Functions in groups centroids								
0 (HGFs)	−0.187	−0.259	−0.251	−0.286	−0.351	−0.310	−0.333	−0.478	−0.410
1 (Non-HGFs)	0.192	0.268	0.261	0.310	0.365	0.326	0.353	0.347	0.424
Gap	0.379	0.527	0.512	0.596	0.716	0.636	0.686	0.825	0.834

4.2 Significance and importance of the discriminant variables

In order to know the importance of the variables entered into the different functions, we have to use the standardized coefficients and the structure matrix. The latter represents the canonical correlations between the discriminant function and each one of the predicting variables. Table 3 summarizes this information for each one of the nine discriminant functions estimated.

First, we should consider which variables have been entered into each one of the respective estimated discriminant functions. Since we have used the step-by-step method, the number of final variables in each function varies from one model to another. Nevertheless, two variables seem to participate in the nine functions: namely, these are the *LgSALES98* and *ROTIND98* variables. Along with them, two more variables are included in two (*INMLIQ98*) or three (*SOLV98*) models. The results are quite clear with regard to the standardized coefficients, with size being the variable that shows the highest values in all of the models, followed by asset turnover. Both solvency and immediate liquidity exhibit lower coefficients than the above, in the models where they are included.

Finally, the values of the structure matrix, in the first place, support those results concerning the standardized coefficients for all of the variables (either within or without the final discriminant function). In the second place, the structure matrix provides an orientation about the sign of the relations between the discriminant variables and the classification of the individuals made by this function. For this second question, it is necessary to have additional information, related to the estimation of the centroids of each group. The centroid is the average value of the discriminant results for a given group. Table 3 shows the value of the two centroids for each of the nine functions.

As to the first question, it can be observed that, in fact, values of the *LgSALES98* and *ROTIND98* variables are very high in the different structure matrices. In all of the cases, the correlations are above ± 0.3, so that variable is significant (Hair *et al*. 1995). The remaining variables – including solvency and immediate liquidity when they are in the final discriminant function – do not reach that threshold. The second question of interest is how the different variables influence the classification of the firms into one group or another, in each analysis. For this purpose, we compare the value of the correlation structure (structure matrix) with the relevant centroids. In all models, the centroid that corresponds to the 0 decile (high-growth firms) has a negative sign, while the centroid that corresponds to the comparison group has a positive sign. Therefore, those variables that exhibit a positive canonical correlation will have a direct relation with the inclusion in the comparison group and a negative relationship with the inclusion in the high-growth firm group.

The two most significant and important variables (*LgSALES98* and *ROTIND98*) exhibit a positive canonical correlations value, thus corroborating that the different discriminant functions will tend to include smaller firms and those with a lower turnover into the group of high-growth firms. The functions that include solvency (*SOLV98*) and immediate liquidity (*INMLIQ98*) always show a positive canonical correlation. Therefore, we can safely state that, on certain occasions, high-growth firms have lower solvency and immediate liquidity than non-high-growth firms.

4.3 Firm prediction or classification

Although previous analysis has focused on the explanatory side of the discriminant analysis, this can also be used for predicting purposes. Based on the score obtained with the discriminant function, each of the individuals (firms) should be allocated to one of the reference groups. This is done by calculating the likelihood that each observation belongs to each one of the groups, which is determined by the Bayes Theorem. This information is summarized in the so-called classification matrix or confusion matrix. This matrix compares the actual and predicted number of individuals in each group, and then it determines the total percentage of individuals that are well classified. The goodness of the classification will be measured by determining the number of well-classified cases that exceeds the percentage that would have been obtained at random, 50% in this case. Table 4 shows the nine classification matrices.

Two aspects are worth discussing. First, in nearly all cases, the percentage of well-classified firms is more than 10 points higher than 50%, showing the strong predicting power of the respective discriminant functions. The second noteworthy result is that the greater the growth differences among the groups, the higher the percentage of well-classified firms. Thus, if we compare the high-growth firms with the moderate – higher than average – growth firms, the percentage is around 60% (more specifically, between 58.7% and 61.6%). However, if we compare high-growth firms with those firms that either grow below the median of their industry or even decrease, this percentage increases significantly, being in the range of 63.9% to 68.7%.

5. Discussion

The results show how high-growth firms tend to have a significantly lower size and asset turnover than non-high-growth firms. Similarly, they seem to exhibit lower levels of solvency and liquidity. Firm age, however, does not seem to be a differentiating factor between the two types of firms.

The results reveal that size is the most discriminating variable between high-growth and non-high-growth firms, consistent with hypothesis 1. The variable that measures firm size (LgSALESS98) appears in every discriminant equation estimated through a stepwise method ($p < 0.001$). This variable shows the higher standarized coefficients (between 0.756 and 1.000) and higher values in structure matrix (between 0.823 and 1.000). The centroids of high-growth firms are negative, so the coefficients mentioned above represent that greater firms tend to belong to the group of non-high-growth firms. The basic postulates of Gibrat's Law (1931) are therefore rejected. It can be observed that high-growth firms are smaller firms, with their larger counterparts being less likely to grow above their sector average.

Unlike size, firm age does not seem to be a good variable for distinguishing between high-growth and non-high-growth firms, according to the different discriminant analyses carried out during our study. LgAGE, the indicator used to measure firm age, is not introduced in any of the discriminant equations estimated, and canonical correlations in structure matrix are very low (< 0.065). Nevertheless, although we have to reject hypothesis 2 due to its lack of significance, the variable sign in the structure matrix is consistent in all cases with our hypothesis with regard to the negative relation between age and relative growth. These results have drawn our

Table 4. Classification matrices.

			Estimated frequencies	
			0	1
0 decile – 1 decile	Observed frequencies	0	348 (50.4%)	342 (49.6%)
		1	218 (32.7%)	449 (67.3%)
	Percentage of well-classified firms = 58.7%			
			Estimated frequencies	
			0	1
0 decile – 2 decile	Observed frequencies	0	404 (58.6%)	386 (41.4%)
		1	252 (37.8%)	415 (62.2%)
	Percentage of well-classified firms = 60.4%			
			Estimated frequencies	
			0	1
0 decile – 3 decile	Observed frequencies	0	412 (59.7%)	278 (40.3%)
		1	260 (39.0%)	407 (61.0%)
	Percentage of well-classified firms = 60.4%			
			Estimated frequencies	
			0	1
0 decile – 4 decile	Observed frequencies	0	439 (63.3%)	251 (36.4%)
		1	270 (40.5%)	397 (59.5%)
	Percentage of well-classified firms = 61.6%			
0 decile – 5 decile			Estimated frequencies	
			0	1
	Observed frequencies	0	440 (63.8%)	250 (36.2%)
		1	240 (36.0%)	427 (64.0%)
	Percentage of well-classified firms = 63.9%			
0 decile – 6 decile			Estimated frequencies	
			0	1
	Observed frequencies	0	447 (64.8%)	243 (35.2%)
		1	269 (40.3%)	398 (59.7%)
	Percentage of well-classified firms = 62.3%			
			Estimated frequencies	
			0	1
0 decile – 7 decile	Observed frequencies	0	448 (64.9%)	242 (35.1%)
		1	255 (38.2%)	412 (61.8%)
	Percentage of well-classified firms = 63.4%			
			Estimated frequencies	
			0	1
0 decile – 8 decile	Observed frequencies	0	452 (65.5%)	238 (24.5%)
		1	233 (35.0%)	434 (65.0%)
	Percentage of well-classified firms = 65.3%			
			Estimated frequencies	
			0	1
0 decile – 1 decile	Observed frequencies	0	488 (70.7%)	202 (29.3%)
		1	223 (33.5%)	443 (66.5%)
	Percentage of well-classified firms = 68.7%			

attention to the lack of relation between age and growth found in our study. We have no accurate information on the distribution by age of the samples used in other works, and therefore cannot make any comparisons. Nevertheless, most of the firms in our sample exhibit very small age differences, a fact that may have affected our results. Thus, more than one-half of the firms are younger than 10 years old and only 5% are older than 25 years. In our opinion, this can explain the lack of significance of the age variable in our study.

The results of the three variables related to the availability of financial resources are also worth discussing. While total liquidity does not seem to make any difference between high-growth and non-high-growth firms (TOTLIQ98 is out of the different discriminant equations estimated, and canonical correlations at different structure matrix are below −0.1), solvency and immediate liquidity do appear to be slightly significant in some cases. Such variables tend to show negative coefficients, albeit non-significant, in most discriminant functions. However, interestingly, when any of these variables do appear in the discriminant function, the coefficient is positive (such as in the case of the *INMLIQ98* and *SOLV98* variables). SOLV98 is significant in discriminant equations number 4 and 9 ($p < 0.001$) with positive canonical correlations (0.163 and 0.134, respectively). At the same time, INMLIQ98 appears significant ($p < 0.001$) in equations 5, 6, and 7, showing the following correlation in structure matrix: 0.098, 0.146, and 0.119. Both variables are included in the models that relate high-growth firms with firms showing very low growth rates or firms that are in decline (4, 5, 6, 7 and 9 deciles). In short, when the availability of financial resources contributes significantly to distinguish between high-growth and non-high-growth firms, the relation is negative, as proposed in hypothesis 3. In some cases, therefore, high-growth firms are characterized by a low availability of financial resources, whether in the short term (low immediate liquidity) or long term (low solvency). This result seems to support the entrepreneurial approach to growth, according to which more important than the availability of financial resources is the search and exploitation of opportunities (Stevenson and Jarillo 1990, Baum *et al*. 2001).

The turnover, on the other hand, shows a high discriminant power, it being the second variable that most contribute to the distinction between high-growth and non-high-growth firms (as shown by the fact that ROTIND98 is significant $-p < 0.001$ in eight of the nine estimated discriminant functions). Similarly, the sign of the structure matrix coefficients shows that high-growth firms start the period with a lower turnover than non-high-growth firms, consistent with hypothesis 4. The canonical correlations in the eight structure matrices in which ROTIND98 is significant, are positive and higher than 0.460, while the centroids of high-growth firms are negative. This fact reveals that the asset utilization level is lower in high-growth rather than in non-high-growth firms within the same sector, and that is why the former need to grow and balance that quotient.

The different direction of the influence on growth that is shown by financial resources, on the one hand, and turnover (idle resources) on the other, is due to their level of specificity, divisibility and transferability (Barney 1991). Thus, while financial resources are little specific (they can be put to several uses), fully divisible, and therefore easy to transfer, the firm assets (and some of them more than others), are more specific, less divisible and, hence, more difficult to transfer to external uses. As the firm needs to put this second type of slack resources to use, they foster the firm growth. Financial resources, unlike their idle counterparts, can be put to different uses – both inside and outside the firm – that have nothing to do with firm growth (financial investments, distribution of dividends, loan repayment, and so forth).

Therefore, the existence of idle assets appears to be a decisive explanatory factor of a firm's high growth, according to Penrose (1959). This influence, along with that of size, seems to indicate that smaller firms tend to acquire more assets in higher quantities than they actually need in the short term. Nevertheless, we do not know whether this is because of the indivisibility of assets, as suggested by the resources and

capabilities based approach, or it is because of the will of the firm, as stated from the field of entrepreneurship.

6. Conclusion

By way of conclusion, we should say that firm growth deserves an increasing attention from researchers. The social and economic development and the generation of new jobs depend, in a similar proportion, on the entrepreneurial capacity to generate new business projects and initiatives, and on the existence of entrepreneurs and managers that are able to turn these embryonic firms into solid organizations capable of withstanding the current international competition. SMEs' growth is an essential challenge within this framework. Although this paper brings some light into the differences between high-growth and non-high-growth firms, further investigations must be conducted to provide more insight into the phenomenon of firm growth.

Although there exists an extensive previous research on firm growth, this paper provides three significant contributions. The first refers to a higher precision of the object to be explained. Thus, unlike other analyses devoted to overall growth, this paper exclusively focuses on high-growth firm differentiation. The second is the combination of two different theoretical approaches, thanks to which we can focus on the reasons that explain some of the results achieved in previous investigations. Thus, the existence of slack resources, and especially of those characterized by higher indivisibility, seems to be the major cause of higher growth for the SMEs. The third contribution is that, when it comes to defining and measuring high-growth firms, we have taken an approach by industry, isolating in this way the implications of the sector lifecycle on the growth of each individual firm.

Results of the empirical research show the important role of resources as a determinant of growth of SMEs. More research is needed in order to improve our knowledge about what kind of resources promotes the high-growth behaviour of firms. Several issues could be considered, following the ideas proposed by Penrose (1995). Two of them are interesting from a practical point of view. The first one is related to the sources of resources. Resources (human resources, technological resources, financial resources), can be obtained from outside of the firm. This is the case of the 'networked' firm. SME networks constitute a way to get access to key resources. Firms connected to these kind of networks probably are in a better position to grow faster. The second one is the role of 'knowledge' as a key resource for growth. Our research finds that useless resources are important to grow, but it is focused on 'physical resources' (tangible and financial resources). Nevertheless, the ability to get access to new knowledge probably (from internal development and/or from external acquisitions) constitutes a dynamic capability very important to be a high-growth firm (Zahra *et al*. 2006).

Nevertheless, along with these novelties, the work has some limitations. Among the most important, we should mention the following: First, the empirical work has been carried out in a particular geographical context, and therefore we are not sure of the real possibility of extrapolating to other settings. Second, the information used was obtained from the annual accounts of the firms, and therefore certain dimensions have not been dealt with in detail; among them, the nature of slack resources, the possibilities of receiving new funds, and so forth.

Despite the above weaknesses, however, the work opens a wide spectrum of questions that deserves further discussion in future investigations. In this sense, the main question posited by our results is to what extent the firm high growth is produced by a behaviour oriented towards the efficient use of existing resources, according to the theory of resources and capabilities, or by an entrepreneurial behaviour, oriented to the identification and exploitation of opportunities beyond the available resources. On the other hand, from a more functional approach, it should be of interest to extend this study to other geographical areas, explore larger samples and consider other factors like the type of growth (organic versus acquisitions). Similarly, future research could provide insight into the comparison of the discriminant analysis results in different time spans. The discriminant analysis can also be used to compare the differences between all of the firm strata (deciles) in which the sample is divided. This will allow us to examine existing differences among firms growing at different rates, and between these firms and firms with negative growth. Finally, future works should use statistical methodologies that enable one to grasp the growing process more dynamically.

References

Acs, Z. J. and Andretsch, D. 1990 *Innovation and Small Firms* (Cambridge, MA: MIT Press).

Almus, M. and Nerlinger, E. A. 2000 Testing 'Gibrat's Law' for young firms – empirical results for West Germany, *Small Business Economics*, 15: 1–12.

Baker, T. and Nelson, R. 2005 Creating something from nothing: resource construction through entrepreneurial bricolage, *Administrative Science Quarterly*, 50: 329–366.

Barkham, R., Gudgin, G., Hart, M. and Harvey, E. 1996 *The Determinants of Small Firm Growth: An Inter-Regional Study in the United Kingdom 1986–90* (London: Routledge).

Barney, J. B. 1991 Firm resources and sustained competitive advantage, *Journal of Management*, 17: 99–120.

Barringer, B. R. and Jones, F. F. 2004 Achieving rapid growth: revisiting the managerial capacity problem, *Journal of Developmental Entrepreneurship*, 9: 73–86.

Barringer, B. R., Jones, F. F. and Neubaum, D. O. 2005 A quantitative content analysis of the characteristics of rapid-growth firms and their founders, *Journal of Business Venturing*, 20: 663–687.

Baum, J. R., Locke, E. A. and Smith, K. G. 2001 A multidimensional model of venture growth, *Academy of Management Journal*, 44: 292–303.

Bechetti, L. and Trovato, G. 2002 The determinants of growth for small and medium sized firms. The role of the availability of external finance, *Small Business Economics*, 19: 291–306.

Bidhé, A. V. (2000) *The Origin and Evolution of New Ventures* (New York: Oxford University Press).

Birch, D., Haggerty, A. and Parsons, W. 1994 *Corporate Almanac* (Minnesota: Connetics Inc.).

Bourgeois, L. J. 1981 On the measurement of organizational slack, *Academy of Management Review*, 6: 29–39.

Brown, T. E., Davidsson, P. and Wiklund, J. 2001 An operationalization of Stevenson's conceptualization of entrepreneurship as opportunity-based firm behaviour, *Strategic Management Journal*, 22: 953–968.

Cabral, L. M. B. and Mata, J. 2003 On the evolution of the firm size distribution: facts and theory, *The American Economic Review*, 93: 1075–1095.

Caves, R. E. 1998 Industrial organization and new findings on the turnover and mobility of firms, *Journal of Economic Literature*, 36: 1947–1982.

Cooley, T. F. and Quadrini, V. 2001 Financial markets and firm dynamics, *The American Economic Review*, 91: 1286–1310.

Correa, A., Acosta, M., González, A. L. and Medina, U. 2003 Size, age, activity sector on the growth of the small and medium firm size, *Small Business Economics*, 21: 289–307.

Davidsson, P. and Delmar, F. 1997 High-growth firms: characteristics, job contribution and method observations. Paper presented at RENT XI Conference, Mannheim, Germany, November.

Davidsson, P. and Wiklund, J. 2000 Conceptual and empirical challenges in the study of firm growth, in Sexton, D. L. and Landström, H. (eds), *Blackwell Handbook in Entrepreneurship* (Oxford: Blackwell Business) pp. 26–44.

Davidsson, P., Kirchhoff, B., Hatemi, J. A. and Gustavsson, H. 2002 Empirical analysis of business growth factors using Swedish data, *Journal of Small Business Management*, 40: 332–349.

Delmar, F., Davidsson, P. and Gartner, W. B. 2003 Arriving at the high-growth firm, *Journal of Business Venturing*, 18: 189–217.

Dunne, P. and Hugues, A. 1994 Age, size, growth and survival: UK companies in the 1980s, *The Journal of Industrial Economics*, 42: 115–138.
Evans, D. S. 1987 The relationship between firm growth, size, and age: estimates for 100 manufacturing industries, *The Journal of Industrial Economics*, 35: 567–581.
Fariñas, J. C. and Moreno, L. 1997 Size, age and growth: an application to Spanish manufacturing firms, working paper 9705, Fundación Empresa Pública, Universidad Computense de Madrid.
Fisher, E. and Reuber, A. R. 2003 Support for rapid growth firms: a comparison of the views of founders, government policymakers, and private sector resource providers, *Journal of Small Business Management*, 41: 346–365.
Friar, J. H. and Meyer, M. H. 2003 Entrepreneurship and start-ups in the Boston region: factors differentiating high-growth ventures from micro-ventures, *Small Business Economics*, 21: 145–152.
George, G. 2005 Slack resources and the performance of privately held firms, *Academy of Management Journal*, 48: 661–676.
Gibrat, R. 1931 *Les Inequalites Economiques* (Paris: Libraire du Recueil Sirey).
Goddard, J., Wilson, J. and Blon, P. 2002 Panel test of Gibrat's Law for Japanese manufacturing, *International Journal of Industrial Organization*, 20: 415–433.
González, A. L. and Correa, A. 1998 Crecimiento y Tamaño: un estudio Empírico, *Revista Española de Financiación y Contabilidad*, 27: 541–573.
Hair, J. F., Erson, R. E., Tatham, R. L. and William, C. B. 1995 *Multivariate Data Analysis with Readings* (Englewood Cliffs, NJ: Prentice-Hall).
Harhoff, D., Stahl, K. and Woywodes, M. 1998 Legal form, growth and exit of West German firms – empirical results for manufacturing construction, trade and service industries, *The Journal of Industrial Economics*, 46: 453–487.
Harrison, A. E., Love, I. and McMillan, M. S. 2004 Global capital flows and financing constraints, *Journal of Development Economics*, 75: 269–281.
Hart, P. E. and Oulton, N. 1996 The size and growth of firms, *Economic Journal*, 106: 1242–1252.
Holtz-Eakin, D., Joulfaian, D. and Rosen, H. S. 1994 Sticking it out: entrepreneural survival and liquidity constraints, *Journal of Political Economy*, 102: 53–75.
Jovanovic, B. 1982 Selection and evolution of industry, *Econometrica*, 50: 508–523.
Littunen, H. and Tohmo, T. 2003 The high growth in new metal-based manufacturing and business service firms in Finland, *Small Business Economics*, 21: 187–200.
Lumpkin, G. T. 1998 Do new entrant firms have an entrepreneurial orientation?, Paper to be presented at the Academy of Management Annual Meeting, San Diego, CA.
Lumpkin, G. T. and Dess, G. G. 1996 Clarifying the entrepreneurial orientation construct and liking it to performance, *Academy of Management Review*, 21: 135–172.
Lumpkin, G. T. and Dess, G. G. 2001 Linking two dimensions of entrepreneural orientation to firm performance: the moderating role of environment and industry life cycle, *Journal of Business Venturing*, 16: 429–451.
Mansfield, E. 1962 Entry, innovation, and the growth of firms, *American Economic Review*, 52: 1023–1051.
Markides, C. 1998 Strategic innovation in established companies, *Sloan Management Review*, 39: 31–42.
McCloughan, P. 1995 Simulation of concentration development from modified Gibrat growth-entry-exit processes, *The Journal of Industrial Economics*, 43: 405–433.
Miller, D. and Friesen, P. 1984 A longitudinal study of the corporate life cycle, *Management Science*, 30: 1161–1183.
Moreno, A. M. and Casillas, J. C. 2000 High-growth enterprises (gazelles): a conceptual framework. Paper presented at the International Conference of the European Academy of Management (EURAM), Stockholm, Sweden, May.
National Commission on Entrepreneurship. 2001 *High-Growth Companies: Mapping America's Entrepreneurial Landscape*. Available at www.cecunc.org/entre/reports/high-growth-companies.pdf.
Nohria, N. and Gulati, R. 1996 Is slack good or bad for innovation?, *Academy of Management Journal*, 39: 1245–1264.
Penrose, E. 1959 *The Theory of the Growth of the Firm* (New York: Wiley).
Penrose, E. 1995 *The Theory of the Growth of the Firm* (New York: Oxford University Press).
Pettus, M. L. 2001 The resourced-based view as a developmental growth process: evidence from the deregulated trucking industry, *Academy of Management Journal*, 44: 878–896.
Prais, S. J. 1976 *The Evolution of Giant Firms in Britain* (Cambridge: Cambridge University Press).
Reid, G. C. 1995 Early life-cycle behaviour of micro firms in Scotland, *Small Business Economics*, 13: 89–95.
Reid, G. C. 2003 Trajectories of small business financial structure, *Small Business Economics*, 21: 273–285.
Samuels, J. M. 1965 Size and growth of firms, *Review of Economics Studies*, 32: 105–112.
Shafman, M., Wolf, G., Chase, R. and Tansik, D. 1988 Antecedents of organizational slack, *Academy of Management Review*, 13: 601–614.
Shane, S. and Venkataraman, S. 2000 The promise of entrepreneurship as a field of research, *Academy of Management Review*, 25: 217–226.
Smallbone, D., Leigh, R. and North, D. 1995 The characteristics and strategies of high-growth SMEs, *International Journal of Entrepreneural Behaviour & Research*, 1: 44–62.

Stevenson, H. H. and Jarillo, J. C. 1990 A paradigm of entrepreneurship: entrepreneural management, *Strategic Management Journal*, 11: 17–27.
Storey, D. 1994 *Understing the Small Business Sector* (London: Routledge).
Storey, D. J. 2001 *A Portrait of Success: The Facts Behind High Growth Companies in the UK* (London: Deloitte & Touche).
Sutton, J. 1997 Gibrat's legacy, *Journal of Economic Literature*, 35: 40–59.
Thompson, J. 1967 *Organizations in Action* (New York: McGraw-Hill).
Tushman, M. and Romanelli, E. 1985 Organizational evolution: a metamorphosis model of convergence and orientation, in Cummings, L. L. and Staw, B. M. (eds), Vol. 17, *Research in Organization Behavior* (Greenwich, CT: JAI Press) pp. 171–222.
Wagner, J. 1992 Firm size, firm growth, and persistence of chance: testing Gibrat's Law with establishment data from Lower Saxony, 1978–1989, *Small Business Economics*, 4: 125–131.
Weinzimmer, L. G. 2000 A replication and extension of organizational growth determinants, *Journal of Business Research*, 48: 35–41.
Weiss, C. R. 1998 Size, growth, and survival in the upper Austrian farm sector, *Small Business Economics*, 10: 305–312.
Wernerfelt, B. 1984 A resource-based view of the firm, *Strategic Management Journal*, 5: 171–180.
Wijewardema, H. and Cooray, S. 1995 Determinants of growth in small Japanese manufacturing firms: survey evidence from Kobe, *Journal of Small Business Management*, 33: 87–92.
Wijewardema, H. and Tibbits, G. E. 1999 Factors contributing to the growth of small manufacturing firms: data from Australia, *Journal of Small Business Management*, 37: 88–96.
Wiklund, J. 1998 Small firm growth and performance: entrepreneurship and beyond. Ph.D. dissertation, Jönköping International Business School, Jönköping.
Zahra, S. A., Sapienza, H. J. and Davidsson, P. 2006 Entrepreneurship and dynamic capabilities: a review, model and research agenda, *Journal of Management Studies*, 43: 917–955.