Economic Dynamism

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Economic Dynamism
Essays on firm entry and firm growth

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Abstract

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The topic of this thesis is economic dynamism. The five articles contribute to the literature on firm entry and firm growth. Studies are based on a dataset covering all Swedish limited liability firms between 1997 and 2010.

The first article investigates conditions for firm entry in Sweden, distinguishing regular entrants from entrants that survive for at least two years, modelling the firm entry decision using count data models. While high income and a well-educated population had a positive effect, the effect was more important for surviving entrants. The second article uses a similar method, but focuses on wholesale industries and distinguishes between regular entry and in-migration of firms, i.e. when an incumbent firm relocates its operations. Access to a university, many educated workers and low local taxes had positive effects. Better access to infrastructure had a strong positive effect on entrants, but it was smaller for in-migrating firms. The third article investigates if the industry context matters for whether Gibrat's law holds, i.e. whether firm growth is independent of firm size. The law is found more likely to be rejected in industries with a high minimum efficient scale and a large number of firms located in metropolitan areas, but more likely to hold in industries with high market concentration and more group ownership. The fourth and fifth article contribute to the high-growth firms (HGFs) literature. In the fourth article it is examined whether the way HGFs are defined matters for the policy implications. It is found that the economic contributions of HGFs differ significantly depending on definition. Young firms are however more likely to be HGFs irrespective of definition. The fifth article considers the frequent argument that policymakers should target high-tech firms, i.e., firms with high R&D intensity, because such firms are thought more likely to become HGFs. We examine this assumption by studying the industry distribution of HGFs. Results indicate that industries with high R&D intensity, ceteris paribus, can be expected to have a lower share of HGFs than can industries with lower R&D intensity. By contrast, we find that HGFs are overrepresented in service industries with a high share of human capital.

Keywords: Entrepreneurship, Innovation, Firm entry, Regional economics, Gibrat's Law, Firm growth, Firm size, Gazelles, High-growth firms, High-impact firms.

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Niklas Elert
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Introductory Chapter

Niklas Elert

1 Introduction

The topic of this thesis is economic dynamism, that process of structural transformation or creative destruction that precedes and accompanies innovation, knowledge evolution and economic growth. Specifically, it addresses two important facets of this dynamism, namely, firm entry and firm growth. The five articles most notably contribute to the literature with respect to their empirical findings and public policy implications. All of the studies are based on a dataset covering all Swedish limited liability firms between 1997 and 2010.

Identifying a common line of argument running through five articles written over several years can be a challenge. Hopefully, this introductory chapter will make the remainder of this thesis read as precisely that – as a thesis, rather than five separate articles – by providing a framework to interpret the individual contributions. While all of the articles discuss relevant theoretical concepts, they are primarily empirically oriented. The next section of the introductory chapter will therefore serve as a more extensive theoretical and empirical background concerning economic dynamism, entrepreneurship, firm entry and firm growth. It expands on some of the concepts that are alluded to in the articles and introduces additional concepts that I deem relevant to better appreciate the content of the thesis. It begins by discussing the importance of entrepreneurship and innovation to economic growth and then proceeds to demonstrate how and why economic dynamism, firm entry and firm growth are important for robust economic development. In addition, it emphasizes the role played by economic institutions and public policy in the creation of a dynamic economy.

Section 3 discusses more specific questions related to the data and methodology employed in the five articles, while each of them is presented extensively in section 4. They will be briefly described below.

The first two articles contribute to the literature on firm entry. In a Schumpeterian view, new firms are vehicles of creative destruction who challenge incumbent firms. The first article (*What Determines Entry? Evidence from Sweden*) examines the determinants of entry in Swedish industries and municipalities while making a distinction between regular entrants and those that survive for at least two years. The second article (*Start-ups and In-migration: Evidence from the Swedish Wholesale Industry*, co-authored with Sven-Olov Daunfeldt and

Niklas Rudholm) poses similar questions but distinguishes regular firm entry from in-migration, i.e., when an incumbent firm transfers it operations from one sector/municipality to another.

However, there is much evidence to suggest that most entrants are essentially failures. This brings questions concerning firm growth to the fore, which serves as the overarching subject of the remaining three chapters of this thesis. The third article (*When is Gibrat's Law a Law?*, co-authored with Sven-Olov Daunfeldt) examines the so-called Gibrat's Law of proportionate effect, which stipulates that firm growth is statistically independent of firm size. The article extends the previous literature by assessing the industry-specific conditions under which the law holds or does not.

If Gibrat's Law holds, the firm growth distribution should be Gaussian. Yet, evidence suggests that this is not the case and the distribution is, in fact, Laplacian shaped, with thicker tails. Notably, substantial interest has been devoted to the right tail of the distribution, where the fast-growing firms reside: a few rapidly growing firms that are assumed to account for the majority of net job creation. Such firms are called High-Growth Firms (HGFs) and are the focus of the fourth and fifth articles of this thesis. The fourth article (*The Economic Contribution of High-growth firms: Do Policy Implications depend on the Choice of Growth Indicator?* co-authored with Sven-Olov Daunfeldt and Dan Johansson) examines the extent to which the way HGFs are defined and measured affects the policy implications that can be drawn from studying them. The fifth article (*Are High-Growth Firms Overrepresented in High-tech Industries?*, co-authored with Sven-Olov Daunfeldt and Dan Johansson) asks whether HGFs are more prevalent in high-tech industries, i.e., industries characterized by a high R&D intensity, and hence whether public policies that target these firms by focusing on such industries rest on a sound foundation.

Section 5 is an attempt to summarize the lessons of this thesis, demonstrating how the findings relate to one another, to theory and to prior empirical evidence. In this section, I also draw some conclusions regarding policy implications and the venues future research on economic dynamism should explore.

2 Background

2.1 Entrepreneurship

The average human being who lived 200 years ago subsisted on the equivalent of less than 2 dollars per day, potentially 3 dollars in the relatively wealthy parts of the globe. Since then, the global population has increased sevenfold, while average income is eleven times higher and more than 30 times higher in a country such as Sweden (Maddison 2010).[1] Average life expectancy at birth has increased from 25 to 70 years (WHO 2014).

This fundamental transformation of human living standards was driven by economic growth. What causes growth? In the words of Robert Lucas (1988:5), "the consequences for human welfare involved in questions like these are simply staggering: once one starts to think about them, it is hard to think about anything else." While the answers remain contested (McCloskey 2010), the view that a country's long-run economic growth depends on its ability to exploit innovations has gained much ground in recent decades (Cohen 2010).

The Austrian economist Joseph Schumpeter identified innovation as the critical dimension of economic change. In Schumpeterian terms, innovation is the creation of new combinations, generally of (old and new) knowledge. Innovation hence promotes the evolution of knowledge (Merton 1993; Braunerhjelm 2011; Johansson 2010). The function of forming these combinations is typically ascribed to the entrepreneur, who Schumpeter and many others saw as the *primus motor* for economic growth (Henrekson and Stenkula 2007:23).

Despite the apparent importance of entrepreneurship for knowledge evolution and economic growth, the concept has typically been ignored or much simplified in mainstream economics (Baumol 1993; Kirchoff 1994; Kirzner 1997; Johansson 2004; Henrekson 2005). Granted, there have been attempts to include entrepreneurship in growth models (Segerstrom et al 1990; Aghion and Howitt 1992; Helpman 1992; Acemoglu et al 2003; Acs et al 2009; Acs et al 2012; Braunerhjelm et al 2010), and a number of recent empirical studies suggest that entrepreneurship is instrumental in developing, exploiting and diffusing knowledge, which in turn positively influences economic growth and job creation (Thurik 1999; Caree and Thurik 1999; Wennekers and Thurik 1999; Audretsch and Thurik 2002; Audretsch et al 2006; Carree et al 2007; Fritsch 2008; Stam et al 2009, 2011; Acs et al 2009; Salgado-Banda 2005: Braunerhjelm et al 2010;

[1] Between 1820 and 2008, global GDP per capita rose from 666 to 7,614 dollars per person per year. In the case of Sweden, it increased from 819 to 24,409 dollars.

Sutter 2009; Koellinger and Thurik 2012; see Van Praag and Verslot 2007 and Vivarelli 2013 for comprehensive surveys).

These studies all face difficulties in defining and measuring entrepreneurship in a manner that captures the wide-ranging and complex functions that entrepreneurs are said to provide outside of mainstream economics (Henrekson 2005; cf Glancey and McQuaid 2000; Swedberg 2000). This is hardly surprising: in many ways, the entrepreneur eludes analytical tractability and formalization, and it was in connection with the growing dominance of the mathematical approach that entrepreneurship was first removed from mainstream economics (Hebert and Link 1982; Barreto 1989). Those who take note of this disappearance generally regard it as deeply problematic (see, e.g., Schumpeter 1942:86; Baumol 1968; Casson 1982; Barreto 1989:141; Hebert and Link 1982; Kirzner 1973:26; Blaug 1986; Machovec 1995; Eliasson 1996:23, 27). In the words of Buchanan (1979:281):

> Increasingly, I have come to the view that the role of entrepreneurship has been the most neglected area of economic inquiry, with significant normative implications for the general understanding of how the whole economy works.

Entrepreneurship is no longer as neglected as it was when those words were written. Yet much remains to be done before it will be successfully incorporated into mainstream economics, if it ever will. At an overarching level, the importance of entrepreneurship and the evolution of knowledge motivates this thesis on economic dynamism, which studies some of the facets of this concept. In the following sections, the relationships among entrepreneurship, entry, growth, and economic dynamism will be discussed in greater detail.

2.1 Entry, Growth, and Entrepreneurship

> The facts are breathtaking. In any given quarter, about one in twenty establishments opens or goes out of business, and one in thirteen jobs begins or ends. (Brown et al 2008:10).

As the above quote concerning the US economy suggests, a market economy is not static, but dynamic. The surface of the lake may be smooth, but strong undercurrents run beneath it. While the total number of firms in operation may vary only slightly over time, the numbers of exits and entries in a market economy in a given month or year are substantial, as many new firms continually replace older ones (e.g., Storey 1994; Davidsson et al 1996). This churning is inherent to the market process. Alfred Marshall (1920: iv.xiii.4-5) likened the

market to a forest, where firms "struggle upwards through the benumbing shade of their older rivals". As the firms grow old and become large, they eventually lose their former vigor and have to give way to "younger and smaller rivals".

As these observations suggest, firm entry and firm growth are important ingredients in the process that Schumpeter (1942) labeled creative destruction. He used this phrase to describe the economic transformation or structural change that accompanies innovation, in which new, growing firms challenge incumbents, who are either destroyed or forced to increase innovation and productivity (Arrow 1962; Christensen 1997; Wennekers and Thurik 1999; Baptista and Preto 2011; Bos and Stam 2014:146).

Are these firms entrepreneurial? Defining entrepreneurship has been called "one of the most difficult and intractable tasks faced by researchers working in the field" (Parker 2004, p 5), and measuring it is even more difficult. It is possible to find no fewer than 13 definitions of entrepreneurship throughout the history of the concept (Wennekers and Thurik 1999; Hébert and Link 1989; 2010). Of these, Schumpeter's definition is the most well-known and the most well used, by theoretical researchers and policy makers alike (Hébert and Link 2006).

In Schumpeter's view, the entrepreneur was an innovator.[2] He regarded the emergence of a new idea or a new combination of ideas as an invention, while he reserved the term innovation for the introduction of a new combination into the economy (1934:14-15), stressing that innovations could take various forms in addition to mere technological improvements. He enumerated five such forms:

> (1) the introduction of a new good — that is one with which consumers are not yet familiar — or of a new quality of a good. (2) The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially. (3) The opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before. (4) The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created. (5) The carrying

[2] Many researchers follow in the same vein. For example, Shane (2012: 17-18) implicitly includes innovation as an essential characteristic of entrepreneurship. Yet Johansson (2010:190) suggests that innovators and entrepreneurs need not be the same individuals, referring to the evolutionary strand of thought called The Swedish Growth School, in which these are regarded as distinct functions that can be performed by different actors (Johansson & Karlson 2002).

> out of the new organization of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position. (1934: 66)

As this enumeration suggests, innovation is a broad and diffuse concept at even the theoretical level. Innovation processes are complex, uncertain, and draw on a wide range of inputs to generate a wide range of direct and indirect outputs (Coad et al 2014b:5). The five categories proposed by Schumpeter intersect and can be combined by firms and entrepreneurs in various ways. The empirical phenomena studied in this thesis map into Schumpeter's five categories, albeit imperfectly.

From a perspective in which knowledge plays a central role, it is natural to regard firm innovation as an experiment or a business hypothesis subject to a market test (Johansson 2010:188).[3] Some researchers therefore expect "a direct relationship between the number of new business experiments (or entrants) and the number of successful cases" (Carreira and Teixeira 2010: 4). There is evidence to suggest that entrepreneurial startups are important links between the creation and commercialization of knowledge, particularly at early stages in which knowledge remains fluid (Braunerhjelm 2008; van Praag and Versloot 2007, 2008). As Baptista and Preto (2011: 421-422) note, new entrepreneurial firms generate knowledge spillovers directly by introducing new knowledge or improving on existing knowledge and indirectly by forcing incumbents to cope with fiercer competition (see also Baptista et al 2008; Baldwin and Gu 2011), although some evidence suggests this is not the case for technological laggards (Aghion et al 2006).

Such firms can also foster competition and the emergence of new sectors (Thurik 1999; Dejardin 2011). New and young firms are more prone to exploit new technologies or knowledge (Jovanovic and Rousseau 2005), and entirely new products are often produced more efficiently in newly established firms, founded for the purpose of producing these very products (Audretsch 1995; Baldwin and Johnson 1999; Blackburn and Kovalainen 2009). Some evidence suggests that new firm formation is beneficial for economic growth (van Stel et al 2005) and employment growth (Hart and Oulton 2001; Thurik 2003), and it is perhaps unsurprising that new firm formation is the most common approach to measuring entrepreneurship in the industrial organization literature (Vivarelli 2013:1456).

However, the relationship between entry and growth is complicated at best (Huber et al 2014). The self-employed are a heterogeneous group of individuals,

[3] See also Polanyi (1951), who likens the scientist's search for truth to the entrepreneur's search for profits.

who are more or less involved in productive entrepreneurial activities (Blanchflower 2000; Earle and Sakova 2000; Vivarelli 2013: 1476). Granted, the creative destruction entailed by new firm formation may be more important in certain sectors (Vivarelli 2013: 1458). The majority of start-ups are however "marginal undersized poor-performance enterprises" with limited growth ambitions and capabilities (Nightingale and Coad 2014), and "most small businesses are best described as permanently small rather than as nascent entrepreneurial firms" (Henrekson and Sanandaji 2014:1760; cf Sanandaji and Leeson 2013).

The large majority of new firms will never become true innovators, something Schumpeter (1934, 1939) himself explicitly acknowledged. Rather, they can be regarded as moving in and out of a revolving door, in effect as a type of "turbulence" (Audretsch and Fritsch 1999; Santarelli and Vivarelli 2002, 2007; Brown et al 2008). Most firms do not grow at all (Davidsson and Delmar 2006:7), and most entrants die young; generally, 50 percent or less survive for more than five years (Geroski 1995; OECD 2003; Bartelsman et al 2005; Delmar and Wennberg 2010). Some firm entries are quite possibly overconfident mistakes (Cabral 1997; Geroski and Mazzucato 2001).

This is not to say that non-innovators are worthless. Baumol (2005, 2010), for example, distinguishes between innovative, or Schumpeterian, entrepreneurs ("superstars") and replicative entrepreneurs, who start firms that are similar to existing businesses (2010:18). Replicators play an important role during the stage of economic development that follows innovation, when a more general adoption and diffusion of new knowledge occurs (Braunerhjelm 2011; see also Baumol et al 2009).

A potentially more important distinction is whether entrepreneurs are driven by opportunity or necessity, i.e., whether one becomes an entrepreneur because one has a good business idea or for other reasons, such as a lack of better means of earning a living (Oxenfeldt 1943; Evans and Leighton 1990; Storey 1991, 1994; Shane 2008; Vivarelli 2013: 1476) or the pursuit of a relaxed lifestyle (Coad 2009:131). Empirical evidence associates increased unemployment with increased entry (Storey and Jones 1987; Santarelli et al 2009), and it appears that unemployed individuals who become self-employed perform worse, create fewer jobs and have a greater propensity to exit than those who come from paid employment (Carrasco 1999; Pfeiffer and Reize 2000; Vivarelli 2013: 1474). In fact, it appears that a positive and linear relationship can only be observed between opportunity entrepreneurship and economic development (Carree et al 2007; Acs 2008; Acs et al 2008a), and even this link remains contested (Vivarelli

2013:1456, see also Acs and Szerb 2010, 2012). Thus, one cannot equate entrepreneurship and entry. In this respect, it becomes puzzling that many entrepreneurship policies in practice seem to do just that (Henrekson and Sanandaji 2014).

How does firm growth relate to entrepreneurship? New fast-growing firms can be considered industrial leaders that are "drawn" from the pool of new economic experiments (Bos and Stam 2014: 148; cf Eliasson 1991; Rosenberg 1992). Empirical studies often implicitly regard mere volume growth (usually in sales or employment) as evidence of prior successful entrepreneurial action (Delmar 2006; Davidsson et al 2010). However, a propensity for innovation generally emerges as a driver of firm growth (Freel 2000; Coad and Rao 2008; Altindag et al 2011; Corsino and Gabriele 2011), and some studies confirm a positive link between innovation and performance (Vivarelli and Audretsch 1998; Colombo and Grilli 2005).

Yet, the self-reinforcing dynamics in the economy may lead to a relatively weak association between entrepreneurial ability to innovate and actual performance, and even if firms are successful at innovation and benefit from it, it is not clear that they will grow (Kirchoff 1994; Geroski et al 1997; Coad and Hölzl 2010; Denrell and Liu 2012; Coad et al 2014b:8). This is perhaps not surprising, as in the face of market competition, firms must overcome a type of Knightian uncertainty regarding the consequences of new inventions and technological regimes (Dosi and Nelson 2010). In recent years, scholars have come to focus on "high impact entrepreneurs", namely, those that exhibit rapid growth (Acs 2008). Yet, as with entry, high growth can at best be regarded as a facet of entrepreneurial action.

Undoubtedly, however, both entry and growth are of relevance for a robust, dynamic economy. The next section is an attempt to further illustrate how.

2.2 Entry, growth and a dynamic economy

In a knowledge-based perspective on the economy, every actor in the market can be described as boundedly rational, i.e., he or she has a limited capacity to analyze and act on information (Simon 1955, 1990; Conlisk 1996, 2001). Knowledge is distributed across a large number of individuals, who consequently diverge in their economic valuations of new ideas (Hayek 1945), and important components of the knowledge they possess are tacit, i.e., impossible to articulate (Polanyi 1967). These features of the market are fundamental sources not only of error and failure but also of entrepreneurial opportunity, provided that the system enables learning and knowledge evolution.

"To err is human", said Seneca, but "to persevere in error is diabolical." Human error is inherent in all private or public endeavors, but what is central is whether one learns from one's failures. Economic journalist Tim Harford (2011) identifies three principles as central to "learning from failure". The first principle stresses the importance of variability. In the market, this occurs when firms are heterogeneous and dispersed throughout the economy and differ with respect to size, age, technology and so forth. As no one can know what firms will be successful a priori, there is a need for a large number of experiments (Winter 1984; Dosi 1988; Dosi et al 1995; Audretsch and Fritsch 2002; Metcalfe 2010; Carreira and Teixeira 2010).

Second, as numerous experiments will inevitably fail, Harford (2011) argues that they be conducted on a scale small enough that errors are survivable for the system as a whole, if not for the individual actor. Thus the need for decentralized decision making and guarding against systemic risks. This emerges in the market because each firm has to select its own strategy, for example regarding whether to exit, continue at the same size, grow or reduce in size (Vivarelli 2013:1465). Firms are constantly searching for new profits by seeking new technology, alternative behaviors and improved organizational structures that will allow them to outcompete their rivals (Eliasson 1996; Dosi and Nelson 2010).[4]

Finally, Harford (2011) stresses the importance of selection, i.e., that successful experiments are pursued and copied while unsuccessful experiments are abandoned. The profit and loss signals conveyed through prices and driven by market competition combine to form one such selection mechanism, however imperfect. It encourages individuals to devote resources to their most high-valued use (Hayek 1945), enabling successful firms to survive and grow, while unsuccessful firms exit. In the face of competition, successful firms survive and thrive, whereas unsuccessful firms eventually decline and exit the market (Dosi and Nelson 2010).

The high exit rates cited above may initially appear to be a tremendous waste of resources, but they are quite possibly a prerequisite for the success of the process described by Harford (2011). Many entries and exits may increase the probability of discovering and selecting industry winners, thereby increasing industry growth (Johansson 2004; Johansson 2010: 195). Similarly, declines and expansions of firms in response to price mechanisms can be considered a fairly reasonable

[4] As Henrekson (2005:441) notes, small entrepreneurial firms can often act as crucial agents of change (Audretsch 1995), and the small business sector can in many ways function as an inexpensive mechanism for identifying and developing entrepreneurial and managerial talent (Lucas 1978).

means of eliminating losers (avoiding type 1 errors) and not failing to identify radically new and profitable innovations (avoiding type 2 errors) (Johansson 2010:191). What we observe is hence a continuous learning process guided by the price mechanism, as Hayek emphasized on numerous occasions (1937; 1945; 1984).

Regardless, the results of all these experiments and mistake-ridden learning may appear chaotic (Dosi 2007). Vivarelli (2013: 1464) notes, "market churning, turbulence, and early failure, (…) emerge as normal and expected features of industrial dynamics". Markets are messy, prone to booms and busts and herd behavior, and as Rosenberg and Steinmueller (2013) argue, much productivity-enhancing technical change is incremental, distributed, and grubby. This is likely unavoidable, but markets also provide mechanisms to create some order amid the chaos. For example, while Schumpeter's entrepreneur moves the market out of equilibrium, Israel Kirzner's (1973) entrepreneur has generally been described as playing an equilibrating role through the pursuit of arbitrage. Kirzner (2009) himself nevertheless argues that the common distinction between Schumpeterian and Kirznerian entrepreneurship is flawed, and that Schumpeterian entrepreneurship is actually one facet of what he labels alertness, i.e., the ability to perceive new economic opportunities that no prior economic actor has yet recognized.

Certainly, being successful in a system characterized by distributed and imperfect knowledge requires skills. However, the type of skills that is required is not entirely obvious. Entrepreneurial talent is unevenly distributed and likely explains some of the differences in size across firms (Lucas 1978; Guiso and Schivardi 2005). It has been demonstrated that education and human capital play important roles in fostering entry, increasing the likelihood of survival and improving post-entry performance (Bates 1990; Gimeno et al 1997; Acs et al 2007; Geroski et al 2010; Arvanitis and Stucki 2012). Whether entrepreneurship is best served by specific rather than general skills nonetheless remains controversial (Vivarelli 2013: 1470). However, firms seem to perform better when they enter the same industry as their parent, suggesting that experience from a similar type of business is important (Andersson and Klepper 2013).

2.3 Gibrat's Law and High-growth firms

In the perspective articulated above, which adheres to the evolutionary view of Marshall (e.g., Alchian 1950; Nelson and Winter 1982; Johansson 2001, 2010)[5],

[5] Sweden has a long history of evolutionary research, dating back to at least the early 20th century, and conducted by, e.g., Wicksell (1898), Åkerman (1939; 1944), and Dahmén (1950). Johansson

the individual firm is considered less important than the characteristics of the environment in which it operates (Metcalfe 2010). One particular property of the market ecology was examined by the French engineer Robert Gibrat (1931). He observed that the size distribution of French manufacturing firms was robustly right skewed. Whereas most firms were small, some firms grew to a substantial size. Based on this observation, Gibrat devised a model of the dynamics of individual firms, predicting that all firms grow at the same proportional rate irrespective of their initial size. In other words, "the probability of a given proportionate change in size during a specific period is the same for all firms in a given industry — regardless of their initial size at the beginning of the period" (Mansfield 1962:1030). This understanding was labeled Gibrat's Law of Proportionate Effect and has generated a large body of literature (e.g., Simon and Bonini 1958; Ijiri and Simon 1964, 1967; Hall 1987; Evans 1987a,b; Geroski 1995; Dunne and Hughes 1994; Sutton 1997; Audretsch et al 2004).

If true, Gibrat's Law establishes that the evolution of firm size is a random walk, in which firm managers are endowed with an initial supply of resources comprising firm capabilities, technology, and social and financial capital (March and Shapira 1992, p. 173; Helfat and Lieberman 2002). The survival of the fittest in the evolutionary market system can then be considered a prerequisite for the right-skewed firm size distribution. The skewness can be related to high costs of entry or difficulties in imitating successful practices (Luttmer 2007). Selection can occur when firms learn their actual productivity levels once they have entered the market (cf Jovanovic 1982) or follow a string of negative productivity shocks (Ericson and Pakes 1995; Klette and Kortum 2004; Luttmer 2007).

The question then becomes, does Gibrat's Law hold, i.e., is firm growth independent of firm size? The answer to this seemingly simple question is complicated by the numerous versions of the law (Chesher 1979 and Tschoegl 1983). Mansfield (1962) identified at least three. First, Gibrat's law may apply to all firms without reference to market turbulence, which characterizes firm entry and exit. Second, Gibrat's law may only apply to surviving firms. Third, the law may only apply to firms with a size that is sufficient for them to produce at a long-term minimum average cost, the industry's minimum efficient scale. Mansfield (1962) rejected all three versions of the law.

The empirical evidence obtained since has generally rejected the first (cf Audretsch et al 2004, Reichstein and Michael 2004) and second versions of the law (Harhoff et al 1998). Instead, researchers typically find that smaller firms

and Karlson (2002) label such research the Swedish Growth School.

grow faster than large firms, regardless of whether all firms or only surviving firms are considered. In contrast, substantial empirical evidence supports the third version of the law, i.e., that above a minimum efficient scale, firm growth will be independent of firm size (Mowery 1983, Hart and Oulton 1996, Lotti et al 2003, Audretsch et al 2004, Geroski and Gugler 2004).

The fact that Gibrat's Law does not generally hold has implications for the distribution of firm growth rates. If Gibrat's Law holds, the firm growth distribution should be Gaussian, which limits the mass located in the tails. Indeed, the longstanding predominant view was that Gaussian laws governed the growth process. Yet, this does not seem to be the case. In fact, the lumpiness and complexity of firm growth demonstrated in recent years suggests that it is inconsistent with the Gaussian framework (Stanley et al 1996; Reichstein et al 2010). Rather, it appears that the firm growth rate distribution is Laplacian shaped, with thicker tails (Stanley et al 1996).

In fact, one of the most robust results in the industrial dynamics literature is that growth rates are extremely right skewed, and the Laplace shape of the growth rate distribution implies that a small number of fast-growers create most new jobs (Coad et al 2014a). For this reason, one strand of the literature has begun to focus on the exceptions: those firms that grow rapidly, the so-called high-growth firms (Birch and Medoff 1994).

Evidence suggests that HGFs provide most, or even all, new jobs in the economy (Birch and Medoff 1994; Storey 1994; Davidsson and Henrekson 2002; Delmar et al 2003; Halabisky et al 2006; Acs and Mueller 2008). A widely held belief is that young HGFs are important for structural change in the economy (Acs 2008; Acs and Mueller 2008; Henrekson and Johansson 2009, 2010; Bos and Stam 2014). HGFs may play a particularly important role when incumbents are reluctant to concede their vested interest in long-established markets (Arrow 1962; Christensen 1997; Witt 2003).

Despite the vast research on HGFs in recent years, relatively little is known about them, which is perhaps unsurprising given the inherent randomness of the growth process. However, seven stylized facts about HGFs do stand out (Coad et al 2014a), the first two of which have already been mentioned. First, growth rate distributions are heavy-tailed, resembling the tent-shaped Laplace distribution (Botazzi and Secchi 2006). This observation makes leads to the second fact: job creation is highly concentrated among a few firms (Henrekson and Johansson 2010: 15).

Third, HGFs are often young, but not necessarily small (Delmar et al 2003; Acs

et al 2008b). If startups are excluded, the net job creation rate is lowest among the smallest firms (Neumark et al 2011). By contrast, most empirical studies find a significant negative effect of age on firm growth (e.g., Evans 1987a, Dunne and Hughes 1994). Thus, young firms, rather than small firms, are responsible for the bulk of net job creation (Haltiwanger et al 2013: 347).

Fourth, HGFs do not appear to be more common in high-tech industries. If anything, they seem to be more present in service industries (Henrekson and Johansson 2010). This is interesting given the numerous industrial policies directed toward high-technology sectors (see for example OECD 2010). The fifth fact states that high growth is not persistent over time (Parker et al 2010; Daunfeldt and Halvarsson 2014). One may go so far as to say that "[m]ost HGFs are one-hit wonders" (Hölzl 2014: 30). This is arguably of relevance to any policy suggestions regarding how to target such firms.[6] The sixth fact is related to the fifth: it is inherently difficult to predict which firms will become HGFs. This is not surprising, as most regression models related to firm growth only explain a small fraction of the variation in the data (Coad 2009).

The seventh and final fact is that the use of different growth indicators selects a different set of HGFs. This is of particular relevance, as most early studies focus on net job creation (Henrekson and Johansson 2010). One can certainly ask whether employment is a relevant variable if the goal is a healthy economy, especially because the evidence associates a larger number of HGFs with a larger number of firms that experience decline (Bravo-Biosca 2010; Hölzl 2011). In this respect, the observation that the relationship among employment, sales and productivity growth seems weak at best should be a cause for concern (Bottazzi et al 2008; Shepherd and Wiklund 2009). However, Coad et al (2014b) are able to demonstrate that growth begins with employment, which leads to future increases in R&D spending and products that are new to the market, which in turn leads to sales increases. The failure to observe corresponding feedback from sales to employment growth is relevant to policy.

However, HGFs are not the only aspect of entrepreneurship research for which the relevance of institutions and economic policy is clear. The last part of section 2 is devoted to discussing such questions in greater detail.

[6] On a related note, Coad et al (2014b: 6-11) are able to demonstrate that so-called High Innovative Firms (HIFs), defined in terms of R&D intensity or a high share of new to market products, are highly persistent. As mentioned above, however, the relationship between innovation and growth is complex, with many HIFs exhibiting little if any growth, while many HGFs are not innovative. HIFs are no more likely to be fast-growers than other firms.

2.4 Institutions and policy

Entrepreneurs are products of their environment. This can be understood when considering an additional, and arguably less noble, role for the entrepreneur described by Baumol (1990: 897-898), who extends Schumpeter's taxonomy by including innovations in rent-seeking procedures:

> Suppose that it turns out (…) that at any time and place the magnitude of the benefit the economy derives from its entrepreneurial talents depends substantially, among other variables, on the allocation of this resource between productive and unproductive entrepreneurial activities (….) Then the reasons for including acts of the latter type in the list of entrepreneurial activities become clear.

It not only matters whether entrepreneurship is active, but if so, whether it is used productively, unproductively or destructively (Baumol 1990; Bhagwati 1982; Murphy et al 1991). Thus, the outcomes of the experimental process described above can be attributed to a deeper set of factors, in that the extent and type of entrepreneurship depend on institutions of both formal and informal character (North and Thomas 1973; Rosenberg and Birdzell 1986; de Soto 1989, 2000; Baumol 1990; North 1981, 1990, 1994; Mueller and Thomas 2000; Busenitz et al 2000; Reynolds et al 2001; Henrekson 2005; Acemoglu and Robinson 2012; Sahut and Peris-Ortiz 2014).

North (1990:3) defines institutions as "the rules of the game in a society or, more formally, (…) the humanly devised constraints that shape human interaction." Institutions hence impose restrictions on actors by defining rules and boundaries for what activities can be considered legitimate (Scott 2008:48-50)[7]. Moreover, the constraints allow for new and otherwise non-existent possibilities, choices and courses of action (Hodgson 2006: 2). By limiting and creating entrepreneurial opportunities, the institutional environment affects the discovery, exploitation and dissemination of knowledge, and consequently, economic development (Hwang and Powell 2005; Manolova et al 2008; Acs et al 2004, 2009; Alvarez and Urbano 2011; Thornton et al 2011; Urbano and Alvarez 2014).[8]

[7] In the following, I primarily consider what one might term the explicitly legal and regulatory institutional pillar. There are, however, other types of institutions of a more informal nature, related to values rooted in social norms and customs or the more or less conscious cognitive beliefs that guide agents (cf March and Olsen 1989; Scott 2008; Bruton et al 2010; Urbano and Alvarez 2014).

[8] Such institutional constraints (regarding, e.g., labor markets, taxation, red tape procedures and property rights) are perhaps of greatest relevance for developing countries (cf Goedhuys and

The institutions governing the protection of property rights, for both material and intellectual property, are regarded as fundamental to the promotion of entrepreneurial activities conducive to knowledge and growth (Baumol 1990; Johnson et al 2000; Boettke and Coyne 2003; Acemouglu et al 2004; Spencer and Gomez 2004; Eliasson 2007; Powell 2008; Gans and Persson 2013). The nature of governmental regulation is also important. Excessive rules and procedures may, for example, discourage potential entrepreneurs (Begley et al 2005; Dana 1990; Djankov et al 2002; Gnyawali and Fogel 1994) and hamper the process of creative destruction (Caballero and Hammour 2000; Djankov et al 2002; Desai et al 2003; La Porta et al 1997, 2000). In general, contract enforcement regulation, which affects the efficiency of the legal system, tends to improve the potential for entry and enhance innovation (Djankov 2008, La Porta et al 2008, Aidis et al 2009). Many empirical studies suggest that rigid labor market regulations have a negative impact on entrepreneurial activity (Klapper et al 2006; Micco and Pagés 2006; van Stel et al 2007; Autor et al 2007; Kugler and Pica 2008; Stephen et al 2009) and the negative effect appears greatest for opportunity-based entrepreneurship (Ciccone and Papaioannou 2006; Ardagna and Lusardi 2009; Bosma and Levie 2010).

Taxes and liquidity constraints also affect entrepreneurship (See e.g., Evans and Jovanovic 1989; Hurst and Lusardi 2004; Alesina et al 2005; Djankov et al 2007; Fiori et al 2007; Gentry and Hubbard 2000; Nicoletti and Scarpetta 2003; Djankov 2008; Arnold et al 2008). Yet, the tax effect is sensitive to the potential for arbitrage between tax bases (Gentry and Hubbard 2000; Parker and Robson 2003; Cullen and Gordon 2007). Taxes that reduce opportunities for individual wealth, thereby contributing to financial constraints, are also reported to have a negative effect on entrepreneurship (Hansson 2008). The administrative burden associated with taxes furthermore seems to only have a negative effect on entrepreneurs (Djankov et al 2008).

The importance of the institutional context for Sweden's economic development is quite evident. Sweden's remarkable growth experience during the period 1870-1950 was preceded by several institutional changes, such as the introduction of compulsory schooling and a new limited liability law, the abolishment of guilds, and freedom of trade (Schön 2000; Braunerhjelm 2005). In recent years, Sweden generally ranks low on international comparisons of the rates of self-employment, new firm formation, and entrepreneurship (Delmar and Davidsson 2000). In contrast, Andersson and Klepper (2013) find that the rate of new firm formation is similar to that of other countries, while Leeson and Sanandaji (2013)

Sleuwaegen 1999; Sleuwaegen and Goedhuys 2002; Beck et al 2005; Chen and Puttinanun 2005; Lee et al 2011; Ardagna and Lusardi 2010).

demonstrate that Sweden ranks reasonably well when the number of billionaires per capita is used as an alternative measure of high-impact entrepreneurial ability.

Sweden's leading firms are nevertheless old, and many of them were founded in the 19th century (Henrekson 2005), although the fraction of large firms has declined in recent years (Henrekson et al 2012). As Andersson and Klepper (2013) note, the contemporary Swedish policy environment is distinctive in ways that might have discouraged the formation of new firms. Notably, Sweden has a high ratio of taxes to GDP. Furthermore, the country has very high marginal taxes on labor and capital income earned by entrepreneurs (see Stenkula et al 2014; Du Rietz et al 2013, 2014) and an unfavorable taxation of stock options relative to other countries (Henrekson 2005).

Nevertheless, Sweden ranks favorably in international institutional comparisons of property rights protections, monetary policy, freedom of trade, and general regulation (Gwartney et al 2013:14). Labor market regulations and the size of the government are regarded as drawbacks according to the same rankings, but the ratio of tax revenues to GDP declined by several percentage points between 1990 and 2007, in part due to the major tax reform of 1991 (Sørensen 2010). Nonetheless, tax rates and tax revenues relative to GDP remain high relative to other OECD countries (Sørensen 2010; OECD 2014). In addition, various employee security provisions and wage policies may also discourage the formation of new firms and firm growth (Davis and Henrekson 1999; Skedinger 2008).

It is important to recall these considerations when discussing possible measures to stimulate entrepreneurship and innovation in the Swedish economy. It should be added that institutions are not identical to policy. Notably, Glaeser et al (2004) argue that an often overlooked and essential aspect of institutions is that they need to be reasonably permanent or durable (see also Scott 2008:48). In this view, short-term policies do not qualify as institutions. They may also create uncertainty that hampers entrepreneurship. Precisely where the line between policy and institutions is drawn is not obvious. For example, a policy to remove barriers to entry by reducing the time required to start a business, the number and costs of permits and licenses required, or the minimum capital requirements of a new firm may have an effect on the broader institutional framework in the labor market (van Stel et al 2007).

Policies may also differ substantially in their generality. For example, entry subsidies directed to all firms are likely to generate adverse effects. Deadweight effects may occur when the beneficiary is a firm that would have survived and grown in the absence of the subsidy. A potentially greater distortion can be

attributed to a substitution effect, which occurs when subsidies support "a revolving door firm which would have exited the market in absence of the subsidy." (Vivarelli 2013:1477). This is likely to be detrimental to more efficient potential entrants and delay the exit of less efficient newborn firms; in other words, it will hamper market selection.

Some researchers therefore favor selective and targeted measures addressed to more promising potential entrepreneurs, such as those characterized by superior human capital or high-quality, innovative ideas (Shane 2009; Vivarelli 2013). Notably, gazelles in young, R&D-intensive companies recently gained a favorable position in EU state aid rules for innovation support (Schneider and Veugelers 2010; Coad et al 2014a).

Such targeted policies may be beneficial to entrepreneurship, innovation and growth, but they may also pose a threat to productive entrepreneurial activity (Dana 1987). Governments have a poor track record in designing and implementing targeted industrial policies in a welfare-enhancing manner (Lerner, 2010). If it is relatively more profitable to lobby governments for funds than to engage in innovation, then many entrepreneurs will choose to focus relatively more of their resources on lobbying (Baumol 1990). Furthermore, a key element of a market economy is its restless character (Metcalfe et al 2006). This knowledge problem means that there is no "crystal ball" that can be used to predict a capitalist economy's future industrial structure (Bos and Stam 2014: 146).

As an example, consider that small firms were long deemed inefficient and wasteful (Galbraith 1956, 1967), in large part due to Schumpeter himself. While his early (1934) work emphasized the importance of young and small firms for innovation, he subsequently (1942) came to believe that large firms would exhibit superior innovation and growth, benefiting from increasing returns to scale (Malerba and Orsenigo 1995). It seemed inevitable to many of his colleagues that the exploitation of economies of scale by large corporations would become the primary driver of innovation and technological change (Galbraith 1967; Williamsson 1968; Chandler 1977). Individual efforts and hence individual incentives would decline in importance, and small firms and entrepreneurs therefore came to be considered marginal elements (Henrekson 2005:440). This view informed much of Sweden's industrial policy in the post-war era (cf Henrekson and Johansson 1999; Henrekson and Jakobsson 2001).

This view has changed considerably in the intervening period. Small firms are no longer regarded with disdain (Birch 1979; Brock and Evans 1986; Loveman and Sengenberger 1991; Landström 2005; Henrekson and Johansson 2010), and a lot

of contemporary industrial policies are directed towards small firms (Storey 2006). As Audretsch and Thurik (2001) argue, highly developed economies have experienced a shift from a managed to an entrepreneurial economy, and while the managed economy was dependent on large firms, the entrepreneurial economy is more dependent on small firms.

This development is, however, a matter of relative change. Baumol (2002, 2004) emphasizes the complementary roles of firms of different sizes. Large incumbents perform well in traditional technological fields that were already based on large, innovative activities, while new firms explore new areas. Small firms and individual innovators hence develop the more revolutionary breakthroughs. These firms are often less R&D-intensive but are entrepreneurially geared. Corporate research then contributes reliability, enhanced power and ease of utilization, which enables these firms to provide a multitude of "incremental improvements", the sum of which proves highly important in the long run (Acs and Audretsch 2005; see also Lassen et al 2006; Robson et al 2009). Therefore it can be argued that all types of firms are needed in a modern economy.

Rather than policies for picking winners, one may hence focus on deeper institutional conditions of the type described above. Of particular relevance to Sweden is perhaps the evidence suggesting that strict employment protections reduce self-employment (Robson 2003) and are associated with reduced probabilities of starting innovative firms and firms with high growth expectations (Stam and Nooteboom 2011). Henrekson and Johansson (2009) emphasize the pivotal role played by labor market regulation and also highlight the effects of tax structures for fostering HGFs. However, while there is certainly scope for institutional design, institutions are often not the product of intentional design but rather the outcome of political struggles and negotiations (Hayek 1978; Acemoglu and Robinson 2012). The outcome of any initiative to change institutions is hence shrouded in uncertainty.

Having provided this overview of the literature in the fields of entrepreneurship, economic dynamism, firm entry and growth, we turn to a discussion of questions related to the data and methodology used in this thesis.

3 Data, Measurements, and Limitations

Choices related to data, measurements and definitions are important in any research field. In entrepreneurship research, the risks of obtaining results that are influenced, or even driven, by methodological choices are large. For example, if entrepreneurship policy is primarily intended to promote innovative

entrepreneurship of the type Schumpeter envisioned, then entrepreneurial proxies such as small business activity, the self-employment rate, or the number of start-ups in the economy may cause misleading inferences (Henrekson and Sanandaji 2014:1760).

This does not mean that studying such rates is not relevant, but it underscores the importance of not equating them with entrepreneurship. The reason that such proxies are employed is generally data availability. In this respect, Nightingale and Coad (2014) note that the economic impact of start-ups generally appears much more favorable in earlier research. To them, this suggests that better data and methods lead to less enthusiastic interpretations. It also underscores the importance of explicitly acknowledging the shortcomings of the data and the choices made.

3.1 The PAR-dataset

Self-employed individuals in Sweden can incorporate their business, transforming it into a limited liability firm (*aktiebolag*), which has a legal personality and is treated as a separate tax subject, meaning that corporate income tax is levied on the net return. Private capital requirements were recently lowered from SEK 100,000 to SEK 50,000. The tax-related advantage of a limited liability firm is greatest when income exceeds SEK 433,900, at which point it becomes advantageous to take dividends as a complement to wage income. All limited liability firms are required to submit annual reports to the Patent and registration office (PRV), including, e.g., the number of employees, wages, and profits.

The industry-specific data used in all five articles are from PAR, a Swedish consulting firm that gathers information from PRV, primarily for use by decision makers in Swedish commercial life. The data cover all Swedish limited liability firms active at some point during the period 1997-2010, yielding a total of 3,831,854 firm-years for 503,958 firms. The panel contains both continuous incumbents and firms that entered or exited during the period.

As the last years of the period witnessed a marked decline in the number of firms, the years 2009 and 2010 have been dropped from the analysis in all articles. Firm activities are specified by branch of industry at the 5-digit level according to the European Union's NACE classification system. The PAR data set was recently updated to cover the aforementioned period. Information on mergers and acquisitions, missing in the earlier version of the data set, was also included. As the second and third articles in this dissertation were completed prior to the update, they cover shorter time periods.

Nightingale and Coad (2014) note several problems that generally pertain to the data used in researching HGFs and new and small firms. One such problem is the data quality related to the lower reporting requirements that small firms typically face, resulting in a trade-off between data quality and coverage (Nightingale and Coad 2014; Coad et al 2013; Delmar and Wennberg 2010). This in turn leads to unrepresentative samples. Furthermore, as government data sets generally concern issues of taxes and regulations, they are sensitive to inaccuracies due not only to accidental misreporting but also deliberate tax evasion (Coad et al 2013).

In Sweden, the coverage problem is generally limited, as all firms have reporting requirements regardless of size. The PAR dataset, however, only covers Swedish limited liability firms. Because all such firms are required to submit annual reports to PRV, the problems of data coverage and unrepresentative samples should be limited – aside from the obvious fact that the dataset is limited to those firms that are actually incorporated. This is important to bear in mind when interpreting the results in the five articles, together with the potential inaccuracies due to tax evasion.

This also relates to the specific political and institutional setting of the Swedish economy described in section 2.4. For example, Edmark and Gordon (2013: 223) examine the determinants of the choice among forms of ownership in Sweden, finding that while lower-income individuals face quite neutral incentives, higher-income households face strong tax incentives to incorporate their firms. In addition, they find that firms are more likely to be corporate if they have more capital assets and employees and if they are owned by individuals with higher expected income. The other organizational forms, sole proprietorships (*enskild firma*), partnerships (*enkelt bolag*), and economic organizations (*ekonomisk förening*), are rarely selected if the firm has growth ambitions. Thus, restricting the analysis to limited liability firms can be said to place greater emphasis on more successful firms (see also Delmar et al 2005). However, Edmark and Gordon (223:224) note that taxes that place small firms at a disadvantage may discourage entrepreneurial activities.

The question of generalizability to other countries is also highly relevant. Henrekson and Sanandaji (2014) note that HGFs are difficult to compare across countries, but it can generally be said that cross-country micro data are difficult to obtain. Scaling is also problematic: at lower levels of industry aggregation (e.g., NACE 4-5 digits), stable patterns such as the firm size distribution seem to break down, exhibiting a much more erratic microstructure. The latter problem is, however, easier to control for, as the dataset permits us to test the robustness of the results to various levels of aggregation (Dosi and Nelson 2010).

3.2 Measurements and methodology

The problem with unrepresentative samples highlighted above by Nightingale and Coad (2014) is often compounded by the extremely skewed nature of the statistic. This can make conventional regression strategies developed to analyze the average impact on the average firm misleading, and make it difficult to conceptualize the typical firm (Coad et al 2014b).

The type of model selected fundamentally depends on the research question and choice of measurements. Firms are heterogeneous and differ in numerous dimensions; hence empirical studies must inevitably sacrifice some detail to obtain manageable measurements. Here, I will only briefly address the choices made and refer the reader to the individual articles for more detailed explanations.

Measuring entry and in-migration is done in a fairly straightforward manner, the first time a firm's organization number appears in the database or the first time an incumbent firm appears in a new location. Information on firm start dates is also employed to ensure that we are considering true entrants rather than firms that changed their organizational form or organization number. Following much of the previous literature on firm locational choice, entry and in-migration are treated as discrete events, making count data methods appropriate to study them empirically (cf Arauzo-Carod 2008; Arauzo-Carod et al 2010). In the first two articles, the dependent variable is therefore defined as the number of new and/or in-migrating firms in a certain municipality and industry in a given year.

In the third article, we assess whether Gibrat's law holds, i.e., whether firm growth is unrelated to firm size. The choice of growth indicator is important here, and we use both employment and sales to check the robustness of our results. These are the two most commonly used growth indicators in the firm growth literature. OLS regression is applied to determine whether Gibrat's Law holds (Fertö and Bakucs 2009). We do so in part to facilitate comparison with previous results. While OLS entails a risk of upward bias in the estimator, meaning that we might reject Gibrat's law less often than we should, this risk is low in short firm data panels such as ours (Hall and Mairesse 2005; Ribeiro 2007). In a second stage, a probit regression model is estimated to assess what industry specific variables affect whether the law holds.

The final two articles address HGFs. As mentioned above, there is little consensus as to how such firms should be defined, which is problematic because methodological choices influence the policy implications that can be derived (Coad et al 2014a). Following Delmar et al (2003: 192-197), one can generally identify a number of measurement choices of great relevance. First, it is

necessary to choose a size measure or growth indicator. As the fourth article focuses on how definitions affect the observed economic contribution of HGFs, we employ no fewer than four different indicators: employment, sales, productivity, and value added. In the fifth article, this question is not our primary concern, and we only consider employment and sales, as they are the most commonly used indicators in the previous literature.

Second, one must decide *how* growth is measured, whether as a percentage change, using first differences, or using composite indicators. As Almus (2002) has demonstrated, this has substantial effects on what firms will be defined as HGFs. In both the fourth and fifth articles, we therefore measure growth in both absolute and relative (percentage) terms. In the fourth article, we also employ the so-called Birch index when considering employment growth, which is a composite index that accounts for both absolute and relative change. Third, one must determine the time period over which growth should be measured. This can be considered annually, over longer periods of time, or from the first period to the last. In the previous literature, three- or four-year periods are the most common (Henrekson and Johansson 2010). In the fourth article, we measure growth over three, five and seven years, whereas in the fifth article we limit our attention to three years.

Finally, it is necessary to determine whether to consider organic growth, acquired growth or total growth. Organic growth refers to endogenous growth through increasing sales volume or hiring, whereas acquired growth occurs through actions such as company mergers or acquisitions, and total growth is the sum of organic and acquired growth. With few exceptions, prior studies use total growth, due to a lack of data on mergers and acquisitions. In the final chapter, we are able to distinguish between organic and total growth and find that the results are not substantially affected by this distinction.

After these decisions on growth, there remains the issue of how to define HGFs. A popular definition is that favored by the OECD and Eurostat, which defines HGFs as firms with an annualized growth rate greater than 20 percent over three years, provided they have at least 10 employees at the beginning of the period (Eurostat-OECD 2007). However, Daunfeldt et al (2014) demonstrate that this definition excludes a large number of firms and their contributions, as it restricts attention to rather large firms. Following recent contributions (e.g., Daunfeldt et al 2014; Coad et al 2014c; Daunfeldt and Halvarsson 2014) we therefore make the choice of defining HGFs as the fastest growing one percent of firms (under the particular combination of growth indicator and measurement) in the last two articles.

In the fourth article, furthermore, probit regression is used to determine what variables influence the probability of becoming a HGF under either of these definitions. In the fifth article, the unit of analysis is the share of HGFs in an industry, and a fractional logit model that can consider proportions as dependent variables is employed.

Additional choices relating to the data, definitions, and methodology will be discussed in greater detail in each of the articles at hand.

4 Chapter summaries

4.1 Chapter 1. What determines entry? Evidence from Sweden

As mentioned above, there are reasons to expect that a larger number of business experiments results in more successful innovation. This being said, some studies find that the net effect of new firms on growth may be negative in the short-term, before turning positive with a significant impact on growth for as long as 10 years. Furthermore, while most entrants die young, new firms can be expected to grow faster than their mature counterparts conditional on survival.

This motivates this study, where a distinction is made between regular entrants and those that survive for at least 2 years. I investigate what municipal and industrial conditions influenced the entry of Swedish limited liability firms during the period 2000-2008 using data that makes it possible to trace entry geographically and with respect to industry at the five-digit NACE level. The choice to make entry is treated as a discrete event, which implies the use of count data models.

Count data only consist of non-negative integers and are typically highly skewed with a preponderance of zeros, thus violating the fundamental assumptions of numerous multivariate statistical techniques. In statistical methods specifically designed to address count data, both positive and zero occurrences are natural outcomes. In the case at hand, this is important because observations with zero instances of entry may have characteristics that preclude entry.

A number of tests suggested that the negative binomial model was the most suitable for the data at hand. This model allows for a higher probability of a zero count and a longer tail than the poisson, increases the conditional variance without changing the conditional mean, and lifts the assumption of the independence of observations by including a parameter that reflects unobserved (between-subject) heterogeneity.

Findings were quite robust to different specifications and levels of aggregation. Political variables, e.g., the municipal tax rate and the ideology of local government, were found to be of limited importance to entry. Industry-specific conditions, by contrast, seem to have had a stronger effect. Notably, municipalities with industries with a high minimum efficient scale of production or high market concentration rates were considerably less likely to experience new firm formation. Substantially more entry occurred in municipalities with high incomes and a well-educated population. The main distinction when comparing conditions for regular and surviving entrants is that the importance of the level of education appears stronger for surviving entrants, pointing to the importance of human capital.

4.2 Chapter 2. Start-ups and firm in-migration: evidence from the Swedish wholesale industry

This article (co-authored with Sven-Olov Daunfeldt and Niklas Rudholm) employs a methodology similar to the previous one. Here, a distinction is made between entry and in-migration, i.e., when an incumbent firm relocates. It is plausible that in-migrating firms are more "valuable" because they have already proven themselves in the market by surviving churning in earlier periods and are larger and possibly provide more jobs. We use a data set covering 13,471 Swedish limited liability firms in Swedish wholesale industries during the period 2000–2004 to ascertain the determinants of new start-ups and firm in-migration. Again, a negative binomial model is found to be suitable to model this question empirically.

The findings suggest that the conditions conducive to entry are also conducive to in-migration. Access to a large harbor, international airport or large railroad classification yard in the municipality nearly triples the number of start-ups and increases the expected number of in-migrating firms by one-half. The presence of a university, numerous educated workers and low local taxes are also associated with more start-ups and firm in-migration. Again, we identify the importance of human capital — not only for entry but also for in-migration. Importantly, there does not appear to be any fundamental conflict between promoting entry and promoting in-migration.

4.3 Chapter 3. When is Gibrat's law a law?

This article (co-authored with Sven-Olov Daunfeldt) examins whether the industry context affects whether Gibrat's law holds, i.e., whether firm growth is independent of firm size. This is achieved using a data set that consists of all limited liability firms by five-digit NACE industry in Sweden during 1998–2004.

We test Gibrat's law using OLS-regression, in line with most previous studies. Granted, this may lead to an upward bias in the estimator, and hence too few rejections of the law, yet this risk is low in short firm data panels. We reject Gibrat's law at an aggregate level, instead finding that small firms grow faster than large firms, which is in line with much previous research. When industry-specific regressions are estimated, however, the law is confirmed approximately as often as it is rejected.

This finding motivates the second step, in which we estimate a probit model at the industry level where the dependent variable takes the value 1 if Gibrat's Law holds, zero otherwise. This dummy variable is regressed in a probit setting on a number of variables deemed to be of theoretical relevance. We find that the industry context — e.g., minimum efficient scale, market concentration rate, and number of young firms in the industry — affects whether Gibrat's law is rejected. Gibrat's Law is more likely to be rejected in industries characterized by a high minimum efficient scale and a large number of firms located in metropolitan areas, but more likely to hold in industries with high market concentration and more group ownership.

These findings are important when contemplating political implications. Finding that the law is rejected at the aggregate level may tempt one to conclude that policies should be undertaken that favor small firms, or even break up larger ones. Such conclusions may have some merit, yet the finding that the situation is less clear-cut at the disaggregate level should provide cause for concern. It hence becomes important to delve deeper into what factors influence whether the law holds, to avoid policy suggestions that are flawed or detrimental.

4.4 Chapter 4. The Economic Contribution of High-growth Firms: Do policy Implications Depend on the Choice of Growth Indicator?

From growth more generally, the fourth article turns to HGFs in particular. Many researchers and policy makers favor policies that target HGFs, as they are believed to promote economic growth and job creation. Crucial for this analysis is the way in which HGFs are defined and measured. Such choices may affect the conclusions drawn and therefore the policy implications. There may, for example, be large societal costs to a policy that favors one type of HGF at the expense of another, notably because the link between employment and productivity growth appears weak. Additionally, most prior studies have defined HGFs in terms of growth in employment or sales and primarily analyzed their contribution to overall employment growth.

In this paper (coauthored with Sven-Olov Daunfeldt and Dan Johansson), we

therefore define HGFs using the commonly applied growth indicators of employment and sales but also add definitions based on growth in value added and productivity. We measure growth in both absolute and relative (percentage) terms and for employment growth also consider the so-called Birch index, a composite measure of relative and absolute growth.

Our results indicate that HGFs identified in terms of employment are not the same firms as HGFs identified in terms of productivity, and that their economic contributions differ significantly. When examining the persistence of HGFs, we find that when growth is measured in relative terms, a firm defined as an HGF in one period is highly unlikely to remain so in the next period. However, the persistence is higher when growth is defined in absolute terms.

Our results cast doubt on the efficiency of implementing policies targeting HGFs. Economic policy promoting fast growers in terms of employment may, for example, come at the cost of reduced productivity growth. Although the HGFs identified using different definitions may not be the same firms, young firms are more likely to be HGFs irrespective of definition. This suggests that economic policy should focus on the conditions for new firm formation and early firm growth, rather than targeting a particular type of HGF.

4.5 Chapter 5. Are High-Growth Firms Overrepresented in High- tech Industries?

The final article (also co-authored with Sven-Olov Daunfeldt and Dan Johansson) is written in a vein similar to the previous one. Its point of departure is the argument that politicians should target high-tech firms because they are potential fast-growers. This argument rests on the assumption that the association among high-tech, innovation and high growth is positive.

We examine these questions by studying the industry distribution of HGFs across all 4-digit NACE industries, using a data set that covers all limited liability firms in Sweden during the period 1997-2010. Our results indicate that industries with high R&D intensity have a lower share of HGFs than industries with lower R&D intensity. These findings cast doubt on the wisdom of targeting R&D-intensive industries or subsidizing R&D to promote firm growth. However, we observe an overrepresentation of HGFs in knowledge-intensive service industries, contradicting the view that HGFs are equally common in all industries.

The political implications of our results are troublesome because they suggest that the link between industry innovation and the share of HGFs is at best complex. The knowledge required to pick winners simply is not there.

Furthermore, if it is believed that policy interventions should rest on some type of market failure argument, targeting HGFs may affect the incentives of these entrepreneurs, as returns to rent-seeking activities increase, i.e., the type of destructive or unproductive entrepreneurship that Baumol suggested be added to Schumpeter's taxonomy.

5 Conclusions

This thesis addresses economic dynamism and the related topics of firm entry and firm growth. In this concluding discussion, I will take the opportunity to discuss the main findings of the five chapters and how they relate to the previous literature on economic dynamism, entrepreneurship and economic growth in greater detail.

In section 2.2, the importance of the evolution of knowledge was discussed in general terms. I also touched upon the importance of human capital and education for various forms of entrepreneurship (Bates 1990; Gimeno et al 1997; Acs et al 2007; Geroski et al 2010; Colombo and Grilli 2010; Arvanitis and Stucki 2012). The relevance of this link is quite evident throughout this thesis. This was evinced in the first two chapters, where there was a clear, positive link between entry or in-migration and a well-educated population, as well as the presence of a university. Furthermore, the evidence from the fifth article suggests that industries in which workers have a greater degree of human capital should exhibit a greater share of HGFs. This stresses the importance of the education and skills not only of founders but also of the workforce, highlighting the pivotal role of a competent workforce in successful innovation in an experimentally organized economy (Eliasson 1996; Johansson and Karlson 2002; Henrekson and Stenkula 2007). Additional research that focuses on these links is necessary.

Section 2.4 concerned the role of economic institutions and policy in entrepreneurship and a dynamic economy. The findings from the first two chapters shed some doubt on the importance of municipal institutions and policies, at least for fostering new firm formation. Indeed, relative to other municipal factors and industrial variables, the effect of institutional and political factors appears rather modest. However, it is important to bear in mind that the variation in these political factors across municipalities is rather limited, and one might expect to observe greater effects across countries with larger geographical entities and greater autonomy (Sobel 2008).

More generally, some evidence in this thesis sheds doubt on policy makers' ability to "pick winners" in the market ecology (Coad et al 2014a). In view of the

discussion in section 2 on the nature of a dynamic economy, this is not particularly surprising. As we are considering an ever-changing system, characterized by idiosyncratic capabilities and mistake-ridden learning (Dosi 2007), there are limits to the knowledge of researchers and policy makers. This can be contrasted with the considerable demand-side biases of politicians and lobbying organizations for positive results that can be translated into public policy (Nightingale and Coad (2014).

This observation is relevant regarding both firm growth and firm entry. Small and new firms have long been a policy obsession (Derbyshire 2012), which, for example, helps explain why £8 billion are spent annually by the UK government on small business support, despite a lack of evidence that this is beneficial for the economy (Storey 2006). The disconnect between the Schumpeterian definition of entrepreneurship and the way entrepreneurship is typically measured serves as a partial explanation for this. When entrepreneurship is essentially defined as self-employment or small business ownership, entrepreneurship policy in effect becomes SME policy (Henrekson and Sanandaji 2014:1764). Targeting small- and medium-sized enterprises is, however, unlikely to promote innovation and economic growth.

Quite reasonably, HGFs have been considered a means of capturing additional high-impact type entrepreneurs. Studying these firms is certainly important for understanding the economy, but as section 2.3 and the findings in this thesis suggest, they are unlikely to be a useful vehicle for public policy, given the difficulties involved in predicting which firms will grow (Coad et al 2014a). There is also the issue of the short-run nature of growth relative to innovation. As Coad et al (2014b: 11) stress: "Recognising this difference helps avoid a composition fallacy that conflates the growth of the economy with an economy with many high growth firms." This fallacy has yet to be dispelled. As discussed in the fifth article, HGFs are mentioned as a key indicator to assess the success of the EU's Lisbon Strategy.

The link between firm entry and firm growth should also be more thoroughly scrutinized. While the first article distinguished between entrants in general and those that survived for at least two years, further studies should consider what one might label high-growth entrants, i.e., firms that grow rapidly post-entry, and whether the conditions that favor the entry of such firms differ from those favoring entry in general. As mentioned above, there is some evidence suggesting that policies intended to increase entry rates are unlikely to increase the share of HGFs (Huber et al 2014), but more research is needed in this respect. Much would be gained by evaluating policies targeting a particular type of firms, for

example R&D-intensive firms or potential fast-growing firms, to determine whether such policies actually have the intended effects.

Furthermore, Coad et al (2014b:8) suggest that the link between innovation and growth should be enhanced by policies focusing on helping firms capture the value of innovation, regardless of where this value is created. In general, little attention has been paid to the joint implications of public policies directed at firms in different stages of evolution (Braunerhjelm 2011), and there is also further need for a multi-level policy approach that accounts for the individual, the firm and the industry in which they operate (Autio and Wennberg 2009; Delmar and Wennberg 2010).

This is no easy undertaking. Firms grow at different paces, the requirements of slow-growing firms and gazelles may be quite different, and it is likely that policy variables influencing growth differ over firms' evolutionary stages and across sectors of the economy. A modest policy conclusion would be to focus on conditions that make for a more robust and dynamic economy, rather than on picking winners. For example Bravo-Biosca et al (2013) find that financial development, banking competition and improved contract enforcement are associated with a more dynamic growth distribution, as well as a higher share of fast-growing and fast-shrinking firms.

This underscores the importance of focusing on the deeper institutions that support economic life more generally, not merely on policies that favor startups, small firms, or HGFs. As Bos and Stam (2014:165) argue, "removing the barriers to growth of new firms (…) is a no-regret policy that is likely to enhance job creation in general." With a focus on removing barriers to entrepreneurship, entry, and growth, rather than creating new targeted policies, deeper institutional issues are more readily assessed, and the dynamic character of the economy is more likely to be promoted and maintained.

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