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High-Growth Firms: Stylized Facts and Conflicting Results

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High-Growth Firms: stylized facts and conflicting results.

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Abstract

High Growth Firms (HGFs) make a considerable contribution to economic growth, and in recent years they have received increasing interest from entrepreneurship scholars. By analysing recent findings in the literature of high growth firms, this study identifies some stylized facts, as well as contradictory findings, and also some unknowns regarding the determinants and internal strategies of HGFs, particularly on the persistence of their superior growth performance and the implications of recent findings for economic policy.

1 Introduction

A central task for entrepreneurship scholars is to seek the characteristics and drivers of high growth firms. A huge literature has sought to identify the main determinants of firm growth, and although a number of factors have been put forward, nevertheless researchers have only been able to explain a small fraction of the variation in firm growth rates (for recent reviews see Gilbert et al. (2006); Coad, (2009); Wiklund, Patzelt and Shepherd (2009); Leitch, Hill and Neergaard (2009) and McKelvie and Wiklund (2010)). Amid calls for firm growth research to have more variety in its approaches (Leitch, Hill and Neergaard, 2009), an alternative stream of literature focusing on high-growth firms (HGFs) has emerged, with its own particular methodologies and findings.

Henrekson and Johansson (2009) brought attention to the growing literature on HGFs with their influential survey on the findings relating to HGFs. Since then, however, the area has continued to grow. Some of the earlier wisdom on HGFs has been either corroborated, or cast into doubt, or else remains in need of further investigation. Our aim is to focus on the recent literature since Henrekson and Johansson (2009) and to critically re-examine the research field. We therefore discuss the characteristics and determinants of high-growth firms, and consider the possible strategies they may apply to reach high-growth. We also discuss the persistence of high-growth episodes, and the possible policy implications. Overall, we address the following research question:

What can be learned from the recent literature on the characteristics and determinants of High Growth Firms?

To answer this question, we will examine recent findings in the literature, which are scattered across many different journals, and try to digest them in order to present a coherent picture. If the available evidence is conflicting, we aim to highlight these tensions and to suggest how future research might be able to reconcile existing evidence to provide a better understanding of the characteristics and determinants of high growth firms. In Section 1, we provide an overview of the research field. Section 2

discusses our theoretical background, which contrasts random-walk models of growth with the Strategic Entrepreneurship perspective, which suggests that firms may possess resources and capabilities that might lead them to have sustained superior (growth) performance. Section 3 presents some stylized facts relating to HGFs. However, there are still many controversies affecting HGF research, and these are listed and discussed in Section 4. Section 5 discusses tentative findings that will need further corroboration before they can attain ‘Stylized Fact’ status. Section 6 summarizes the key findings, identifies some limitations of HGF research, suggests some avenues for further progress, and concludes.

1.1 General overview

Figure 1 shows how interest in HGFs has grown in recent years. The interest starts picking up in the 1980’s and it has continued to growth until date. The graph shows data until 2008, but we conjecture that interest in HGFs has continued to grow since then.

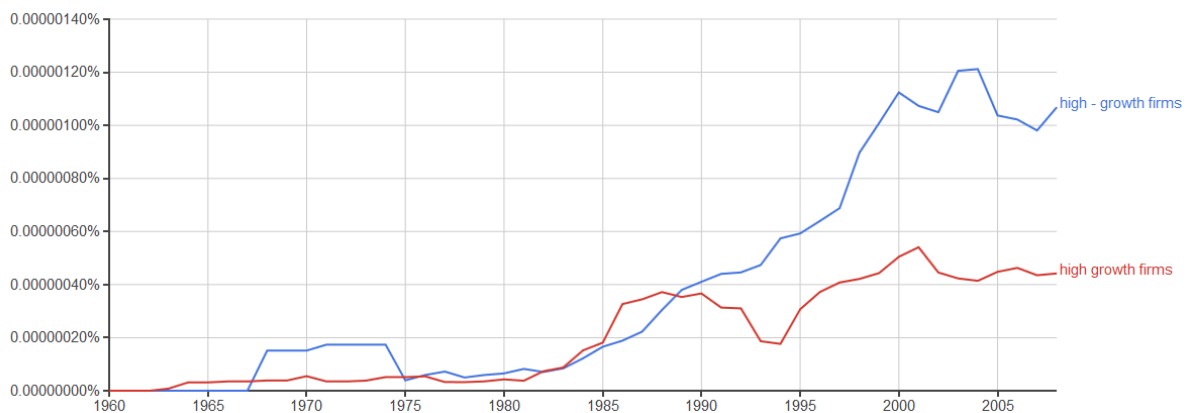


Figure 1: Google Ngrams statistics of publications on High Growth Firms (spelt in two different ways, either hyphenated or not, according to popular usage). Accessed: 10/09/14

High Growth Firms or “Gazelles” can be considered a rare economic phenomenon found across all sectors experiencing above-average growth. This type of firms represents a small minority, yet they account for a disproportionate amount of jobs in the economy. The interest on small firms was sparked by David Birch (1979) who claimed that small businesses were responsible for a large portion of job creation in the US. His findings were highly criticized a decade later. Brown et al. (1990) criticized Birch’s definition of

business size, and Davis et al. (1996) criticized Birch on his methods and conclusion. Their empirical evidence did not find any strong relationship between net job growth rates and size within the manufacturing sector during the period 1972-1988. More recently, Haltiwanger et al. (2013) observed that it was age, rather than size, that was associated with job creation: "our main finding is that once we control for firm age there is no systematic relationship between firm size and growth." (Haltiwanger et al., 2013, p347; see also similar results in Lawless 2014). Nevertheless, Birch's dataset allowed researchers for the first time to examine the business dynamics in the US, and furthermore it was the trigger of this research field (Acs et al. 2008). Even though Birch's findings have been disputed in subsequent analysis, they remain influential in policy circles. Neumark et al. (2011, p16) write that:

"Birch's work appears to have had a lasting effect on U.S. policy. For example, the SBA has an Office of Advocacy (for small businesses) that still trumpets Birch's findings in trying to help small businesses with regard to regulatory constraints, taxation, and other matters."

Birch (1994) also devised the term "gazelle". He observed they were innovative firms of all sizes with a high growth rate; the real cause for creating most of the jobs in the US (Acs et al. 2008). In 2009, NESTA published a significant report called "The Vital 6 per cent" showing that half of the employment generated in the UK between the period of 2002 and 2008 was made by 6 per cent of the highest growing businesses. According to the report, the UK has one of the largest shares of HGFs compared to other countries. HGFs can be found across in every region of the UK generating spillovers in their local economies. Gazelles were also found across sectors in relatively equal proportions, if at all overrepresented in services with the phenomenon repeating in recession times. The report also claims that innovation is one of the drivers of firm growth, with innovative firms growing twice as fast as companies that do not innovate (NESTA, 2009). The NESTA report urges the government to create policies that encourage these types of economic "super-heroes". The evidence shown in this report is reassuring, especially for economies going through recession.

Henreksson and Johansson (2009) also constitutes an influential paper in the HGF literature. They reviewed empirical evidence on High Growth Firms as job creators, the

analysis was based on the findings of 20 studies since the 1990's, and despite the heterogeneity of each study, similar findings emerged. All the studies showed that HGFs generated most of the jobs in the economy; they tend to be younger than non-HGFs and of all sizes, and they also tend to be in all sectors (Henreksson and Johansson, 2009). The empirical evidence also seems to suggest that HGFs are more likely to employ the young, less educated, immigrants and long-term unemployed individuals (Coad et al. 2014b). These findings are attractive to politicians and policy makers who see high-growth firms as job creators, innovators, and economic players capable of making a change in the economy and hence a possible escape from the current economic recession; one of the biggest recessions in decades. Moreover there is much interest in Europe, where unemployment levels among the young workforce have hit record numbers during the current recession. Interest in HGFs has influenced the Europe 2020 strategy: the European Commission is looking to focus their attention into the fast-growing small and medium-sized enterprises (SMEs) under one of the EU seventh framework programmes for research and technological development. HGFs are also drivers of industry growth in the industries where they are found. Evidence from across 43 industries in the Netherlands over a period of 12 years shows that the presence of HGFs influenced the growth of the industry (Bos and Stam, 2014)., However, HGFs do not remain for long in the HGF category: a firm that is considered high growth in one period is unlikely to be classified high growth in the next period (Hölzl, 2014, Parker et al., 2010; Daunfeldt and Halvarsson, 2014), making them possibly unsuitable for the role of policymaker's champion. This is, however, why researchers are hesitant that high growth firms could become the new politician's obsession, bearing in mind their ideological enthusiasm for small firms (Nightingale and Coad, 2014). It is important to understand this economic phenomenon of HGFs, to help policy-makers make informed decisions about them. As this piece of work will point out, there has been a lot of work in the characteristics of high growth firms, whether they are dependent on size (Huber et al., 2013), on age (Haltiwanger et al., (2013), or the type of industry (Mason and Brown, 2012; Bos and Stam, 2014; Bravo-Biosca, 2010) but there has not been a lot of research on the modes of growth that HGFs apply, and if their growth is sustainable.

Policies Fostering HGFs

Shane (2009) criticized policy makers for encouraging the creation of new start-ups with the hope of transforming stagnated economies as “the typical start-up is not innovative, creates few jobs, and generates little wealth” (Shane 2009, p141), but goes hand in hand with the common belief among politicians that any start-up company is beneficial for growth in the economy. In fact, most of the start-up firms do not survive over 3 years (Shane, 2009; Coad et al., 2013). Instead, Shane suggests politicians should focus in the small group of firms with growth potential by reallocating resources to programmes supporting high growth firms. However, it is difficult to ignore that so far, one of the stylized facts in the high growth firm literature is the inability to predict their growth episodes (Coad et al. 2014a). So, the question remains about how these policies could easily identify HGFs, if the findings on HGFs are so diverse and their growth can be inconsistent. Shane does not go into detail on specific policies but he suggests that the source of financing could be able to identify potential HGFs and as such the state should act as a venture capitalist, since the US companies funded by venture capital make an enormous economic contribution and their employment concentration is dense. But even the source of financing does not ensure that the firm will grow into a HGF and more importantly that the high growth event will be repeated over time. The evidence presented by Parker et al. (2010) shows that “those HGFs which continue to grow rapidly are those which are least likely to sell shares to others, including members of the workforce, directors and venture capitalists” (Parker et al. 2010, p. 224), which is problematic for Shane’s (2009) recommendations that policy should identify HGFs and sustain their continued growth.

Mason and Brown (2011) also provide details of appropriate policies to foster and develop HGFs. They suggest supporting the creation of start-ups in all areas, not exclusively in the technology sector (although generic support for all startups should be reduced); nevertheless one of the main impediments as mentioned before is the inability to predict HGFs, which the paper also recognises as a challenge. In this case, it is suggested to look for companies with the desire to grow internationally, but there is no clear approach to segmenting prospective HGFs or to the timing for offering assistance. In any case, appropriate policies are context specific and hence geographically

dependent, and any policy should be custom made according to the necessities of the local economy (Mason & Brown 2011). Huber et al. (2014) also coincided that policies should take into account structural implications to encourage growth of HGFs. Their findings favour policies aiming at increasing entry size which would increase the share of fast growers (Huber et al. 2013).

2 Theoretical Background

This section examines two groups of theories that try to explain the persistence behaviour of sustained superior performance in firms and survival. Firstly, from the strategic management point of view, where sustained superior performance is due to dynamic strategic choices within the firm. Secondly, the firm's performance as a random process - within the random process explanation we will revisit Gibrat's law and Gambler's Ruin theory.

2.1 Strategic Entrepreneurship and Strategic Management

In the literature of strategic entrepreneurship, the firm's output will rely on the owner's behaviour, which is determined by their knowledge and skills and ability to access key resources. Indeed, entrepreneurs can draw on their human capital, which will take a number of forms - formal education, industry experience, prior business experience, managerial experience, and so on. It may be reasonable to expect that human capital, combined with entrepreneur-specific capabilities and resources as well as heterogeneous abilities for opportunity-recognition, will allow some entrepreneurs to enter profitable niches and enjoy sustained superior performance compared to others. The strategic entrepreneurship approach therefore suggests that some entrepreneurs will derive sustained competitive advantage from their resources and capabilities (Ireland et al, 2003).

In other words, if the entrepreneur fails to identify the best possible opportunity and/or fails to take advantage of such opportunity, then the firm will be unable to create a competitive advantage that will improve performance. HGFs, then can be seen as skilled firms able to identify entrepreneurial opportunities to create a competitive advantage, but they seem to fail at maintaining that competitive advantage through time.

2.2 Random Walk models

Another branch of the literature explaining firm growth performance is based on random processes rather than on greater managerial strategies, in response to the

mounting empirical evidence that firm growth rates are erratic and difficult to predict. Persistent growth is therefore a product of random events – because even random processes can produce cases of sustained above-average performance over time. The paper of Henderson et al. (2012) refers to the random process in sustained growth. The patterns that (perhaps mistakenly) are identified in stochastic methods are confused and used to fit a specific theory of convenience. In the case of sustained growth, even if sustained growth is repeated, one should not rule out that it might have happened by chance. As the authors noted: “Unless we know what randomness might produce in a large population of firms, our ability to understand systematic drivers of sustained superior performance is limited” (Henderson et al., 2012, p389). They model growth using Markov chains, which entails that future and past states depend on the present state, but where growth is random. The states are defined as performance percentiles to capture random changes across time. Their further assumptions are that transition probability stays constant over time with firms being homogeneous in their resources and change happening after a year. The model used showed a higher-than expected number of sustained superior performers, which suggested that sustained high performance among the cohort was not totally random and some of the sustained persistence can be due to the heterogeneity of resources that firms are given in the earlier stages of the firm (Henderson et al., 2012).

Denrell (2004), on the other hand, examines persistent resource heterogeneity. Simple random process of resource accumulation can explain sustained inter-firm profitability differences. One of the explanations for the resource diversity takes on heterogeneity in initial stock of resources and how that heterogeneity is maintained. A second explanation assumes similar allocation of stock among firms but heterogeneity on initial flow of resources due to certain firms’ advantages to better accumulate and develop resources. A third explanation assumes homogeneity in stocks but the accumulation of resources is meant to be path dependent, such that only small random events will cause heterogeneity of resources. The first two explanations would make the same firms perform the same way if the process is run again whereas the last one wouldn’t, as the differences are caused by random events. Furthermore, Denrell (2004) proposes a fourth explanation where there is also heterogeneity in stock but resource stocks can be modelled as the result of several independent random events, where the expected flow

of stock is not dependent on existing stock of resources. The Cournot model was used to track random walks, the results on persistent superior performance cannot all be explained by systematic differences *ex-ante*, yet it can be used to explain part of this (Denrell, 2004). Both papers assume homogeneity in firms' resources, which seems too optimistic, where in reality; firms are most likely to have differences in their resources *ex ante*, and these resources might indeed provide a sustained advantage for the improved performance of the firm.

For Gibrat (1931), growth rate is not linked to the firm size distribution. Gibrat's law states that firm growth rate is independent of the size at the beginning of the period tested, and the difference are just due to shocks in the system, and therefore the growth in firms is a random process, not depending on firm size or having any correlation over time. However, most of the empirical studies tend to reject the law, especially for smaller firms (because among samples of smaller firms, there is a negative relationship between size and expected growth), but the law seems to hold for bigger firms (You, 1995; Caves, 1998; Daunfeldt and Halvarsson, 2014). Nevertheless, the law is a good approximation of the firm growth rates distribution, indicating that growth in HGFs is mostly random.

One of the recent ways to explain randomness in the firm growth rate is based on Gambler's ruin theory, as described in Coad et al. (2013), where a combination of random growth in function of size and survival are taken into account. Firms are like gamblers playing around a table, each of them stocked with individual resources at the start of the game and the outcome of the game (growth of resource stock) is purely random. Players (firms) cannot learn how to actually win the game, since it is a game of chance. When using the framework, the results do confirm that growth paths measured over 4 growth periods are close to a random walk. As the authors suggested perhaps, there is one point, when firms get experience, that they have more control of their performance.

Overall, both theoretical branches (Strategic Entrepreneurship and Random Walk models) complement each other and a combination of both should help to understand how HGFs might come about and how they will or will not sustain their high growth. Growth rates are likely to be hard to predict, but firms may be able to spot growth

opportunities and build on them where possible; resources therefore may play a role for high growth.

3 Stylized Facts About HGFs

Despite the various definitions and the use of different growth indicators of HGFs, the findings in the literature conclude that high-growth firms are job creators, generally young firms, found across all industries but they also show signs of low persistence. The following section will discuss these findings and what low persistence would mean to policy makers who are eager to implement HGF policies.

3.1 Small Numbers of High-Growth Firms are Job Creators

The literature on high-growth firms has shown that the distribution of firm growth rates is heavy-tailed and it represents a Laplace shaped distribution (a.k.a. the symmetric exponential distribution) on log-log axes. Bottazzi and Secchi (2006) confirmed earlier studies by finding supporting evidence of the tent shape of firm growth distribution in the manufacturing sector in Italy. Coad (2010) also observes the characteristic shape in the manufacturing sector in France. Bottazzi et al. (2011) observe that the tent-shape is observed to have fatter tails than expected, in the case of French manufacturing firms.

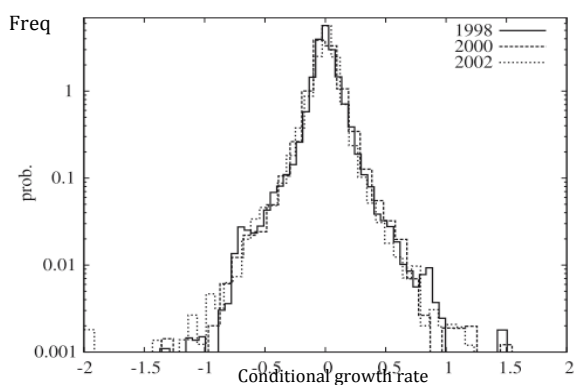


Figure 2 – Distribution of sales growth rates of the French manufacturing firms. Note the logarithmic scale on the y-axis. Source: Bottazzi et al. (2011).

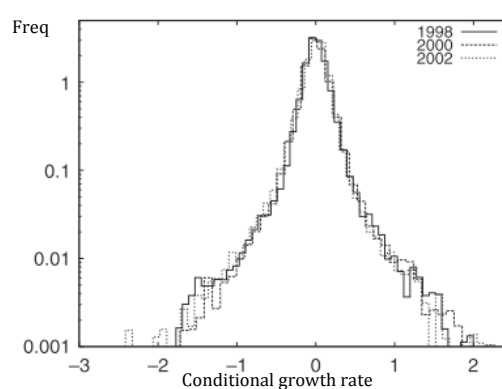


Figure 3 – Distribution of employment growth rates of the French manufacturing firms. Note the logarithmic scale on the y-axis. Source: Coad (2007).

Because of this distribution, only a small group of firms experience very high growth, and create a disproportionately large percentage of new jobs in the economy. This is one of the facts with broader support in the research field. The papers have studies sampling firm populations from different countries such as the UK, USA, Canada, Sweden, and Finland among others during different time frames. Independently of the definition used, most of the empirical evidence coincides with this result. In recent work, Daunfeldt et al. (2012) found that about 6% of all firms during 2005-2008 in Sweden generated about 42% of the jobs. In Finland, 4.6% of high-growth firms created 90% of all net jobs during 2003-2006 (Deschryvere, 2008). In the UK, 6% of all firms generated 49% of all new jobs during the period 2002-2008 (Nesta, 2009). Furthermore, earlier studies also show the same conclusion, Henrekson and Johansson (2010) summarised the literature of HGFs by analysing 20 studies on high-growth firms. The papers analyzed covered a long period, from 1977 to 2006. The studies focused on several countries, used various definitions of HGFs, and measured employment growth in different ways. . Nevertheless, most of the studies supported the proposition that HGFs generate a large share of all new jobs, and that this is especially noticeable in recessions where HGFs will also be present. However, the paper also highlights four studies, where organic growth is separated from acquired growth (since the datasets used in most papers do not distinguish between organic growth and acquisitions). Three of those papers studying Swedish HGFs, like Davidsson and Delmar (2006), found that HGFs had a modest job contribution to the Swedish economy during the period 1987-1996. The other two papers used similar data - see Henrekson & Johansson (2009) for detailed survey. The authors attribute the modest correlation to one of the most severe recessions in Sweden during the period the firms were studied, however, even in the last year when the economy was recovering, they found HGFs to be modest jobs contributors. One additional observation is that the firms studied in Davidsson and Delmar (2006) were required to have a minimum of 20 employees, but as noted in a later study by Daunfeldt and Halvarsson (2014), 95% of surviving firms in Sweden had less than 10 employees at the beginning of the period during 2005-2008. It would be interesting to see the percentage of surviving firms during 1987-1996 with more than 20 employees as if there is anything to go by, like for the period 2005-2008, a large majority of surviving firms would have been excluded, ignoring a large part of the business dynamics.

Table 1 summarizes previous findings on HGFs, and also indicates the multiplicity of definitions used for HGFs.

3.2 Sectors for HGFs

The empirical evidence shows that HGFs are represented in all sectors and not over-represented in the technology sector, as many believe. Actually, some studies have found HGFs to be overrepresented in services, as the findings of Henrekson and Johansson (2010) show. For example, Acs et al. (2008) also shows that HGFs were represented in every single sector with manufacturing doing as well as sectors such as finance, insurance, real estate, transportations and services in general, but firms appear to be declining over time, which make the swiftly growing industries, led by HGFs, also shift over time. Similar results are found for the UK, where 4 and 10 per cent in each industry in the UK were high-growth firms during the period of 2002-2005 and 2005-2008 (Anyadike-Danes, 2009). The results are also similar for other countries within the OECD (Schreyer, 2000). Most recently, Daunfeldt et al. (2014) find that irrespective of the HGF definition used; knowledge intensive firms are overrepresented among HGFs instead of in the expected high-technology sector, thus indicating a clear importance of human capital to stimulate HGFs. Given the findings, there is still the popular belief among politicians that high-tech sectors are the most likely to produce HGFs (see box 1). Policies therefore should be wary of targeting selected industries.

Box 1: On the popular belief that HGFs come from high-tech sectors

Entrepreneurship scholars often imply that true entrepreneurship is about high-growth firms, and that true entrepreneurship also involves innovation. Dennis (2011, p99), for example, defines entrepreneurship in terms of being innovative - "entrepreneurship, by definition, is innovative." Furthermore, Henreksson (2005: p439) and Reynolds et al. (2005 p223) define entrepreneurship in terms of subjective growth ambitions. Bottazzi and Da Rin (2002, p235) and Avnimelech and Teubal (2006; p1477) confine 'start-ups' to high-tech industries. Indeed, the ideal-type or template for an entrepreneurial firm is to be innovative, more likely to be found in high-tech sectors, and also to experience fast growth. Audretsch (2007, p65) writes that "entrepreneurship is the missing link between investments in new knowledge and economic growth."

Policy makers, for their part, are interested in HGFs from a job-creation perspective, and also in investing in high-tech sectors – for a number of reasons, such as capability development as well as a possible job 'multiplier' effect (whereby new high-tech jobs might lead to other jobs being created elsewhere in the economy, e.g. providing services for new high-tech workers; see Moretti 2010, and Moretti and Thulin, 2012). Putting the two together, high tech HGFs would be especially valuable. Even more exciting and dynamic would be the subset of innovative HGFs that are young - referred to as young leading innovative firms, or 'Yollies', by Veugelers and Cincera (2010), which would include the young large high-tech firms such as Microsoft, Apple, Google, Skype, Facebook, Genentech, etc. These latter firms have made an enormous contribution to economic growth, productivity growth and job creation.

Despite the huge interest in high tech HGFs, it is nevertheless surprising that HGFs are not over-represented in high-tech sectors. Henreksson and Johansson (2010) survey the available literature on HGFs and observe that HGFs are not over-represented in high tech sectors. Mason and Brown (2012) focus on high tech HGFs in Scotland, and explain (see their page 2): "A key assumption amongst policy-makers is that high-growth firms (HGFs) are dominated by TBFs. [Technology Based Firms] ... The reality is that the representation of technology based firms in the population of HGFs is on a par with their proportion in the economy – and some studies suggest that they may even be under-represented." Daunfeldt et al. (2014) observe that Swedish HGFs are actually less frequent in sectors that have high levels of R&D investment; they did not find any link between investment in R&D and the process of high growth.

If one assumes that firm growth is driven by some sort of superior firm-level capability, according to which 'better' firms will enjoy faster growth, then it is natural to think that high-growth firms will also be high-tech, or more innovative, or at the very least, to have better routines and capabilities than their slower-growth counterparts. The reality of firm growth suggests, however, that firm growth is well approximated by a random process, such that innovation has only a limited effect on firm growth. In reality, high-growth firms are found in all sectors, and not especially in high tech sectors. In our view, it would be better to consider high-growth firms and high-tech firms as being conceptually distinct.

3.3 Age of HGFs

Another robust fact of High-growth firms is the average age of HGFs. Studies looking into the characteristics of HGFs have found that the average age of HGF is younger on average than non-HGFs, and there seem to be an inverse relationship between age and high growth. Recent work (Haltiwanger et al., 2013) has looked at the relationship that size and age have on growth rate in the firms in the US. Their result showed that age and not size was the most important determinant for the firm's growth dynamic. When young firms survived, they showed higher rates of gross job creation, but also destruction due to the big dynamic of job creation and destruction that exist among young firms; but they also found that large firms over 10 years old accounted for almost 40% of job creation and destruction in the US. These findings would agree with previous findings in earlier papers (Henrekson and Johansson, 2010), where HGFs were noticeably younger than non-HGFs in different time periods, countries, etc. An earlier study on US firms showed that the average age for HGFs in the US population studied was relatively old: "The average age of a high-impact firm is around 25 years old." (Acs et al. 2008, p1).¹ But it seems that the average age of HGF in other countries is a lot younger, Schreyer (2000) showed this for Canada, Spain, Germany, the Netherlands and Sweden where the average age of firms experiencing high growth is less than nine years. Growth rates tend to have a negative dependence with growth age (Haltiwanger et al., 2013; Lawless 2014).

3.4 Low Persistence of HGFs

Most of the studies in the literature look at HGFs from a static analysis point of view (Coad et al. 2014a), but can HGFs repeat their performance in the following periods? The evidence found is not reassuring and this should raise alarm bells to policy makers, before formulating any kind of policy targeting HGFs. If they can't sustain their growth and they only generate jobs at the short term, should policy makers focus their attention on HGFs? Or should they accept that they are the results of the general economic dynamics? Persistence then has a lot of weight in the field and should be looked at

¹ However, given that age distributions are skewed and approximately exponentially distributed, even if the mean is 25 years, the mode may be much lower. (In this case, we would prefer to see the mode and median age.) Furthermore, considering that many datasets under-represent young firms (especially short-lived young firms), then this sample selection bias may also boost the average age of HGFs upwards.

carefully to determine if high growth episodes repeat or if the episodes are random. For this reason, Coad et al. (2014a) suggest that ‘these studies are of little relevance if firm growth is random’ and the growth event is not repeated in the next period. Even if superior performance is sustained for a number of periods, it is not guaranteed that this is not the result of randomness, sometimes it is easy to misidentify patterns in random data (Henderson et al., 2012).

In a recent study by Daunfeldt and Halvarsson (2014) on Swedish HGFs during 1998-2008, they found that firms that experienced high employment growth in one period were not persistent over time, on the contrary, they would have suffered job losses in the previous period, and very unlikely to repeat their high growth performance in coming periods. The reverse effect was also found in firms experiencing great job losses; those firms were relatively likely to become HGFs in the next period. Daunfeldt and Halvarsson (2014) therefore apply the phrase “one-hit wonders” because HGFs appear unlikely to repeat their high-growth performance across time. Daunfeldt et al. (2013) found that irrespective of growth indicator, HGFs showed a low degree of growth persistence when growth was measured in relative terms. However, when measured in absolute terms, HGFs had a higher probability of remaining HGFs in the coming period. Hölzl (2014) also showed that persistence depended on the choice of growth measurement (i.e., the Eurostat-OECD definition or the Birch Index definition). When the Eurostat-OECD definition was used, HGFs were not able to replicate their high growth event (i.e. what Daunfeldt and Halvarsson would call “one hit wonders”); whereas the HBF (HGFs measured according to the Birch Index, which gives emphasis to larger firms whose relative growth rates correspond to larger *absolute* growth increments) were more likely to display persistence. An earlier study from Coad (2007) using quantile regression also found robust results that showed that firms that grow a large amount in one period will be unlikely to repeat such growth, although larger firms have a smoother growth experience. So, what about the rare firms that do persist? Will they exhibit any vital characteristics that non-persistent firms have? Bottazzi et al. (2014) goes a step beyond looking at key firm characteristics such as productivity, profitability and financial status in persistent high growth in Italy, Spain and France, but they do not find any relationship between these characteristics and persistence, consistent with the idea of firm growth being random. Nevertheless, as seen in theoretical models, sustained

profitability can be the result of a random resource accumulation process (Denrell, 2004).

One of the possible explanations for the low persistence of growth in HGFs is that growth is best modeled as a random process, but survival of firms will also depend on the resources available at the time (Coad et al., 2013). Even when looking into the strategic management theory to understand the relationship between management and firm growth performance, Parker et al. (2010) found little signs of persistence; they followed HGFs over two periods, 1992–1996 and 1996–2001. HGFs had a difficult time sustaining their growth, firms who performed well in one period were unlikely to repeat the high growth in the following period, and arguments based on a ‘best-practice’ logic did not hold, the management practices that encouraged high growth in 1992-1996 did not do so for 1996-2001.

High growth in firms might be perceived to be random since no apparent patterns are identified; however, the lack of growth persistence could be further linked to non-linear behaviours within firms at different periods, which can be seen as different development stages of the firm: organizations tend to go through periods of equilibrium followed by periods of extensive changes in a manner resembling ‘punctuated equilibrium’ models (Wales, Monsen & McKelvie, 2011). This erratic growth path could help explain why periods of growth occur in a non-linear way, are difficult to explain, and are therefore dismissed as ‘random’ even if there is some underlying structure in growth rates that remains elusive and undetected.

So, if there is no clear tendency of firm persistence, could they be predicted? The most likely assumption is that HGFs cannot be predicted *ex ante*. Hölzl (2009) confirms this unpredictability property of HGFs with data from 16 countries. This would make it even harder for policy makers to design policies to encourage HGFs. In addition to the low persistence in HGFs, empirical work has also found that some HGFs underperform once the high growth episode has occurred. Acs et al. (2008) explored this issue for HGFs in the US with most firms exhibiting no change or decline after experiencing high growth, and only a very small percentage of firms showing constant growth.

Prior to the growth episode, HGFs were not identified since most of them did not experience any growth and some were experiencing decline. This finding of high growth followed by high decline, together with the low persistence of HGFs, is worrying to any policy maker who wants to design policies for high-growth firms with a view to their longer-term job creation. It also shows the dynamism of the firm, as the more firms enter the market the more dynamic the job market will also become.

4 Controversies in the field

Because of the heterogeneity of growth and the characteristics of the firm, there are a number of controversies in the field that require attention from researchers. This makes it harder for researchers and policy makers to reach definite conclusions on the role of HGFs for the economy. The following section will discuss some of the controversies of HGFs.

4.1 Definition of High-Growth-Firms

One of the main controversies in the field of HGFs is the diversity of definitions used for HGFs and the number of measurements used to identify what a high growth firm is. Previous work (Delmar 2006; Delmar & Davidsson 1998) has recognized four important factors to take into account when evaluating growth. These factors are likely to affect how the firm is identified. Below a brief description on how they can affect how a HGF can be identified.

Indicator of growth: A firm's growth performance can be measured in a number of ways, such as growth of sales, number of employees, productivity, value added, market share, profit, etc (Shepherd and Wiklund, 2009; Davidsson et al., 2009; Delmar et al., 2013). Most of the studies in the literature use either sales and number of employees as growth indicators (Delmar 2006), since they do not seem to affect the results and they are moderately correlated (Coad, 2010). However, other indicators do not seem to have such correlation, for example it has been seen in the literature that there is a weak link between productivity and employment (see e.g. the results in Bianchini et al. 2014). It seems like firms with high growth of employment will have low productivity levels, which implies that HGFs identified using employment and productivity growth will not be the same firms. Daunfeldt et al. (2013) showed that HGFs in terms of employment were not the same as HGFs in terms of productivity, differing considerably in their economic contribution. Employment and sales HGFs have an inverse relationship with productivity growth, which means that they are not as productive. The choice to use a specific indicator of growth should depend on the type of policy that is pursued at that

moment in time, since, “Economic policy promoting fast growth in employment may therefore come at the cost of reduced productivity growth” Daunfeldt et al. (2013:p23). Furthermore, researchers should be aware of the implications each growth indicator involves.

The most common indicators of growth used in the literature are sales and number of employees, since they are less disputed than other indicators and are more readily available (Delmar, 1997; Chandler et al., 2009). Nevertheless, it is important to point out that all the indicators have limitations (Shepherd and Wiklund, 2009): sales, for instance, is susceptible to inflation and currency exchange rates, while employment is not (Delmar et al. 2003). Furthermore, an innovative firm may experience sales growth while introducing a labour-saving process innovation (hence, reducing its employment requirements).

Measurement of growth: Growth can be measured in relative and absolute terms, but selecting the type of measured growth can affect the results of the final model. As Delmar (1997) highlights, relative measure of growth is likely to benefit small firms, given that smaller firms reach remarkable growth in percentage terms, whereas absolute measures are more related to the growth of larger firms (Delmar, 1997: 67). This bias in the sample according to the growth measurement chosen does not seem to be taken into consideration when comparing studies. Delmar et al. (2003) found that firms showed a low degree of growth persistence irrespective of the growth indicator used, the firm’s size had a negative effect on the probability of a firm becoming a HGF when measured in relative terms. On the other hand, the probability of a firm remaining a HGF in the coming period increased when measured in absolute terms, the firm’s size was positively related to the firm becoming a HGF. A recent contribution by Hölzl (2014) tries to reduce this impact by combining absolute and relative growth rate (a.k.a. the Birch index), but his works shows that using this index is not practical for comparing HGFs over time (Hölzl, 2014). It is important for researchers to take into account how measuring HGFs can affect the outcome when comparing results, to make sure they are comparing actual similar results and not a misinterpretation of different facts. Measurement in relative terms or absolute terms should depend on the research

question, however further attention to which one to choose should be a focus, especially when the results can have an effect on policy implications.

Period studied: The length of time used in every study will probably affect the variables in the final model as changes in growth are affected by different periods in time, hence it depends on short and long-term changes, but work on how macroeconomic circumstances affect samples is still missing (Delmar et al. 2003). There is no set length of time to study HGFs, and the measurement period tends to vary from paper to paper. Most common studied time periods are of five or three years, but several other studies use shorter or longer time periods depending on their interest. Furthermore, more often than not, researchers seem unable to provide an explanation for their choice of length. It seems an overlooked point in the field providing further challenges when trying to compare studies.

The modes of growth: This is a key factor, because of how the firm reached its high growth will determine the effect it has on employment. The firm can grow organically or by acquisition. Organic growth is the growth due to internal growth, while acquisitive growth is the growth through external acquisitions or mergers (Delmar et al. 2003). Organic growth is likely to have a greater effect on employment, but distinguishing between the two has proven problematic. If the growth in employment or turnover was due to mergers or acquisitions, Eurostat suggests not to consider the firm to be a high-growth firm (Eurostat 2007). Acquired firms are likely to significantly increase employment, but they would not create additional new jobs. In practice, due to the limitations of datasets on mergers and acquisitions and the inability to distinguish between the two types of growth, most researchers will use total growth, the addition of organic + acquired growth (Coad et al., 2014b). This could add to the problem of including firms in the sample of HGFs, that grow through M&A rather than through organic growth, and hence do not make a 'genuine' contribution to economic growth by creating new jobs that didn't already exist in the acquired firm.

HGF definitions: As mentioned before, HGFs have been measured in several different ways. In the next section, the different set definitions will be further explained to give an overview of their differences. One definition of HGFs is based on a threshold, and

defined HGFs as the x% fastest growing firms during a particular period. Birch and the OECD-Eurostat's definitions are based on growth at a particular pace. Birch's definition of Gazelles in his 1995 work (Birch et al. 1995) focused on firms growing at a specific pace during a specific time period, their paper defined gazelle as a firm achieving a minimum of 20% sales growth each year over a specific period of time, with a base-year revenue of at least \$100,000 (Birch et al. 1995).

The Organization for Economic Cooperation and Development (OECD) and Eurostat developed a definition of HGFs in 2007 based on employment growth. High-growth firms are defined as follows "All enterprises with average annualised growth greater than 20% per annum, over a three year period should be considered as high-growth enterprises. Growth can be measured by the number of employees or by turnover"(Eurostat 2007: p61), furthermore, they define a minimum size threshold of 10 employees to avoid a distorted image due to the growth of small firms. Gazelles were classified as a sub-group of high-growth firm. In addition to the previous definition they should also be less than 5 years, Hence, according to the Eurostat-OECD, gazelles are defined as - "All enterprises **up to 5 years old** with average annualised growth greater than 20% per annum, over a three year period, should be considered as gazelles" (Eurostat 2007, p63, emphasis added). The following formulas are used in the Eurostat (2007) manual to describe how to calculate average annualised growth within the firm:

Measured in employment

$$\sqrt[3]{\frac{Employees(t)}{Employees(t-3)}} - 1 > 0.2 ,$$

Where, $Employees_{t-3} \geq 10$ (Source: Eurostat 2007)

Measured in turnover

$$\sqrt[3]{\frac{Turnover(t)}{Turnover(t-3)}} - 1 > 0.2 \text{ (Source: Eurostat 2007)}$$

If the number of employees falls below the threshold at any given time within year 1 and 2 when measuring turnover, the firm will still be considered as a high-growth enterprise conditional on reaching a total growth of 72.8% or higher between period t-3 and t.

Other authors have used other sets of definitions based on larger growth percentages or shorter or longer periods of time, between a start and end year, or as annualized growth over a specific number of years. Each definition of high-growth firm has its own limitations, for example, when using the definition with the highest growth rate during a particular period, it is not really possible to compare HGFs across time or across countries (Coad et al, 2014a). On the other hand, if using the suggested Eurostat-OECD definition based on the 10+ employees cut-off, many firms would be excluded from the analysis (as Daunfeldt et al. (2012) showed, such a definition would exclude almost 95% of surviving firms in Sweden and about 40% of new private jobs during 2005-2008, which would make it difficult to compare studies across countries). John Haltiwanger and colleagues define high-growth firms as those having annual growth rates above 25%, and with no lower bound on initial size (Decker et al., 2014, p8). Instead of applying a threshold on growth rates, however, Coad et al. (2014b) apply a threshold on the relative growth performance of firms, and measure HGFs as the 1% or the 5% fastest-growing firms in a particular year.

The classification of firms into HGFs and non-HGFs also changes the methodology of firm growth research, because while the standard growth literature estimates “the average effect for the average firm” with firm growth rate as a continuous dependent variable, the HGF literature generally focuses on the binary dependent variable ‘HGF or not.’ Hence, firm growth is no longer measured as a continuous variable (e.g. using OLS regressions) but instead growth performance is measured by comparing HGFs with non-HGFs (e.g. using probit regressions: Lopez-Garcia and Puente, 2012).

As previously mentioned, in an important paper for the HGF literature, Henrekson and Johansson (2009) encountered noticeably different definitions of HGFs when reviewing 20 papers on HGFs, and despite this heterogeneity, important and unambiguous results were found. This is perhaps why some authors would not agree to have a set definition. For Delmar et al., (2003), firm growth is “fundamentally a multidimensional rather than

one-dimensional phenomenon” they used 19 measures of firm growth over a 10-year period, they consider that all high-growth firms grow differently. Considering only one measure of growth would limit the knowledge to one form of organizational growth. This is a complex and crucial issue in the literature of high-growth firms that still requires attention.

Given the number of measures of firm growth and the different number of definitions on HGFs and the complexity of growth study (as highlighted in Table 1), we are also convinced that there could not be only one definition for HGFs, but there should be recognized that different types of HGFs do exist. At the moment, the same definition of HGF is used for firms experiencing “different” types of growth, which selects different types of firms with different results in some cases. Although this will add to the complexity and the heterogeneity of the field, it should also help to untangle the findings and have them more distinct according to the different types of HGFs.

| Study | Country | Period | HGF definition | Measurement of employment growth | Firm type | Result |
|-----------------|-------------|-----------|---|--|--|---|
| Schreyer (2000) | France | 1985-1994 | 10% fastest growing firms in the studied population | Birch(1987) growth indicator as defined as $m = (Et1-Et0) * (Et1/Et0)$, where Et1 and Et0 indicates employment size by the end and the beginning of the employment period | Manufacturing and other industries, not services | HGFs create a disproportionately large amount of jobs among studied firms |
| | Canada | 1990-1996 | 5% fastest growing firms in the studied population | Birch(1987) growth indicator as defined as $m = (Et1-Et0) * (Et1/Et0)$, where Et1 and Et0 indicates employment size by the end and the beginning of the employment period | Manufacturing | HGFs create a disproportionately large amount of jobs among studied firms |
| | Italy | 1990-1995 | 5% fastest growing firms in the studied population | Birch(1987) growth indicator as defined as $m = (Et1-Et0) * (Et1/Et0)$, where Et1 and Et0 indicates employment size by the end and the beginning of the employment period | Manufacturing and services | HGFs create a disproportionately large amount of jobs among studied firms |
| | Netherlands | 1989-1994 | 5% fastest growing firms in the studied population | Birch(1987) growth indicator as defined as $m = (Et1-Et0) * (Et1/Et0)$, where Et1 and Et0 indicates employment size by the end and the beginning of the employment period | Manufacturing | HGFs create a disproportionately large amount of jobs among studied firms |
| | Spain | 1990-1994 | 10% fastest growing firms in the studied population | Birch(1987) growth indicator as defined as $m = (Et1-Et0) * (Et1/Et0)$, where Et1 and Et0 indicates employment size by the end and the beginning of the employment period | Manufacturing and Services | HGFs create a disproportionately large amount of jobs among studied firms |

Table 1. Showing the most used definitions of HGFs in the literature and the findings supporting the evidence of job creators. Adapted from Henrekson and Johansson (2009) and Daumfeldt and Halvarsson (2012)

| Study | Country | Period | HGF definition | Measurement of employment growth | Firm type | Result |
|---------------------------|---------------|------------------------------|--|---|---|---|
| Schreyer (2000) | Germany | 1992-1995 | 10% fastest growing firms in the studied population | Logarithmic average annual rate of growth | Private sector | HGFs create a disproportionately large amount of jobs among studied firms |
| | Sweden | 1987-1996 | 10% fastest growing firms in the studied population | Absolute Employment | Private sector | Modest job creation compared to non-HGFs |
| Littunen and Tohmo (2003) | Finland | 1990-1997 | Doubling sales in real terms over the studied period | Absolute Employment | Metal and business service firms | HGFs created all jobs in firm population studied |
| Acis et al. (2008) | United States | 1994-2006, 3 x 4 year period | Firms doubling sales | Absolute Employment | All sectors | Small minority of the firms creates most of the jobs in the economy |
| Fritsch and Weyh (2006) | Germany | 1984-2002 | Employment Shares of the 1%, 5%, 10% and 25% largest firms in different firms in different cohorts | Absolute Employment | Start-up with more than 1 employee and less than 20 employees | Large portion of job creation in the private sector |
| Halabisky et al. (2006) | Canada | 1985-1999 | Firms growing by more than 50% between 1985 and 1999 | Absolute Employment | All firms | Large proportion of jobs generated in the private sector |

Cont. Table 1. Showing the most used definitions of HGFs in the literature and the findings supporting the evidence of job creators. Adapted from Henrekson and Johansson (2009) and Daunfeldt and Halvarsson (2012)

| Study | Country | Period | HGF definition | Measurement of employment growth | Firm type | Result |
|--------------------------------|-----------------|---|---|--|----------------|--|
| Deschryvere (2008) | Finland | 2003-2006 | Firms with an 20% average growth in Employees over a 3-year period, min 10 employees | Absolute and relative employment | All industries | Small proportion generates more than half of total employment in economy |
| Anyadike-Danes et al. (2009) | UK | Two three year periods: 2002-2005 and 2005-2008 | OECD definition | Total employment | All industries | 6% of surviving firms create a disproportionately large amount of jobs. |
| Stangler (2010) | US | 2007 | Top-performing 1 per cent of firms | Relative Employment | All industries | Gazelles create 40 percent of new job creation |
| López-García and Puente (2012) | Spain | 1996-2003 | Similar to HGF OECD employment definition but with a minimum of 1 employee | “Birch–Schreyer indicator”: (Et1-Et0)*(Et1/Et0), where Et1 and Et0 indicates employment size by the end and the beginning of the employment period | All industries | 7.7% of firms marked as fast-growers account for about 80% of total net job creation among small firms |
| Bos & Stam (2013) | The Netherlands | 1997-2008 | 5- and 10-year-old with at least 20 employees, generating 20 jobs each year. | Total Employment | All industries | An increase in the prevalence of HGFs in an industry appears to have a positive effect on subsequent industry growth |
| Hölzl (2014) | Austria | 1985-2007 | 2 definitions used. OECD definition & Birch Index definition with a 20% annualized growth rate during 3 years | Total Employment | All industries | Most HGFs are not able to replicate their high-growth event |

Cont. Table 1. Showing the most used definitions of HGFs in the literature and the findings supporting the evidence of job creators.

Adapted from Henrekson and Johansson (2009) and Daunfeldt and Halvarsson (2012)

4.2 Size of HGFs

There have been several studies in the literature examining whether high growth depends on an ideal size, but the correlation between size and firm is not completely clear, and recent findings in the area are not robust. In the area of HGFs, David Birch (1979) stated that in the United States, small firms were responsible for a disproportionately high proportion of job creation. Since then, there has been debate about the sturdiness of these results and the validity they have across countries and through time. The size of the firm can be associated with the mode of growth that firms experience, smaller firms are associated with organic growth whereas larger firms grow through acquisitions (McKelvie and Wiklund, 2010), which would favour that smaller firms are likely to experience higher growth. Recent studies show mixed evidence on the size distribution of HGFs. When Schreyer (2000) looked into HGFs in countries like Spain, France, Canada, Italy and the Netherlands, he found that both small and large firms made an important contribution for employment gains in all countries, with the exception of the Dutch firms where the largest job contribution came from large firms, but overall the role of larger firms as job creators was more significant than smaller firms (Schreyer, 2000). In Finland, HGFs started as small firms but high growth medium-sized firms created most jobs (Deschryvere, 2008). For the French manufacturing sector, Coad (2007a) found a negative correlation of annual growth for groups of smaller firms and positive correlation for larger firms. When surveying the literature on size and the relationship to HGFs there is still mixed evidence and plenty of negative evidence on the dependence of growth rates on size across industries, across countries and different periods of time and this should be taken into consideration (Coad, 2007a). Concerning entry, it seems that smaller entrants can have higher failure rates but also higher growth rates (Santarelli and Vivarelli, 2007). But when testing the relationship between size and growth, the results seem less robust than when testing the relationship between age and growth. Haltiwanger et al. (2013) showed in their results some evidence in support of small business as job creators, but even a more robust finding was that when firm age was controlled for, the inverse relationship between net growth rates and size disappeared.

4.2.1 Size and Gibrat's Law

Firm size and growth rate have also been studied in the literature, often investigating the null hypothesis that firm growth is completely independent of size and follows a random walk. This baseline position of random growth corresponds to Robert Gibrat's 'Law of Proportionate Effect' (Gibrat, 1931). Gibrat observed that the size distribution of French manufacturing firms closely resembled a lognormal distribution, which he took as evidence supporting the hypothesis that firm growth followed a random walk (with growth rates being independent of size). This paper will not go into the details of Gibrat's law (see for example Coad, 2009) but it will discuss the huge interest of researchers in testing the law. For Parker et al. (2010), HGFs and Gibrat's law are of interest to three different groups, for scholars in the strategic management field (where randomness in firm growth is not compatible with notions that some businesses consistently perform better than others), for management consultants (who are keen to discover the secrets of sustained superior performance), and to policy makers (given that a small group of HGFs contribute vastly to wealth and job creation). Recent studies have noted the negative relation that size has on growth rate, the findings tend to show smaller firms growing faster than larger firms, with larger firms not following any type of pattern in their growth, hence following the behaviour expected in Gibrat's law. Lotti et al. (2009) suggest that Gibrat's law should not be totally rejected, as the validity of the law improves with time and emerges as a 'long-run regularity', after size and age diminish their significance in the selected population of firms. The enormous amount of evidence suggests that even though the data does not fully support the law, it is a useful approximation for the observed growth rate of firms.

4.3 Innovation and Rapid Growth

We begin by discussing the role of innovation on growth identified in the firm growth literature (Section 4.3.1), before contrasting this to the HGFs literature (Section 4.3.2).

4.3.1 Innovation and Firm Growth

The common belief is that innovation drives HGFs; from the creative destruction Schumpeterian point of view, new innovators are the drivers of economic change

(Schumpeter, 1942). Theoretical work has repeatedly suggested that innovation will be a key driver of firm growth (e.g. Nelson and Winter, 1982). Questionnaire evidence has also ascribed a strong role for innovation on growth: "Executives overwhelmingly say that innovation is what their companies need most for growth." (Carden 2005, page 3, who presents findings from the latest McKinsey Global Survey of Business Executives). Empirical work, however, was slow in reporting the expected benefits of innovation on firm growth, and in some cases no significant effect could be found at all (Coad and Rao, 2008). While the standard empirical approach of focusing on the 'average effect for the average firm' produced disappointing results, nevertheless the application of quantile regressions to the context of innovation and firm growth has found that innovation (measured in terms of R&D or patents) is crucially important for a minority of fast-growth firms located at the upper quantiles of the growth rate distribution (Coad and Rao 2008, Stam and Wennberg 2009, Goedhuys and Sleuwaegen 2009, Hölzl 2009, Falk 2012, Czarnitzki and Delanote, 2013; Mazzucato and Parris, 2015).

However, these findings must be understood alongside the finding that, at the industry level, industries that are high-tech or high-R&D don't have more HGFs (Daunfeldt, Elert and Johansson, 2014). Instead, putting the two together, it appears that although innovation matters for HGFs, they are not more common in innovative sectors. HGFs are more innovative within their sectors, even if their sectors may be relatively low-tech (for example, if Starbucks, Walmart or IKEA engage in innovative activity, they will grow faster than their rivals, even though they are in relatively low-tech sectors). In this view, 'Schumpeterian entrepreneurs' who found high-growth firms are found in all sectors, and there is no reason to suspect that they belong in high-tech sectors only.²

Another finding emerging from the standard literature on firm growth (as opposed to the HGFs literature) is that the choice of growth indicator is particularly important in relation to innovative activity. While successful innovation can be expected to lead to sales growth, it may also lead to employment decline if the innovative firm implements a process innovation that reduces its labour requirements (Coad and Rao, 2011; Harrison et al., 2014).

² We are grateful to Sven-Olov Daunfeldt and Dan Johansson for their thoughts on this point.

Further issues affecting the relationship between innovation and firm growth have also been raised. First, innovation may be measured in many ways. Most of the studies in the literature use either number of patents or R&D activities, or perhaps self-reported estimates of the share of sales that derives from new innovative products. Each of these indicators has its drawbacks, however. While R&D expenditure is fairly stable over time, patent counts are extremely volatile. Furthermore, investment in R&D does not generally translate to successful product or process innovation and not all patents filed by a company are commercialized, and in the case of small firms patents might not be registered. Second, a distinction should be made between product innovation and process innovation (assuming that more datasets providing this information become available). Third, investments in innovation could take a long time (a decade or more) before a firm can translate its successful innovation into sales growth. Until that time, a firm must invest heavily, and bear the risks of failure at many stages along the way. The long time lag between investment in innovative activity and sales growth makes it difficult for the econometrician to detect a statistically significant result in the data.

4.3.2 Innovation & growth of HGF

Innovation seems to be a double-edged sword. Findings such as Parker et al. (2010) show that “gazelles that developed new products for introduction to the market after 1996 were significantly less likely to survive and less likely to be acquired than to be liquidated” (Parker et al. 2010:215) with larger firms avoiding new product development. That might be explained by the internal dynamics of the firm and the external environment, as the firm is growing so rapidly, the firm might employ all their resources on sales generation and develop a market in which it is already familiar. The role of innovation not only differs between HGFs and non-HGFs, but also among HGFs across different countries, the relative technological position of a country plays a role in the amount of investment HGFs place on R&D, firms at the technological frontier will place more emphasis on R&D, whereas HGFs in catch-up countries do not require as big an investment (Hölzl 2009). But, how does innovation influence employment growth? Product innovation and process innovation have different effects on employment growth (Coad 2009). Product innovation tends to have a positive effect on employment

growth as Hölzl & Friesenbichler (2007) found. Niefert (2005) found that the effect on employment of innovation (when measured by patenting activities), is positive but it appeared to happen in the long run around a year after the patenting activity (although firms with patenting activities did not seem to show higher rates of growth, and this relationship diminished over time). The study of Stam and Wennberg (2009) showed that this is likely the case for high growth start-ups in the high tech sector, where R&D plays a considerable role during the early stage of firm creation. Coad and Rao (2011) also looked at innovation (patenting and R&D activities) and employment growth, and found evidence that it does have a positive effect on HGFs. However, process innovation seemed to have a negative effect on employment in Italian manufacturing (Hall et al., 2008) which agrees with previous studies when studying different countries (Hall et al., 2005). This effect of process innovation should be studied more in detail and across sectors; it might be that the jobs affected in one sector might allow jobs to be created in another sector. So, when referring to product innovation and sales growth, overall, innovation will have a positive effect on HGFs, but there are still a lot of gaps in the literature that need to be looked at, for example empirical work should look closer to the relationship between innovation and growth and how it is affected by sectors, this could shed some light into sectoral differences and demands. Studies should expand to look at longer periods of time, especially the role of innovation and chances of persistence. There is a big difference across countries in terms on innovation, so it could be unlikely that the findings and the policy implications on HGFs, for example, in countries closer to the technological frontier are similar to the ones in countries far from the technological frontier. There should be a distinction between the type of firms studied, since all of the above found little influence of innovation and growth for the average firm.

In this sense HGFs with their successful innovation are the newcomers likely to create new industries (Bos and Stam, 2014). This would also imply that innovation should have a positive role for HGFs.

Mason et al. (2009) reports that, “The ability of high-growth firms to outperform others derives in large part from their greater levels of successful innovation”. By innovation they refer to product innovation, process innovation or wider innovation and to further

compliment their view, they found that innovative firms in the UK between 2002-2005 grew twice as fast, both in employment and sales than non-innovative firms.

4.4 Product Diversification and its Effect on High Growth

Product diversification is very much linked with product innovation and growth, yet there is little research done in the area. As mentioned earlier, most findings revealed a positive relationship between product innovation and sales and employment growth especially in HGFs, but for the average firm, innovation does not play an important role for growth. As already highlighted, Hölzl & Friesenbichler (2007) found “that gazelles are indeed more innovative than other firms in terms of innovation success rooted in product diversification. Their share of turnover of products that are new to the market is significantly higher”, however, we also know how uncertain innovation is for firms and how it could affect firms negatively if the innovation fails to succeed. In this respect, the product diversification strategy of HGFs does not seem to favour the persistence of HGFs (Parker et al., 2010). This finding highlights the uncertainty that innovation can bring to the internal dynamics of a firm. Coad and Guenther (2013) found a positive correlation between product diversification and employment growth before the diversification process occurs, but a negative relationship after product diversification, the paper does not look at HGFs specifically and it looks at an industry which is “mature, and perhaps declining”. Further research should look at the link of innovation, product diversification and HGFs more closely, given that both are related, and the effects on the firms are not yet clear.

4.5 Acquisitions and High Growth

The HGF literature has barely explored the role of acquisitions for HGFs. Some authors do not differentiate between internal and acquired growth, or completely ignore acquired growth when analysing high growth. Each type of growth is likely to bring different opportunities to the firm and also different requirements on managers for the firms to perform (Delmar et al. 2003). On one hand, internal growth is associated with higher employment gain than acquired growth is, it is also more associated with small

and younger firms in growing sectors, whereas acquired growth is associated with larger and older firms with slow growth. On the other hand, acquired growth has an important effect on a firm's productivity growth, since jobs are likely to be relocated to more productive uses (Henrekson and Johansson, 2009). Relocating jobs does not represent real job creation. The recent empirical evidence finds a negative relationship between the roles that acquisitions play on growth. For instance, Delmar's et al. (2003) results showed that organic growth is largely associated with small and young firms, while acquisition growth was more common among larger and older firms in inert sectors. This implies the weak relationship between acquisition and high growth. Mohr et al. (2014) did not find that any fast growth firm expanding due to acquisitions. Nevertheless, more empirical research should look at the effects of acquisition in firms, the benefits perhaps could be seen long term and they might not be obvious shortly after an acquisition takes place, since it is a time of readjustment within the newly-formed firm.

5 Tentative Findings

The following section discusses three aspects of HGFs that need further research in the field to better understand these types of firms. They have not received the required attention and they can contribute to better understanding this research field.

5.1 Alliances and Growth

The role that alliances have in high-growth firms is an overlooked subject. Alliances might refer to any two or more businesses or organizations with a short or long relationship that cooperate in mutual activities related to the organization. Alliances are closely related to innovation; a firm is not an isolated entity that will produce an innovation on its own, firms are likely to require external connections such as suppliers, partners, etc. to successfully achieve innovation in new products, services or process within the firm. So far, the empirical evidence suggests alliances to be positively correlated with high growth, especially in the early stages of growth, but the interaction between two firms is complex. It requires 'getting to know' the alliance partner(s), it takes time and resources to understand these interactions and how the HGFs can take advantage of that, but we should also remember that high growth can happen relatively quickly and hence have a lot less time to learn how to make the most out of alliances. Mohr et al. (2013) looked at the role of alliances on high growth in firms in the Cambridge (UK) high-tech sector, and observed a positive correlation between most of the alliances studied and high growth, especially for market-oriented partnerships and technology partnerships. However, venture capital was negative related to high growth but venture capital fostered alliances, which translated subsequently into growth. Parker et al. (2010) also coincided in the negative relation that venture capital had on the persistence of HGFs.

In terms of partnerships, Wynarczyk & Watson (2005) also found a positive correlation between high growth and UK SME subcontractors during the period 1993-1999, firms that invested in supply chain partnerships enjoyed considerably higher growth rates than others. Alliances, therefore, is a broad term and not all alliances will have the same effect on growth. Studies should look at the types of alliances and their effect in high-

growth firms across different sectors and across different countries, to also shed light into the differences of HGFs across countries and how HGFs interact with other firms while growing.

5.2 Internationalization or Exports

R&D or patenting activities are positively associated with high growth in firms as previously noted. In addition, these activities are positively associated with exports as one of the strategies of the firm to increase their size, which highly improves the chances of high growth. Like with any diversification type of strategy, in this case market diversification, there are risks associated with it, since the firm is entering uncertain territories, and resources would need to be relocated to successfully enter new markets. The recent empirical evidence shows a positive relationship between innovation, exporting and high growth, but it will also likely depend on the geographical region of the firm. The case of the Austrian HGFs studied by Hölzl and Friesenbichler (2007) strongly supported export activities to be related to high growth. Product innovation in the previous year is a major determinant of whether the firm will subsequently start exporting. This result is also found for HGFs in the UK, where export activities were the cause of high growth rates and even increased the likelihood of survival (Parker et al., 2010; Mohr et al., 2013). However, there is a significant difference when analysing the role of export activities across countries, with a pronounced importance for HGFs in the most technologically advanced countries in Europe (Hölzl, 2009).

The role of exports in high growth should be paid more attention, especially, the role it has for HGFs in different countries. Generally speaking, it seems to have positive effects on high growth, but it is highly likely to depend on the state of the international market and the resources of the firm to reach markets away from home. From a policy perspective, it would be interesting to consider if reducing the barriers to trade in international markets would encourage high growth in firms.

5.3 High-Growth Firms across Countries

High growth firms can be found across all OECD countries and even though firms show considerable heterogeneity, certain commonalities among them arise (as previously discussed). However, studies have also shown there are clear differences in HGFs across countries, the number of HGFs varies significantly across them with countries such as the UK with one of the highest numbers of HGFs in comparison to the other European countries; but also a lot less in comparison to the number of HGFs in the US (Anyadike-Danes et al. 2009). Evidence from 16 countries displayed differences in their approach to innovation, with R&D activities being more important for HGFs at the technological frontier, whereas HGFs further from the technological frontier were more likely to engage in technology acquisition rather than their own R&D (Hölzl, 2009).

Bravo-Biosca (2010) explores the growth dynamics of the firms between Europe and the US, finding big differences in the number of shares of HGFs across continents with a more dynamic scene in the US and a larger number of HGFs as well. The differences of HGFs across countries should be a central fragment of research, as it can shed further light into the demands of HGFs in specific countries. The reason of such differences across countries, the role of institutions and the barriers of growth present in different countries should be studied.

6 Summary, Limitations and Conclusion

6.1 Summary of Key Findings

This research highlighted the most recent findings on HGFs, which should further help to understand this phenomenon and the implications these recent findings might have in terms of policies and for future research. The heavy tailed ‘tent-shape’ of firm growth rate distributions highlights that most firms do not grow, a small number of firms experience episodes of high growth (Bottazzi and Secchi, 2006). They are interesting for researchers and policy makers because of their ability to create a disproportionate amount of new jobs. Researchers in the field have studied the characteristics and the determinants of this type of firm, but the heterogeneity of definitions and the complexity of firm growth make it challenging for researchers to explain some of the characteristics of these firms. In principle high growth episodes in firms are rare and most unlikely to be repeated.

This chapter has shown that more research should be done to understand the dynamics and the internal characteristics of high-growth firms, about which we know very little. From the literature, there are only four strong characteristics of HGFs supported by empirical evidence. It is clear that a small number of HGFs generate most of the new jobs in developed economies at a certain time, they are found across all sectors of the industry and they tend to be relatively young, those three characteristics give a positive outlook for any policy maker to implement them as drivers of job creators and economic development. However, there is also a fourth consistent fact of high-growth firms that should be of concern for policy makers, which is their low persistence. Most of the evidence suggests that high-growth firms do not tend to persist in their growth, and the possibility of repeating their HGF performance is very low (Daunfeldt and Halvarsson, 2014), with recent findings confirming that growth is mostly a random process (Coad et al., 2011), but in the instances that they do persist, how can we be sure it is not a misinterpretation of randomness? This is a critical point to look into which needs more research; the findings are insignificant if firm growth is random and cannot be predicted. Moreover, this requires attention because HGFs are one of the goals of the European strategy 2020. Our interpretation of the evidence suggests that it is still too

early to be targeting high-growth firms. HGF status might simply be a temporary state, a one off event. HGFs might only be able to solve a job crisis in the short term but as seen, it cannot be sustained in the long term. The findings of low persistence should be ringing alarm bells among policy makers and researchers. The consequences of scaling up HGFs in economies are still unknown, as it seems it would increase volatility in the market, it is likely that a lot more jobs are created but also a lot more jobs are lost in the economy, taking into account that High-Growth is most likely followed by high decline or below-average growth.

One of the most conflicting and discussed issues in the HGF literature is the relationship of growth rate in terms of size. Gibrat's law (1931) established that a firm's growth rate is independent of its size. This issue has been relentlessly explored among researchers, with mixed empirical evidence: most recent studies have shown an inverse relationship between size and growth rate. Although the law is rejected in most studies, nevertheless, most researchers use it as a good approximation. In our opinion, the size is likely to influence the growth of a firm but these studies do not seem to provide an explanation of growth paths in firms.

The findings in the literature showed a positive influence between innovation, alliances, exports and high growth. There seem to be a strong link among them; however, this can also affect the performance of a firm due to the uncertainty of entering a new market. Not a lot of research has been done on these issues, which suggests it would be important to further investigate the role that different strategies have for high growth. Alliances also seem to be positive for sales growth. However, one argument is that alliances are about two or more different firms coming together, and making that collaboration a successful one requires time and skill that could deter the focus on growth.

The differences across countries shown in this work reflect the complexity of the field and the challenges policy makers will have if they plan to target specific firms. Different countries will have different demands to foster HGFs.

There is a big heterogeneity in the field, and more questions than answers about the role of HGFs in the economy and the characteristics of those firms. The field is clear in the advantages of HGFs as job creators and generators of wealth in the economy during a specific period, but can this be sustained and provide long term advantages? Up to a certain point, perhaps, but the levels of uncertainty are still high.

6.2 Limitations when Researching HGFs

One of the challenges of the field is the diversity of growth indicators of HGFs and different definitions available. First, the field of research does not count with a definition of HGFs; which is problematic because using different definitions will bring confusion when trying to compare across sectors, countries and years. One of the more accepted definitions used in recent research is the EUROSTAT-OECD definition of HGFs, one of the main problems with this type of definition is that it requires a minimum number of 10 employees, but in countries like Sweden, this would ignore 95% of surviving firms, which could cause problems when HGFs are compared across countries (Daunfeldt & Halvarsson, 2014). But the heterogeneity of the HGFs presents a challenge to consider one set definition. The heterogeneity of growth indicators in HGFs is also a limiting factor, as some of them (e.g. in the case of productivity growth and employment growth) are not correlated.

Another limitation for the research of this field is the quality of datasets available. Many countries do not have comprehensive datasets with quality data or with new or small firms. New and improved datasets should improve the chances of getting more reliable results. The quality of the database could pose the problem of not being able to rely on past results, and it can also cause a problem when trying to compare HGFs across countries.

The models used to study HGFs are based on ideal conditions, when in reality the business dynamics has a more complex picture. Many times, we can see the theory not matching the results with the data provided. There are external factors affecting the performance of firms to which the researcher might be oblivious. Another methodological limitation is the type of regression used in the studies. The majority of

the papers used linear methods like Ordinary Least Squares (OLS), in which the objective is to identify the average firm behaviour. Only a selected number of papers used other methods like quantile regression, which takes into account the entire distribution of firm growth (Coad 2007; Coad and Rao 2008; Hölzl, 2009; Capasso et al., 2014). This could create a problem when interpreting the result, as the behaviour of HGFs is different than for the average firm.

6.3 Prospects for Future Research

There is plenty to explore in the area of HGFs and their role in the economy. Most research looks at HGFs in one period but not across time. One of the key characteristics in order to determine if HGFs can be targeted by economic policies is to determine or have more of an insight in the persistence of this type of firm, or whether they are indeed just a random phenomenon. Researchers have tirelessly tested Gibrat's law (1931) to evaluate if growth rate is independent on the size, generally finding that smaller firms grow faster, but that growth is largely random and difficult to predict. However, Gibrat's model of random growth doesn't provide any explanation of growth processes, beyond the suggestion that growth is random. However, at the regional level, studies have shown levels of persistence on entrepreneurship, hence it would be important to investigate the persistence of HGFs at the regional level.

Although there is little persistence in the growth rates of single firms, nevertheless it remains to be explored whether there is persistence, across regions, of the relative frequency of HGFs. Indeed, regional economic performance may display persistence in a number of dimensions, such as infrastructure, cultural attitudes, and social institutions, that might lead some regions to consistently have higher HGFs rates than others. Somewhat related are the findings in Fritsch and Wyrwich (2014), who find evidence of region-specific persistence in self-employment rates in Germany even over the very long term (1925-2005).

So far the empirical evidence finds that growth rates are mostly random but randomness cannot fully explain the observed growth rate, strategies within the firms should also help with the high growth in the firm, but little has been done to look into

the role of different internal firm strategies and high growth (no doubt due to data limitations). The link between innovation and HGFs should be expanded, as it seems like it is a double-edged sword for high growth. Innovation is important for high-growth firms, but the type of innovation will have different effects on high growth as seen earlier. Product innovation will have a positive relationship with employment growth, but the case of process innovation is different. Process innovation has a negative relationship with employment growth in a firm, but it will help the firm to become a high productivity firm. This obviously also cries for explanations and further exploration on the different growth indicators in HGFs and their implications, since clearly, the two do not indicate the same.

Other strategies that should be looked at include internationalization of firms and how an export policy within the firm helps growth. Most research found exports closely related to innovation, but is their relationship with growth negligible? Or does it directly influence high growth? Even if the new market fails, the firms still can go back into the local market, but would their growth be affected? Internal strategies seem to be neglected in the literature, only very few studies look at characteristics.

Since HGFs will be implemented in the European Strategy 2020, the differences of HGFs across countries should be properly addressed and investigated. Especially when those differences are also seen across sectors. The interaction of public, private and financial institutions and firms in different countries should be analysed, to identify how they facilitate or not fostering HGFs in different economies. It is a complex subject but one that requires attention. At the moment not all the observations found for HGFS in one country are valid for a different country.

6.4 Conclusion

So, what do we know from the recent literature on the characteristics, determinants and internal strategies of high-growth firms? Within its limitations, this paper has tried to organize the recent literature to get a better picture of what constitutes a HGF and its internal workings.

In a field of research where heterogeneity of the subject brings so many challenges to researchers, there are a number of accepted facts about HGFs; HGFs constitute a very small numbers of firms experiencing above average growth, that minority of firm creates most of the jobs in the developed economies, they are likely to be young and they can be found across all sectors in the industry. However, one of the puzzling aspects of the field is the diversity of definitions HGFs are provided in the different studies which makes it harder to compare different findings in different papers across time, industry, and country. They differ regarding the length of the period studied, their growth measurement, growth indicators which affects the selection of firms, and the results obtained. Therefore, it is necessary to focus the attention on this basic topic that is the definition of HGF and their indicators. This should create a clearer picture of findings.

Research on HGFs has mostly been focused on one time period, but when researchers look at HGFs through time, most of the studies indicate the difficulty they have to keep their high growth with many not growing or even experiencing decline but not many keep that persistent high growth. This characteristic of HGFs can determine the possible policy implication that this type of firm can have. For policy makers, this should be a warning sign not to precipitate their inclusion in different economic programmes with the findings so far. Gibrat's law has been repeatedly used in the field to determine the relationship between growth and size, the law has been mainly rejected, but it offers a good approximation of the industrial approximation nevertheless implying that firm growth is mainly random. However, random growth models are a-theoretical and do not provide any explanation for the growth processes. Therefore, it would be useful to expand this law (e.g. by allowing for firm-specific capabilities as in Le Mens et al., 2011) or test other theories of growth that can provide an explanation for firm growth behaviour.

Innovation and internal strategies also play a positive role in high growth. A successful innovation within the firm can generate high growth, HGFs do tend to be more innovative than non-HGFs, but the role of process innovation in high growth is not as clear. HGFs are more likely to go into international markets, alliances can influence high growth in firms, and so can product diversification. However, we do not know what is

the influence of specific internal strategies in different time periods: if high growth in firms is mostly random, it seems dubious to understand that the same internal strategies will directly influence high growth in all periods. This is an area in the literature that is clearly underdeveloped and many questions arise especially if they can be studied across time.

Does the recent literature say something about determinants? This is one of the major issues with HGFs; the high growth process cannot be determined before the high growth episode happens. Could certain internal strategies of HGFs be a determinant for growth? It is not known yet.

With the intentions of the European Commission to target HGFs in their agenda for 2020, the focus for researchers should be to understand how HGFs come about and how they can, if possible, sustain their growth. But it is expected that HGFs are temporary 'black swans', the consequences of targeting specific firms across different countries seem impractical and unlikely to provide any productive results if there are no clear determinants for HGFs. We therefore conclude that HGFs are unreliable saviours for our current economic difficulties.

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