

## Whom do high-growth firms hire?

Article (Published Version)

Coad, Alex, Daunfeldt, Sven-Olov, Johansson, Dan and Wennberg, Karl (2014) Whom do high-growth firms hire? *Industrial and Corporate Change*, 23 (1). pp. 293-327. ISSN 0960-6491

This version is available from Sussex Research Online: <http://sro.sussex.ac.uk/id/eprint/49136/>

This document is made available in accordance with publisher policies and may differ from the published version or from the version of record. If you wish to cite this item you are advised to consult the publisher's version. Please see the URL above for details on accessing the published version.

### **Copyright and reuse:**

Sussex Research Online is a digital repository of the research output of the University.

Copyright and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable, the material made available in SRO has been checked for eligibility before being made available.

Copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

---

# Whom do high-growth firms hire?

---

Alex Coad<sup>\*,§</sup>, Sven-Olov Daunfeldt<sup>\*\*</sup>, Dan Johansson<sup>†</sup> and Karl Wennberg<sup>‡</sup>

---

We study employment and new hires among high-growth firms (HGFs) in the Swedish knowledge-intensive sectors 1999–2002. Using matched employer–employee data, we find that HGFs are more likely to employ young people, poorly educated workers, immigrants, and individuals who experienced longer unemployment periods. However, these patterns seem contingent on the stage of the firm’s evolution. HGFs that have already realized some rapid growth are more likely to hire individuals from other firms, even though immigrants are still overrepresented among new hires. In the case of both HGF employees and HGF new hires, employment opportunities in HGFs are provided by young and small firms.

**JEL classification:** D24, L25, L26.

## 1. Introduction

In recent years, a burgeoning literature in economics, management, and regional science has amassed around research on firm growth, specifically attending to the

---

<sup>\*</sup>Alex Coad, Science and Technology Policy Research (SPRU), Jubilee Building, University of Sussex, Brighton, UK; and Department of Business and Management, Aalborg University, Fibigerstraede 4, 9220 Aalborg O, Denmark and The Ratio Institute, SE-103 64 Stockholm, Sweden. e-mail: A.Coad@sussex.ac.uk

<sup>\*\*</sup>Sven-Olov Daunfeldt, HUI Research, SE-103 29 Stockholm, Sweden and Dalarna University, SE-791 88 Falun, Sweden. e-mail: sven-olov.daunfeldt@hui.se

<sup>†</sup>Dan Johansson, HUI Research, SE-103 29 Stockholm, SE-701 82 Örebro, Sweden and Örebro University, Sweden. e-mail: dan.johansson@oru.se

<sup>‡</sup>Karl Wennberg, Stockholm School of Economics, SE-113 83 Stockholm, Sweden and The Ratio Institute, SE-103 64 Stockholm, Sweden. e-mail: karl.wennberg@hhs.se

<sup>§</sup>Main author for correspondence.

small group of *high-growth firms* (henceforth HGFs). Empirical studies have shown that the greater share of net job-growth originates from a small number of HGFs (Birch and Medoff, 1994; Brüderl and Preisendörfer, 2000; Delmar *et al.*, 2003; Littunen and Tohmo, 2003; Halabisky *et al.*, 2006; Acs and Mueller, 2008; Acs *et al.*, 2008). Macro-oriented research on HGFs has focused on the role of HGFs for job creation (Henrekson and Johansson, 2010), productivity upgrades, and industrial dynamics (Bos and Stam, 2014; Delmar *et al.*, 2011), as well as innovative outcomes (Stuart, 2000; Hözl, 2009; Colombelli *et al.*, 2014). Micro-oriented research on HGFs, on the other hand, has focused on the processes, predictors, and conditions that facilitate or hamper firm growth (Coad, 2009; McKelvie and Wiklund, 2011).

The remarkable ability of HGFs to create jobs has also received increasing policy interest. Given the interest in HGFs' potential for job creation, among scholars and policy makers alike, we know little about what type of jobs they are creating and which types of people come to occupy these jobs. These questions are imperative both from a macro and a micro perspective. From a macro perspective, the types of jobs being created are important to know the effect of HGFs on total unemployment and the overall dynamics of labor markets. Do rapidly growing firms primarily "cannibalize" on incumbent firms by recruiting highly skilled individuals from incumbents, or do they play a more complementary role by recruiting newcomers and hence providing new opportunities for individuals marginalized on the labor market? From a micro perspective, HGFs represent one of the most dynamic forms of business organizations, and researchers have taken a great interest in what human capital factors may help them to realize and sustain rapid growth (McKelvie and Wiklund, 2011). Do HGFs benefit from recruiting individuals with a high human capital base, allowing them to tap into their employees' prior business and industry experiences to further the growth of the firm (Wennberg, 2009)? Or conversely, do HGFs benefit more from recruiting low-educated but perhaps more committed employees, which they train in-house (Eisenhardt and Schoonhoven, 1990; Lepak and Snell, 1999)? The rapidly changing work environment found in HGFs suggests that they may offer important skills upgrades for employees who are hired. However, research to date has little understanding of which individuals are hired by HGFs. Without a more thorough understanding of what type of individuals HGFs recruit, critical links in our understanding of both the micro-level dynamics and the macro-level significance of HGFs are missing.

A major reason for this lack of attention in the literature concerning the hires in HGFs has been the lack of firm-specific data that can be matched with data on individual hires. While a number of studies has been successful in gathering firm-specific data with individual-specific data on employees (e.g. Abowd and Kramarz, 1999), using such data to investigate the hires of *growing* firms is a daunting task that requires collecting data that allow for identification of HGFs, identification of their employees, and information on the employees' previous labor market positions

(Wennberg, 2005). Hence, very few studies to date—if any—have used matched employer–employee data to analyze the employment decisions of HGFs.<sup>1</sup>

The purpose of this article is to study whom HGFs hire using a matched employer–employee data set covering all individuals employed in the knowledge intensive industries in Sweden during the period 1999–2002. Theoretically, we outline a number of rationales from the labor economics and strategic management literature suggesting why the hires of HGFs might, or might not, differ from those of other firms, which we use to guide our selection of variables in the empirical analysis.

There are three main dimensions to our empirical analysis. First, we distinguish between the individuals currently employed in HGFs and the individuals hired into HGFs. Second, we measure growth in terms of either employment growth or sales growth. Third, we use different growth thresholds for the HGF category (5% and 1% highest growth firms).

Our results indicate that young individuals, poorly educated workers, single household members, immigrants, individuals with prior unemployment, and individuals without self-employment experience are more likely to be employed by an HGF. Many of these characteristics are common for individuals that are marginalized on the labor market, suggesting that HGFs provide them with employment opportunities that otherwise might not have been present. On the other hand, the results indicate that HGFs start to recruit employees from other companies toward the end of their high-growth episode. This suggests that the employment patterns of HGFs seem contingent on the stage of firm evolution. However, even when HGFs have obtained rapid growth, they are still more likely to provide new jobs for immigrants than non-HGFs. Hence, in both the analyses of HGF employees and HGF new hires, our results show that important employment opportunities are provided by young and small firms.

The next section provides a theoretical background to the article, where we develop hypotheses to guide our empirical investigation. The matched employee–employer data are described in Section 3. Section 4 presents the econometric model, while the results are reported and commented in Section 5. Finally, Section 6 summarizes and draws conclusions.

## 2. Theoretical background

The question of whom HGFs hire may be approached both through a supply-side perspective (by focusing on the reasons for individuals to take up employment in

<sup>1</sup>A recent paper by Dahl and Klepper (2007) used matched employer–employee data to analyze hiring decisions of the general population of new firms in Denmark. Nyström (2011) also uses matched employer–employee data to study the hiring decisions of start-ups in Sweden in 2005. Her results indicate that the share of immigrants, recent graduates, and people entering the labor market is slightly higher in new firms compared with incumbents.

HGFs) and through a demand-side perspective (by focusing on the need for labor and skills in HGFs). The distinction between supply and demand on the labor market is crucial for this issue since HGFs represent a specific part of the market for labor, with unique characteristics. For example, with regards to the demand for labor in HGFs, it may be that HGFs seek specific competencies that offer complementary skills to those currently existent in the firm. It may also be that HGFs are unable to offer the same type of formalized and stable jobs as incumbent firms owing to their rapid growth and consequently high organizational turbulence, and would hence try to hire labor that is younger, more flexible, or has a more versatile skill background.

In regards to the supply of individuals taking employment in HGFs, it may be that risk-seeking individuals seek employment in the challenging and turbulent work environment offered by HGFs. Such individuals may prefer the possibility of high future earnings or promotion opportunities in an HGF compared with the stable income or job security offered by large stable firms. Individuals may also be tempted by unique aspects of being employed in rapidly growing firms, such as learning opportunities, flat decision-making structures, or versatility in job tasks (Rajan and Zingales, 2001)—after all, it has been suggested that “[w]ork is more fun in a growing company,” (Roberts, 2004: 243). Further, it may also be the case that individuals with a weaker labor market position seek employment in HGFs owing to a lack of other employment opportunities. Such individuals may be attracted to HGFs to increase their human capital as a potential stepping-stone on the labor market.

### *2.1 Employees as complementary resources in HGFs*

Penrose's (1959) theory of the growth of the firm views firms as collections of idiosyncratic resources, and it is the constellation of existing resources that provides the impetus and direction for further growth. This implies that firms may choose to add human resources by first evaluating their current configuration of human resources and seeking to add those workers who are appropriate matches to existing human resources (Lepak and Snell, 1999). In our context, it is worth investigating whether HGFs have specific requirements of their new employees (such as specialized vocational training) or whether HGFs have similar hiring strategies to the control group of non-HGFs. Are HGFs composed of energetic “jack-of-all-trades” characters, or do they carefully seek a diverse and complementary human resource base?

Penrose (1959) also emphasized that managers become increasingly more accustomed to their work tasks and more efficient in the execution of these tasks. As a consequence, managerial attention is freed up as routinization becomes prevalent and these managers can direct their excess managerial attention toward growth projects. As managers become more experienced, they also become more aware of growth opportunities. A major constraint on firm growth, however, is that new

human resources must be added, and these new managers must be trained and internalized, which takes time and effort. If a firm attempts to grow too fast, then managers may be too distracted with their growth projects and with training new managers to maintain previous levels of production efficiency. The “Penrose effects” may arise, then, as excessively fast growth leads to a decrease in productivity.<sup>2</sup> In our context, it can be expected that HGFs will struggle to keep productivity levels high, as they can easily become overwhelmed by issues relating to their fast growth. As a result, they may seek employees who are better suited to the stresses and strains of managing fast growth.

In their treatment of the resource-based view of the firm, Foss and Ishikawa (2007) and Foss *et al.* (2008) suggest that Penrose’s view of firm growth is intimately tied to the subjective view of resources among managerial teams, given the heterogeneity of managerial mental models and shared experiences.<sup>3</sup> Following this argument, HGFs would strive to recruit individuals with extensive human capital and industry experience but with diverging mental models. The ideas by Foss and colleagues have some support in the research on drivers of HGFs, where the human capital of employees has been shown to facilitate rapid growth (Almus, 2002). Hence, from a resource-based perspective, HGFs need to expand and augment their stock of human capital by hiring employees that offer complementary capabilities needed to sustain and expand the scope of operations in the firm.

Furthermore, the type of human capital resources needed for HGFs may differ depending on the firms’ age and size. The model of firm growth proposed by Greiner (1972) emphasizes that growing organizations pass through a number of stages of organizational transformation, from an informal creative team, through stages of increasing monitoring and delegation, into a lumbering mammoth controlled by bureaucrats. Workers may have preferences regarding their employer’s size, given that the nature of the work environment (including factors such as autonomy, skills utilization and diversity of tasks all contributing toward overall job satisfaction) is strongly affected by the size of the organization. For example, life cycle models of firm evolution (Miller and Friesen, 1984; Kazanjian and Drazin, 1989) suggest that rapidly growing firms would reach a stage where formalized hiring practices would become important (Davila and Foster, 2005). In sum, this line of arguments suggests that HGFs of different sizes may attract different employees.

## 2.2 Hiring new employees in HGFs as a cost-efficient strategy

However, it is not necessarily the case that HGFs always benefit from hiring highly skilled employees that already have jobs. Such employees do not only come with

<sup>2</sup>Cf. the literature emphasizing the importance of founder characteristics for (new) firm performance (e.g. Santarelli and Vivarelli, 2007 and Roberts *et al.*, 2011).

<sup>3</sup>See also Lockett and Thomson (2004) and Lockett (2005) on Penrose’s contribution to the RBV.

higher general human capital, they also come at a higher cost and are more likely to seek other work unless their internal promotion possibilities accrue rapidly (Feldman and Ng, 2007). In dynamic labor markets, especially where customer-contact settings are important, high turnover rates may not only increase the costs of recruitment and selection, but also negatively affect sales growth because new employees face a learning curve, and the cost of training new staff may be lower than the cost of hiring highly skilled staff (Batt, 2002).

There is ample empirical evidence that wages are consistently higher at larger more stable firms, even after exhaustive efforts to control for observable worker characteristics and other job attributes (e.g. Oi and Idson, 1999). Garen (1985) and Kremer (1993) develop theoretical models that explain the systematic sorting of more productive workers to larger employers as an efficiency-enhancing outcome in economies with heterogeneous, imperfectly substitutable labor. Small and more rapidly growing HGFs may favor less specialized labor if recruitment and training costs are lower than the costs of recruiting specialized labor, especially if specialized labor is more mobile and less likely to stay in the firm. However, for larger HGFs that have already achieved a period of growth, the opposite may be true. Hence, it is possible that the selection and sorting of employees into HGFs through hiring and compensation is contingent on the stage of development of the firm (Halabisky *et al.*, 2006). In line with this, Bassanini (2010) finds that gross jobs and worker flows are contingent on firm characteristics like age, industry, and size. From the employee perspective, individuals may seek employment in HGFs despite the possible uncertainty associated with such employment, if it may offer a springboard that can enhance their labor market position. This would primarily concern individuals with a weak labor market position such as the unemployed. It may also concern those seeking to learn specific skills, such as minorities, youths, and other individuals with a weaker labor market position. These groups may be tempted to enhance their labor market potential by taking employment in HGFs, despite the employment risk associated with HGFs. In their theory of recruitment and monitoring in young growing firms, Rajan and Zingales (2001) explain how owner-entrepreneurs of growing firms have to provide new employees with the knowledge of or access to critical resources for them to learn to produce effectively. While the focus of Rajan and Zingales is on monitoring and incentives, rather than reallocation of these critical resources, a conclusion of their theory is that from the perspective of employees, young growing firms constitute a suitable setting for learning key skills.

### 2.3 Matching models

The labor economics literature focuses on the matching of job vacancies and unemployed individuals, suggesting that it takes time to create new job-worker pairs (see Mortensen and Pissarides, 1999 for a survey). The more time is spent searching for a suitable employee, the higher the costs, but the better the



expected match.<sup>4</sup> In this context, firms choose an “optimal stopping strategy,” which puts limits on the amount of time they are willing to invest in searching for new hires. In HGFs, it is reasonable to expect that less time is available to search for new hires. Time spent in search bears the opportunity cost of neglecting a growing pile of work tasks. HGFs therefore have a higher degree of urgency, and cannot afford to “hold out” for long in the hope of finding a better match. Summarizing, this line of argument suggests that in contrast to the resource-based theory’s emphasis on growing firms employing individuals with high human capital, HGFs might be expected to compromise the quality of their new hires for speed of hiring.

It can be concluded that theory and prior research suggest a number of possible reasons why some individuals would seek employment in HGFs, and that HGFs would seek to employ individuals with distinct characteristics. Although the theoretical explanations sketched out above are rooted in existing theory, we acknowledge that there is a tension between them. Do we really expect that HGFs start with superior human resources, but then take on employees with lower human capital? This goes against notions of firms seeking to maintain a coherent match of the quality of their employees (Kremer, 1993). With little empirical work to guide us in our assessment of these potential explanatory mechanisms, our empirical exercise attempts to fill this gap.

In our study, firm growth is measured either in terms of employment or sales. While these two growth indicators are correlated, they represent different facets of firm growth (Coad, 2010). We expect that HGFs experiencing fast growth of sales are different from HGFs experiencing fast growth in terms of employees. Sales can be considered an output, while employment is essentially an input. As such, HGFs that grow rapidly in sales might be expected to be more efficient and more profitable than employment HGFs, and therefore we suspect the employees of HGFs growing rapidly in sales to be more skilled than the employees of HGFs growing rapidly in employment.

### 3. Data

#### 3.1 Data sources

To investigate what kind of employees HGFs hire, we need data that allows for identification of HGFs, as well as identification of their employees and information

<sup>4</sup>Hiring costs can be substantial and also tend to increase with firm size. Blatter *et al.* (2012: 25) observe that, “Very small firms with fewer than 10 employees spend on average 10 weeks of wage payments to fill a vacancy, while large firms with 100 or more employees have to bear hiring costs that are almost 17 weeks of wage payments” and that, “newly-hired workers are not yet fully productive for about 80 days. During this time, the average productivity-loss compared to an average skilled worker within a firm is about 30%.”



on the employees' previous labor market positions. To facilitate these demands, we draw on a unique matched employer–employee data set maintained by Statistics Sweden (SCB), the official census bureau in Sweden. Firm-specific information is obtained from RAMS (“Registerbaserad arbetsmarknadsstatistik”), a database that provides yearly data on all firms in Sweden. The firm-specific data are matched with individual data from LISA (“Longitudinell integrationsdatabas för sjukförsäkrings- och arbetsmarknadsstudier”), a longitudinal database that provides yearly information on all inhabitants in Sweden  $\geq 16$  years. Note that our unit of analysis is the individual, not the firm.

Specifically, our data originate from a large longitudinal study of entrepreneurship in the knowledge intensive sector between 1989 and 2002 (Delmar and Wennberg, 2010). Firms were identified as belonging to these sectors if they met Eurostat and Organization for Economic Cooperation and Development (OECD) classifications. These classify industries as knowledge-intensive if the ratio of research and development expenditures to gross domestic product is above the mean ratio in the economy (Götzfried, 2004, see Table A1). This excludes basic industries such as agriculture, retail commerce, and simple services.<sup>5</sup> Only firms that were active during the study period (1999–2002) were included in the sample, which means that we excluded all firms with zero turnover from our sample. We also excluded all firms that were active in the health care and education industries (SIC-codes 80–85), since these industries are highly regulated and dominated by public actors in Sweden. The final sample thus contains  $\sim 50,000$  firms and 500,000 individuals in 2002.<sup>6</sup>

### 3.2 Defining HGFs

The analysis of HGFs includes deciding on an indicator of growth, measurement of growth, and a suitable time to study (Delmar and Davidsson, 1998; Delmar *et al.*, 2003). A growth indicator relates to the variable used to calculate growth, while the measurement of growth concerns how growth is calculated (absolute growth, relative growth, or some combination of the two).

We use number of employees and sales as our growth indicators since they are most commonly used (Daunfeldt *et al.*, 2013), but only moderately correlated (Shepherd and Wiklund, 2009). Growth is measured as the percentage change in the number of employees and sales volume during the period 1999–2002. We use the whole period since (i) it accommodates the fact that while many HGFs exhibit “erratic” growth as

<sup>5</sup>Appendix 1 reveals that some of the included industries are not knowledge-intensive industries. The reason is that the data set also follows individuals that transition into knowledge intensive firms from nonknowledge intensive firms. We have therefore also done estimations where SIC-codes 1–18, 24, 37, 41, 62, 63, 75 and 90 have been excluded from the analysis. The results are unchanged and available from the authors on request.

<sup>6</sup>4,244,000 individuals were employed in total in Sweden in 2002, meaning that our sample represents  $\sim 12\%$  of the total workforce.

opposed to steady growth (Coad, 2007; Coad and Hözl, 2009; Daunfeldt and Halvarsson, 2012; Hözl, 2014), other HGFs may exhibit “persistent” growth, and (ii) this is a common length of study period in prior studies of growth (Henrekson and Johansson, 2010). Note that growth is calculated here as relative rather than absolute growth. While absolute measures of firm growth lean in favor of large firm growth, relative growth measures might lead to a bias toward small firms (Schreyer, 2000; Acs *et al.*, 2008). We therefore control for firm size, and also conduct robustness tests where we test our models on firms in different age and size categories.

There is no commonly accepted definition of HGFs. They are usually identified either as a certain share of the fastest-growing firms or as those growing at a particular rate, measured either as total growth or as annualized growth over the period. Other definitions of HGFs include firms that have at least doubled their sales over a 4-year period and have an employment growth quantifier of two or more over the period (Acs *et al.*, 2008). The OECD recently proposed defining HGFs as those with  $\geq 10$  employees at the beginning and average employment growth exceeding 20% over a 3-year period (Ahmad, 2006).<sup>7</sup> In this article, we use four different definitions of HGFs.  $HGF_i$  takes the value 1 for the (i) 1% fastest growing firms in terms of percentage change in employees; (ii) the 5% fastest growing firms in terms of percentage change in employees; (iii) the 1% fastest growing firms in terms of percentage change in turnover; and (iv) the 5% fastest growing firms in terms of percentage change in turnover. We also considered applying the 10% threshold, but this would mean including firms that grew by only one employee during the period 1999–2002, so we decided against it.

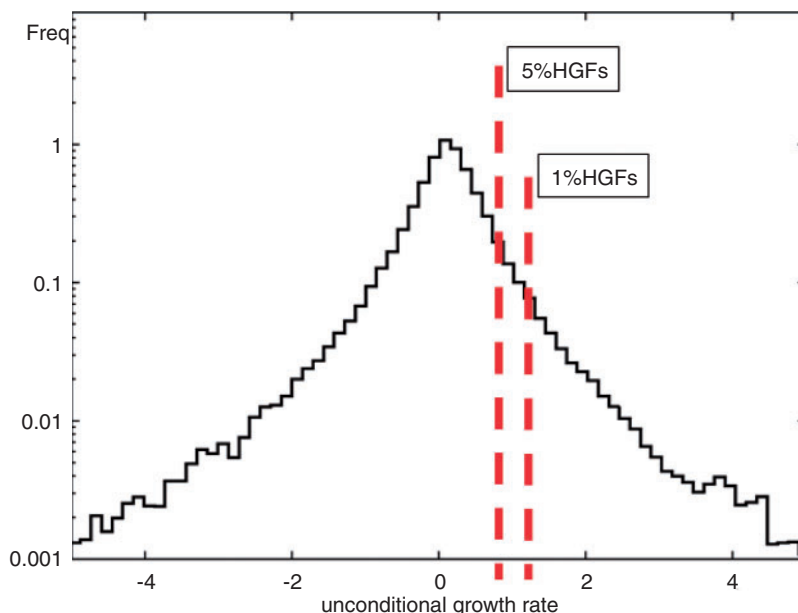
Figures 1 and 2 show the growth rate distributions for sales and employment growth, respectively, and give an indication of the thresholds that delimit the 5% and 1% fastest growing firms. They show that while a small fraction of firms grows as much as 3–4 times (300%–400%) over the 3-year period of investigation, the mean growth rates remain at 5%–10%. Further, we see that the variance in sales growth (Figure 1) is higher than the variance in employment growth (Figure 2).

### 3.3 Data and descriptive statistics

Our independent variables are the following (variable names in *italics*):

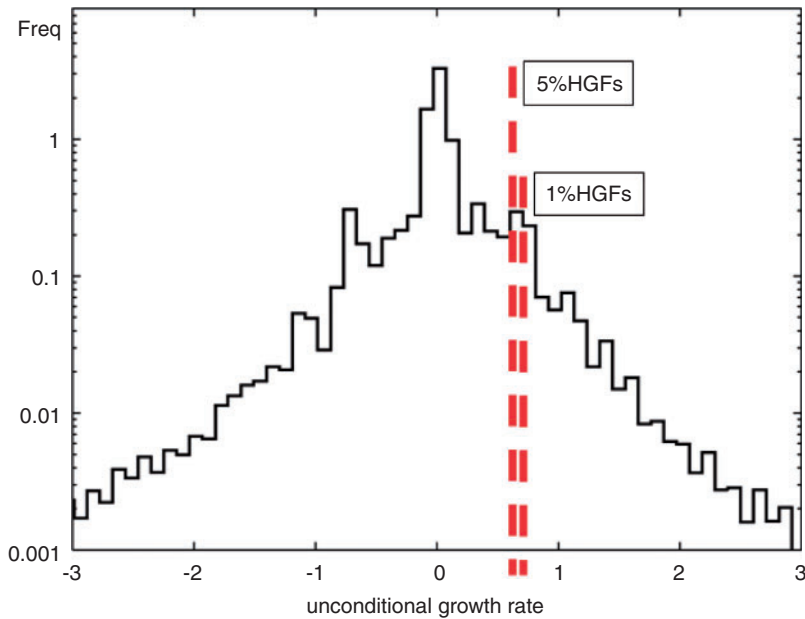
- *Age* (between 16 and 84 years).
- *Immigrant status* (four dummy variables: *Nordic* = 1 if the immigrant origin from the Nordic countries; *Western* = 1 if immigrant is from Western European countries or North America; *Eastern* = 1 if immigrant is from Eastern European countries; and *Other* = 1 if immigrant comes from Africa, Asia, or Latin America.)

<sup>7</sup>The OECD definition has, however, been criticized since it excludes most firms in the economy, and since there is empirical evidence that these firms are important in generating HGFs (Anyadike-Danes and Hart, 2011; Daunfeldt *et al.*, 2012).



**Figure 1** Kernel density of the distribution of firm sales growth rates, where growth is calculated in log-differences. Plots obtained using gbtutils 5.2 (Epanenchnikov kernel). Note the log scale on the y-axis. Thresholds delimiting the 5% and 1% fastest-growing firms occur at the values 0.814 and 1.228, respectively, and are indicated as an approximate guide.  $N = 47,390$ .

- *Gender* (1 = woman)
- *Educational attainment* (four dummy variables:  $L\_High-school = 1$  if <3 years at high-school is the highest obtained level of education;  $High-school = 1$  if completed a 3-year high-school education;  $College = 1$  if college education <3 years;  $University = 1$  if university  $\geq 3$  years).
- *Spouse* (1 = married/cohabiting, and 0 = single household member).
- *Children* (number of children in household, ordinal scale)
- *Unemployment* (measured as days in unemployment in the preceding year, ordinal scale). This is used in the analysis of being employed in a HGF (Table 5).
- *D\_Unemployed* (dummy variable whether an individual entered an HGF from unemployment, where 1 = entered from unemployment). This is used in the analysis of becoming hired in an HGF (Table 6)
- *Self-employment* (1 = self-employed between 1989 and 1997).
- *Work classification*, i.e. whether an individual had a specific occupational code (dummy variable equal to 1 if the individual has a work classification, and 0 if no classification). This variable approximates for professional specialization.
- *Year* (1 = 2002, and 0 = 2001).



**Figure 2** Kernel density of the distribution of firm employment growth rates, where growth is calculated in log-differences. Plots obtained using gbutils 5.2 (Epanenchnikov kernel). Note the log scale on the  $y$ -axis. Thresholds delimiting the 5% and 1% fastest-growing firms occur at the values 0.639 and 0.693, respectively, and are indicated as an approximate guide.  $N=47,390$ .

*Firm size* and *Firm age* are also included in the empirical analysis to test whether there are differences in employment decisions between small and large HGFs, and young and old HGFs. Firm size is measured as number of employees in 1999, while firm age is defined as the year of observation minus the registered start year. Note, however, that the data on the start year is truncated. The earliest registered start year is 1990 (even if the firm existed before 1990), implying that we cannot observe whether a firm is  $>14$  years of age. While we would ideally have more complete data on firm age, our truncated firm age variable does provide some useful information on the underlying variable of interest.

Immigration to Sweden is dominated by refugees and individuals that want to reunite with their families. This group is generally considered to be the most marginalized on the Swedish labor market. Less than 5% of all immigration to Sweden during the past decades consists of labor migration (Statistics Sweden, 2002). Refugees come primarily from Asia, Africa, and Latin America, whereas immigration from Europe and North America most often represent labor migration. Data on the region of origin of all immigrants are used to distinguish between these different types of immigrants in the empirical analysis. More specifically, we divide

immigrants into the following regions of origin: (i) Nordic countries; (ii) Western European/North America; (iii) Eastern European; and (iv) Other. Thus, the first two groups mainly consist of labor immigrants, whereas immigrants from the Eastern European countries both include refugees (mainly from former Yugoslavia) and labor immigrants. The group *other* consists of immigrants from South America, Asia, and Africa, which means that this group mainly consists of those immigrants for whom entering the Swedish labor market is most problematic.

*Educational attainment* is measured using Statistics Sweden's SUN ("Svensk utbildningsnomenklatur") variable, a standard for classification of individual education that follows the International Standard Classification of Education (ISCED). Four dummies are constructed to analyze whether HGFs are more likely than non-HGFs to hire employees with higher education, or vice versa. Our base case is individuals that have only completed elementary school.

The *work classification* variable was taken from Statistics Sweden's SSYK variable. This variable is congruent with the international classification ISCO-88 (International Standard Classification of Occupations 1988), created by the International Labor Organization (ILO). It is a hierarchical variable based on both occupations and level of work authority. However, in this article we merely use it as a control for whether individuals being hired into HGFs have clearly defined occupation or not, and have hence coded all individuals with a SSYK value as one, or zero otherwise.

Two different samples are used to analyze the employment decisions of HGFs. First, we use data on employees for all active firms in knowledge intensive industries in 2002 to analyze whether employees in fast-growing firms have certain characteristics in common. Many of the employees in these firms might have started their jobs before the firms could be characterized as HGFs. Thus, we also analyze how these firms employ new individuals as they realize their growth potential. This sample consists of individuals that were hired into an HGF from unemployment or from employment in another firm during the period 2001–2002.

### 3.3.1 Summary statistics for employees

We begin with a discussion of the summary statistics for HGF employees, before moving on to summary statistics for HGF new hires. The summary statistics in Table 1 refer to the individual and firm-level variables. Table A2 provides some summary statistics at the firm-level for firms that are HGFs in terms of sales or employment growth, at the 5% and 1% threshold levels.

In our sample of employees, the average individual is ~41 years old, ~10% of our individuals are immigrants, 36% are females, 22% have a university education, and ~6% have experience in self-employment. Comparing these figures to the summary statistics for HGFs in Table 2, we see that HGF employees have higher proportions of immigrants from Asia, Africa and Latin America (compare 0.082 for Empl-HGFs (1%) with the figure of 0.03 for the full sample). HGFs also have higher proportions

**Table 1** Summary statistics for the data set investigating individuals *being employed* in an HGF

Variable	Observations	Mean	Standard deviation	Min	Max
Age	504,764	40.94	11.98	16	84
Unemployment days	504,764	31.52	93.85	0	1277
Nordic (D)	504,764	0.033	0.18	0	1
Western (D)	504,764	0.015	0.12	0	1
Eastern (D)	504,764	0.024	0.15	0	1
Other (D)	504,764	0.03	0.17	0	1
L_high-school (D)	504,764	0.25	0.43	0	1
High-school (D)	504,764	0.24	0.42	0	1
College (D)	504,764	0.17	0.38	0	1
University (D)	502,595	0.22	0.41	0	1
Gender (D)	504,764	0.36	0.48	0	1
Spouse (D)	504,764	0.54	0.50	0	1
Children	504,764	0.70	0.99	0	12
Work classification (D)	504,764	0.93	0.26	0	1
Self-employment (D)	496,718	0.063	0.24	0	1
Firm size	504,764	1838	4443	1	36594
Firm age	499,480	11.22	3.29	4	14

Notes: D = dummy variable. Mean and standard deviation for turnover is measured in billion SEK.

of poorly educated workers, and lower proportions of university educated employees compared with non-HGFs. Interestingly, HGF employees tend to have lower levels of self-employment experience.

### 3.3.2 Summary statistics for new hires

Summary statistics for the sample of new hires and for those already employed by HGFs are presented in Tables 3 and 4, respectively. In contrast to the corresponding statistics for employees, we see that new HGF hires, on average, are more likely to be university-educated (0.33% in Table 3 vs. 0.22% in Table 1), are more likely to be females (45% vs. 36%) and more likely to be immigrants from Asia, Africa, and Latin America (9.3% vs. 5%, as denoted by the *Other* immigrant variable). New hires in HGFs also tend to have less experience in self-employment (2.65% vs. 6.36%) and are slightly younger (36 years vs. 41 years) than those already employed in an HGF. These descriptive data indicate that there might indeed be distinctive employment patterns in HGFs, and also distinctive recruitment patterns. To analyze these

**Table 2** Summary statistics for the data set investigating individuals *being employed* in an HGF, for various definitions of HGFs (top 5% or top 1% sales or employment growth)

Variable	Empl (1%)		Empl (5%)		Sales (1%)		Sales (5%)	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Age	41.240	11.953	39.666	11.698	43.728	11.407	40.422	11.733
Unemployment days	57.629	129.304	40.743	107.677	44.452	117.220	44.290	112.736
Nordic	0.039	0.194	0.042	0.200	0.042	0.201	0.034	0.182
Western	0.013	0.112	0.016	0.126	0.013	0.111	0.014	0.116
Eastern	0.035	0.184	0.030	0.171	0.033	0.179	0.031	0.174
Other	0.082	0.274	0.051	0.219	0.087	0.282	0.062	0.241
L_high-school	0.310	0.462	0.260	0.439	0.346	0.476	0.273	0.445
High-school	0.190	0.393	0.219	0.414	0.163	0.369	0.207	0.405
College	0.117	0.321	0.155	0.362	0.099	0.299	0.144	0.351
University	0.139	0.345	0.199	0.399	0.117	0.322	0.188	0.391
Gender	0.391	0.488	0.352	0.478	0.385	0.487	0.365	0.481
Spouse	0.437	0.496	0.492	0.500	0.454	0.498	0.470	0.499
Children	0.601	0.971	0.684	0.993	0.574	0.956	0.646	0.982
Work classification	0.942	0.234	0.946	0.225	0.952	0.213	0.943	0.232
Self-employment	0.019	0.136	0.022	0.147	0.016	0.127	0.031	0.173
Firm size	83.775	206.571	1815.231	3392.537	367.871	931.227	487.151	1073.007
Firm age	8.939	3.328	10.563	3.632	10.421	2.916	9.143	3.502
No observations	31,472		96,808		23,472		50,852	

*Notes:* Number of observations is reported, but might be slightly less for some variables, due to a small number of missing observations in some cases.



**Table 3** Summary statistics for the data set investigating individuals *hired* into an HGF in 2000–2001

Variable	Observations	Mean	Standard deviation	Min	Max
Age	258,813	35.78	12.19	15	93
Unemployed (D)	256,403	0.20	0.40	0	1
Nordic (D)	258,813	0.03	0.17	0	1
Western (D)	258,813	0.01	0.12	0	1
Eastern (D)	258,813	0.03	0.16	0	1
Other (D)	258,813	0.05	0.16	0	1
L_high-school (D)	258,813	0.22	0.41	0	1
High-school (D)	258,813	0.26	0.44	0	1
College (D)	258,813	0.18	0.38	0	1
University (D)	258,492	0.33	0.47	0	1
Gender (D)	258,813	0.45	0.50	0	1
Spouse (D)	258,813	0.40	0.49	0	1
Children	258,813	0.64	0.97	0	12
Work classification (D)	258,813	0.44	0.50	0	1
Year (D)	258,813	0.37	0.48	0	1
Self-employment (D)	252,295	0.027	0.16	0	1
Firm size	258,813	1697	4569	1	36,594
Firm age	256,494	10.20	3.35	3	14

Notes: D = dummy variable. Mean and standard deviation for turnover is measured in billion SEK.

patterns in detail, below we present a detailed econometric analysis in two steps, first analyzing what kind of people are employed in HGFs, then analyzing new hires into HGFs. To ensure that our results are not an artifact of different definitions, we break down all analyses based on the four different definitions of HGFs (the 1% and 5% fastest growing firms in employment and sales, respectively).

#### 4. Econometric analysis

To investigate whether HGFs employ different individuals compared with non-HGFs, we estimate the following probit model:

$$\Pr(HGF_{it} = 1) = F(\theta_i^i X_{it} + \psi_j^j Y_{it} + a_1 + a_R + \varepsilon_{it}), \quad (1)$$

where the dependent variable ( $HGF_i$ ) is a dichotomous variable, taking the value 1 if individual  $i$  can be classified as an HGF employee during the period 1999–2002, and 0 otherwise;  $X_{it}$  is a vector of individual-specific characteristics assumed to influence

**Table 4** Summary statistics for the data set investigating individuals *hired* into an HGF in 2000–2001, for various definitions of HGFs (top 5% or top 1% sales or employment growth)

Variable	Empl (1%)		Empl (5%)		Sales (1%)		Sales (5%)	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Age	40.169	12.479	37.764	12.491	42.925	12.002	38.644	12.311
Unemployed (D)	0.106	0.308	0.140	0.346	0.076	0.265	0.127	0.333
Nordic	0.040	0.196	0.036	0.187	0.046	0.210	0.036	0.186
Western	0.013	0.115	0.015	0.121	0.013	0.115	0.014	0.119
Eastern	0.038	0.192	0.031	0.172	0.039	0.194	0.035	0.184
Other	0.093	0.291	0.068	0.252	0.105	0.307	0.082	0.275
L_high-school	0.309	0.462	0.251	0.434	0.345	0.475	0.272	0.445
High-school	0.199	0.399	0.232	0.422	0.161	0.367	0.211	0.408
College	0.116	0.320	0.150	0.357	0.097	0.296	0.140	0.347
University	0.181	0.385	0.272	0.445	0.139	0.346	0.250	0.433
Gender	0.436	0.496	0.419	0.493	0.452	0.498	0.433	0.495
Spouse	0.400	0.490	0.409	0.492	0.406	0.491	0.399	0.490
Children	0.579	0.963	0.614	0.967	0.537	0.938	0.599	0.963
Work classification	0.685	0.464	0.521	0.500	0.796	0.403	0.599	0.490
Year	0.673	0.469	0.482	0.500	0.788	0.409	0.571	0.495
Self-employment	0.017	0.128	0.019	0.138	0.012	0.109	0.019	0.135
Firm size	65.485	161.601	685.821	1870.957	89.747	359.840	227.096	680.322
Firm age	8.381	3.422	9.351	3.592	9.445	3.048	8.335	3.495
No observations		31,656		73,136		21,020		41,729

*Notes:* Number of observations is reported, but might be slightly less for some variables, due to a small number of missing observations in some cases.

the probability of being employed by an HGF in period  $t$ ; and  $\theta_t$  is the corresponding parameter vector.  $Y_{it}$  is a vector of firm-specific characteristics relating to firm  $j$ , and  $\psi_j^i$  is the corresponding parameter vector.

To control for heterogeneity across industries and regions, industry-specific ( $a_1$ ) and region-specific ( $a_R$ ) fixed effects are also included in the model. The inclusion of a full set of firm-specific fixed effects in our probit model proved to be too computationally intensive, so we did not include them. To allow for the possibility that some HGFs have systematically different hiring practices than others, we cluster our standard errors at the firm-level.

The vector of individual-specific characteristics,  $X_{it}$ , includes age, days in employment during the period 1999–2002, four dummies indicating whether the individual is born outside Sweden, sex, educational attainment, marital status, and the number of children in the household. We expect age to display nonlinear effects (from inexperienced youths, to the “golden age” or middle age, to those who are too old), and so we include an age-squared term alongside the linear age variable. The vector of firm-specific characteristics,  $Y_{jt}$ , includes firm age and firm size. The latter variable is measured using the initial size of the firm, measured as the number of employees in 1999.

Equation (1) is also estimated for a subsample including only individuals who changed their employment status in 2001 or 2002, either going from unemployment to employment or changing employer. In this case, we use an unemployment dummy instead of days in unemployment to investigate whether HGFs hire unemployed individuals or already employed individuals to a greater extent than non-HGFs when expanding their businesses. We also include a year dummy, taking the value 1 if the individual changed his/her employment status in 2002, to control for the influence of macroeconomic trends in the hiring decision of HGFs.

## 5. Results

Equation (1) is first estimated for the full sample, using data on all individuals employed by firms active in the Swedish knowledge intensive industries in 2002. These are referred to as HGF employees (as opposed to HGF new hires). The aim is to analyze whether individuals employed by HGFs have certain characteristics that are different from those employed by other firms. In the next step, Equation (1) is reestimated for a subsample of individuals that changed their employment status in 2001 or 2002, either by ending an unemployment period or changing employer. These individuals are referred to as HGF new hires. Industry- and region-specific fixed effects are omitted from the tables to save space.<sup>8</sup>

<sup>8</sup>The explanatory power of the models increases a lot when these fixed effects are included in the model, indicating that the probability of being employed or hired by HGF is influenced by industry and region-specific heterogeneity. The results are available from the authors on request.

### 5.1 *The characteristics of employees among HGFs*

The results from estimating Equation (1) for the full sample are presented in Table 5, which shows the probit regression results when the growth of HGFs is measured in terms of employment or sales, or whether HGFs are defined as the top 1% or the top 5% fastest growing firms. Despite the differences between these regressions, they do not give conflicting results. The Pseudo- $R^2$  statistics indicate that a better model fit is obtained when HGFs are defined as the top 1% fastest-growing firms.

Irrespective of the choice of growth indicator and definition of HGFs, the results reveal that HGF employees on average are younger, have longer unemployment periods, somewhat lower education level, and are more likely to be immigrants from Asia, Africa, and Latin America compared with non-HGF employees. Young individuals, the long-term unemployed, the low-educated, and immigrants from Asia, Africa, and Latin America are often seen as outsiders on the labor market. Taken together, the evidence thus suggests that rapidly growing firms can provide these groups with employment opportunities that otherwise might not have been present. Below we look to the coefficients of Table 5 in more detail, attending to both their statistical significance and their economic significance in terms of marginal effects.

Our marginal effect coefficients can be interpreted as follows: a coefficient of 0.061 on the *Other* immigrants variable in the case of Employment HGFs (top 5%), for example, indicates that immigrants from Asia, Africa, or Latin America are 6.1% more likely to be employed by an HGF, compared with the baseline category (Swedish born). This is a substantial effect compared with previous studies on the role of ethnicity in hires (Holzer and Neumar, 1996; Giuliano *et al.* 2009). The differences between nonimmigrants and immigrants from Asia, Africa, or Latin America in being employed by HGFs are relatively weaker for the three other definitions (marginal effects 1.06%, 0.83%, and 1.49%). The patterns for the *Nordic*, *Western*, and *Eastern* immigrant variables are similar to the patterns of the *Other* immigrant variable, with all dummies being positively associated with employment in an HGF. These statistical relationships are consistently stronger for the top 5% HGFs in terms of employment growth.

The other key variables of interest in our study are employees' age and prior unemployment. The estimates in the top row at Table 5 indicate that employees' age is unanimously negatively associated with being employed in an HGF (marginal effects:  $-0.03\%$  and  $-0.22\%$  for the 1% and 5% fastest growing HGFs in terms of employment, and marginal effects  $-0.09\%$  for the 5% fastest growing HGFs in terms of sales). While these effects may seem slight, it should be remembered that the age variable ranges from 16 to 84, with a standard deviation of 11.98 (Table 1). Hence, a one standard deviation decrease in age from the sample mean indicates that a 29-year-old person is between 0.36% and 2.6% more likely to be employed

**Table 5** Probit results for *being employed* in an HGF. Dependent variable equals 1 if the individual is employed by an HGF in 2002, otherwise 0

Variable	Empl (1%)		Empl (5%)		Sales (1%)		Sales (5%)	
	Marg. Eff.	z-stat	Marg. Eff.	z-stat	Marg. Eff.	z-stat	Marg. Eff.	z-stat
Age	-0.0003*	-5.84	-0.0022*	-5.29	-0.0001	-1.82	-0.0009*	-6.60
Age squared	3.22E-06	1.13	8.33E-06	0.38	1.11E-06	0.27	3.97E-06	0.50
Unemployment days	1.97E-05*	4.00	0.0001*	4.35	3.63E-06	1.24	3.80E-05*	2.43
Immigrant status								
Nordic	0.0016	1.56	0.0257*	4.15	0.0001	0.05	0.0035	1.24
Western	0.0016	1.35	0.0314*	2.94	0.0003	0.21	-0.0003	-0.08
Eastern	0.0079*	2.73	0.0268*	2.53	0.0029	1.39	0.0100	1.76
Other	0.0106*	4.78	0.0612*	4.22	0.0083*	4.10	0.0149*	2.77
Education level								
L_high school	-0.0025*	-5.26	-0.0176*	-3.33	0.0003	0.37	-0.0032	-1.36
High school	-0.0043*	-6.44	-0.0257*	-2.61	-0.0018	-1.70	-0.0089*	-3.45
College	-0.0043*	-3.83	-0.0141	-1.13	-0.0021	-1.33	-0.0086	-1.82
University	-0.0039*	-2.33	-0.0069	-0.45	-0.0019	-0.90	-0.0049	-0.91
Control variables								
Spouse	-0.0023*	-5.53	-0.0101*	-4.99	-0.0018*	-3.59	-0.0056*	-4.88
Gender	0.0004	0.41	0.0045	0.55	0.0001	0.05	-0.0039	-1.29
Log(children)	0.0002	0.40	-0.0011	-0.44	-0.0003	-0.68	1.98E-05	0.02
Work classification	0.0054*	4.82	0.0499*	4.14	0.0028	1.21	0.0184*	4.51
Self-employment	-0.0093*	-12.77	-0.1043*	-11.93	-0.0096*	-9.84	-0.0302*	-8.05
Firm age	-0.0025*	-4.59	-0.0128*	-2.91	-0.0011*	-2.17	-0.0109*	-6.45
Firm size	-0.0051*	-5.21	-0.0180*	-2.58	-0.0052*	-5.69	-0.0092*	-2.86
Sector dummies	Yes		Yes		Yes		Yes	
Region dummies	Yes		Yes		Yes		Yes	
Pseudo-R <sup>2</sup>	0.5159		0.2148		0.5669		0.3445	
No observations	483,996		489,297		438,025		488,975	

*Notes:* Marginal effects and z-statistics reported. Standard errors clustered at the firm level. Sector dummies at the 2-digit level SIC-level. Region dummies at the county level. The asterisk (\*) denote significance at the 5% level.

in an HGF compared with a 41-year-old person (the mean age of individuals in the sample).<sup>9</sup>

Attending next to the coefficient for *Unemployment* we find that it is consistently positively associated with being employed in an HGF, but only marginally significant

<sup>9</sup>The coefficient for *Age squared* is but a control variable, akin to much research in hiring decisions in labor economics (e.g. Giuliano *et al.*, 2009). The effect of this coefficient is negligible.

for the 1% fastest growing firms in terms of sales. The estimated coefficients indicate that an individual with 100 more days of unemployment during the past year (evaluated at the sample mean) is 0.2%–1% more likely to be employed by an HGF.<sup>10</sup>

The four education dummies in Table 5 all exhibit a negative but negligible influence on *being employed* in an HGF. When HGFs are defined as the top 1% fastest-growing firms in terms of employment, the marginal effects of all four education dummies remain <1%. However, in the model predicting employment in HGFs defined as the top 5% fastest-growing firms in employment, both those that have spent <3 years in high-school or attained a 3-year high-school degree exhibit a negative association with being employed in an HGF compared with those that have only completed elementary school, with marginal effects at –1.76% and –2.57%, respectively. Taken together, these results indicate that HGF employees in general have somewhat lower education levels than employees in other firms.

Looking at the control variables, we find that HGFs employ single household members to a greater extent than non-HGFs, as evidenced by the statistically significant negative coefficient estimates for the *Spouse* dummy (marginal effects –0.23%, –1.01%, –0.18%, and –0.56%). The parameter estimates regarding the *Work classification* code for employment HGFs indicate that employees with a work classification code are 0.54% and 4.99% more likely to be employed by an HGF. The null hypothesis of no effect of work classification on the likelihood of being employed by sales HGFs cannot be rejected for the 1% fastest growing firms, whereas employees in the 5% fastest growing firms in terms of sales are 1.84% more likely to have a work classification code than employees in non-HGFs. This indicates that HGF employees in general do not seem to occupy ill-defined job positions.

Interestingly, the dummy for prior *Self-employment* is one of the strongest single coefficients in our model, with marginal effects at –0.93%, –10.43%, –0.96%, and –3.02%, all statistically significant. This indicates that HGFs are much less likely to employ prior entrepreneurs, perhaps because such individuals are more likely to start firms on their own (Wennberg *et al.* 2010).

Our firm-level variables indicate that HGFs are consistently more likely to be younger, and also more likely to be smaller than non-HGFs, which is in line with previous research.<sup>11</sup>

<sup>10</sup>We have also estimated models where *Unemployment* is logged, but economic interpretations of logged variables in a nonlinear model such as the probit are more complicated. All results remain qualitatively similar, and are available from the authors on request.

<sup>11</sup>An aggregated analysis as in Table 5 might wipe out effects that are present in a more disaggregated analysis. Therefore, we also estimated Equation (1) for different firm sizes and age classifications. This robustness analysis did not yield any major insights, however, and so we do not report it here.

## 5.2 New hires

Table 6 shows estimates when we only include individuals that changed employment status to being employed by an HGF in 2001 or 2002. In short, the results show that akin to the previous analysis of HGF employees, immigrants and the less educated are also more likely to be hired into HGFs. However, there is no longer any strong association between individuals' prior unemployment or their age on the likelihood

**Table 6** Probit Regression on individuals *being hired* to an HGF in 2001–2002. Dependent variable equals one if the individual is hired by an HGF in 2001 or 2002, otherwise zero

Variable	Empl (1%)		Empl (5%)		Sales (1%)		Sales (5%)	
	Marginal effects	z-stat	Marginal effects	z-stat	Marginal effects	z-stat	Marginal effects	z-stat
Age	0.0001	0.89	0.0011	1.47	0.0002	1.15	0.0002	0.80
Age_squared	−0.00001	−1.87	−0.00002	−0.88	−3.87E−06	−0.63	−0.00003*	−2.24
Unemployed (D)	−0.0103*	−2.80	−0.0580*	5.89	−0.0053*	−2.35	−0.0222*	−3.59
Immigrant status								
Nordic	0.0043	1.53	0.0285*	3.37	0.0019	1.04	0.0022	0.42
Western	0.0086*	2.11	0.0196	1.61	0.0058	1.59	0.0084	1.06
Eastern	0.0277*	3.38	0.0348*	2.08	0.0068*	2.43	0.0260*	1.99
Other	0.0304*	4.89	0.0749*	3.56	0.0108*	3.10	0.0242*	2.33
Education level								
L_high school	−0.0005	−0.21	−0.0276*	−3.49	0.0024	1.97	0.0024	0.52
High school	−0.0064*	−2.79	−0.0459*	−3.20	−0.0007	−0.47	−0.0067	−1.57
College	−0.0047*	−2.02	−0.0209*	−2.32	−0.0005	−0.21	−0.0060	−1.23
University	−0.0092*	−2.33	−0.0423*	−2.06	−0.0017	−0.63	−0.0040	−0.47
Control variables								
Gender	−0.0050	−1.32	−0.0054	−0.34	−0.0008	−0.38	−0.0144	−1.94
Spouse	−0.0028*	−2.02	−0.0078	−1.87	−0.0012	−1.06	−0.0027	−1.00
Log (Children)	−0.0019	−1.39	−0.0118*	−2.53	−0.0018	−1.82	−0.0040	−1.50
Work classification	−0.0021	−0.84	−0.0047	−0.61	0.0040*	2.87	−0.0035	−0.70
Self-employment	−0.0185*	−7.98	−0.0878*	−9.02	−0.0105*	−5.71	−0.0347*	−6.48
Firm age	−0.0088*	−5.80	−0.0248*	−4.74	−0.0032*	−2.86	−0.0218*	−6.75
Firm size	−0.0168*	−5.98	−0.0384*	−3.46	−0.0098*	−5.06	−0.0234*	−4.61
Sector dummies	Yes		Yes		Yes		Yes	
Region dummies	Yes		Yes		Yes		Yes	
Pseudo-R <sup>2</sup>	0.5261		0.2519		0.6261		0.3932	
No. observations	246,443		248,578		235,874		248,101	

*Notes:* Marginal effects and associated z-statistics. Standard errors clustered at the firm level. Sector dummies at the 2-digit level SIC-level. Region dummies at the county level. The asterisk (\*) denote significance at the 5% level.



of being hired into HGFs. Toward the end of their high growth episode, HGFs thus seem able to attract older individuals and individuals that already have a job. Below, we report on all coefficients in some more detail.

Looking first at the four immigrant dummies, we see for the *Eastern* variable that HGFs are more likely to hire immigrants from Eastern European countries (marginal effects 2.77%, 3.48%, 0.68%, and 2.60%). The *Other* immigrant variable also show that immigrants from Asia, Africa, and Latin America are more likely to be hired by HGFs compared with nonimmigrants, irrespective of growth indicator and choice of cutoff level for being defined as an HGF (marginal effects 3.04%, 7.49%, 1.08%, and 2.41%).

The coefficients for *Age* and *Age\_squared* have no noteworthy association with being hired by HGFs, but the dummy variable for *unemployment* is negative, which suggests that individuals who were unemployed are 0.53%–5.08% less likely to be hired in HGFs compared with non-HGFs. It thus appears that HGFs are initially composed of individuals with a history of unemployment, but that HGFs tend to avoid taking on unemployed individuals when it comes to hiring new individuals toward the end of the growth phase.

HGF hires are also more likely to be lower-educated workers, although these associations are only significant for employment-HGFs, not sales-HGFs. Specifically, employees with a university degree are 4.23% less likely to be hired by the 5% fastest growing HGFs in terms of employment and 0.92% less likely to be hired by the 1% fastest growing HGFs in terms of employment.

The control variables exhibit limited influence on the likelihood of being hired by an HGF, but here as well we find that new hires in HGFs tend to have less self-employment experience regardless of how we define HGFs, although once again the association is stronger when high growth is measured in terms of employment (marginal effects at  $-1.85\%$ ,  $-8.78\%$ ,  $-1.05\%$ , and  $-3.47\%$ ).

Taken together, the two probit equations comparing employees in HGFs and new hires in HGFs indicate that while HGFs tend to be composed of employees from groups that are often considered as potential outsiders on the labor market (younger or less educated individuals, immigrants, and more often with recent experience in unemployment), when it comes to new hires, they are no longer as likely to recruit from these disadvantaged groups. One interpretation is that firms with strong growth ambitions need to employ individuals from these groups to begin their fast growth. However, at later stages of their high-growth episode, their recruitment strategy seems to change. Now they seem able to attract older individuals and individuals that already have jobs.

Also in this analysis, our firm-level variables indicate that HGFs are more likely to be younger and smaller than non-HGFs. To ensure the robustness of the results we therefore analyzed whether the hiring decision differs between old and young HGFs, and among HGFs of different sizes by estimating Equation (1) separately for size classes and age intervals. We did not find any noteworthy differences in these models

(available on request), which indicates that our analyses are relevant both for younger and older HGFs, as well as for larger and smaller HGFs.

## 6. Discussion

We began this article with the observation that HGFs have been shown to generate many new jobs, but research to date has been virtually silent regarding which types of individuals are hired by HGFs. As policymakers are increasingly looking to new growing firms as drivers of job creation and economic development, this is a conspicuous void in the literature. Research to date also lacks a theoretical perspective that may explain hiring practices in HGFs. While the resource-based theory of firm growth originating with Penrose (1959) suggests that growing firms need to hire capable individuals with extensive human capital to cope with the challenges of growth, other work in microeconomics and labor economics suggests that due to the uncertainty associated with rapid growth (Henrekson and Johansson, 2011) and the necessity of close ties of entrepreneurs to new employees (Witt, 2000; Rajan and Zingales, 2001), individuals with a weaker labor market position may be tempted to take employment in HGFs to enhance their labor market potential. In this article, we began to fill this empirical and theoretical void based on a study using a comprehensive matched employer–employee data set that includes all active firms in the Swedish knowledge intensive industries during 1999–2002.

Our empirical investigation revealed several intriguing results. First, when analyzing what characterizes the work-force among HGFs, we found that young individuals, those who are less educated, immigrants, and those with long unemployment periods were more likely to be employed by HGFs than non-HGFs. These groups are often considered as typically outsiders on the labor market, suggesting that HGFs provide them with employment opportunities that are not present to the same extent among other firms. This speaks against the suggestions of resource-based theory that growing firms need to hire individuals with “complementary skills” to bolster the base of human capital in the growing firm (Penrose, 1959). Our results are reminiscent of the case-study evidence in Barringer *et al.* (2005), who observe that fast-growth firms are not particularly selective in their hiring decisions, but put more emphasis on on-the-job training. Below we discuss two, partly related, theoretical explanations for our findings.

From an economic viewpoint, HGFs, especially those in knowledge-intensive sectors, might be credit constrained since they are dependent on developing new products, solutions, and business models that often are innovation-intensive activities that are more difficult to fund with debt capital compared with equity (Hall and Lerner, 2010; Martinsson, 2010). Since owner-entrepreneurs of young firms have to provide new employees with the knowledge of or access to critical resources for them to learn to produce effectively, we might speculate that HGFs seek to hire low-cost

employees and enhance their skills through on-the-job training (Rajan and Zingales, 2001). To the extent that these skills are developed in a particular organization, it becomes more difficult for competitors to bid away those talents (Becker and Gerhardt, 1996).

From a management perspective, the evidence presented in this article may also be accommodated by moderation of the Penrosian resource-based view of firm growth. Later developments of Penrosian ideas emphasize sustainable competitive advantage (SCA) of firms to originate from valuable, inimitable, rare, and nonsubstitutable (VRIN) firm-specific resources (Wernerfelt, 1984; Dierickx and Cool, 1989; Barney *et al.*, 2001). From this perspective, HGFs' potential to renew and upgrade their talent pool depends on the hiring of individuals with extensive general human capital (Mahoney, 2005), as one would predict whether education and age are used as the common proxies for human capital. If one considers the often dynamic and rapidly changing organizational structure of HGFs (Eisenhardt and Schoonhoven, 1990), one strategy to leverage the benefits from human capital relative to the costs incurred would be to hire less experienced labor and then invest in on-the-job experience and training. The resulting knowledge and experience of those employees then become more idiosyncratic to the specific firm, decreasing the risk of employee turnover and in so doing, improving the cost/benefit ratio of their human capital (Lepak and Snell, 1999). Regardless of whether HGFs choose marginal employees because of their dynamic nature and the urgency to quickly find new employees or some other reason, from a Penrosian perspective our results indicate that one source of the competitiveness of HGFs emanates from their ability to accurately evaluate and invigorate marginalized groups. Asymmetric information makes it difficult for employers to assess, for instance, the productivity of immigrants. The asymmetry is larger the more unfamiliar the language, religion, work experience, education, culture, etc. are to employers. By taking on the risk of hiring less productive workers, HGFs may have the ability to overcome these asymmetries and discover and use the "true" productivity of marginalized groups to fuel their growth.<sup>12</sup> This could especially be the case in countries with rigid labor market legislation, like Sweden, where "failed" hiring decisions are costly and employers therefore have incentives to employ people associated with low asymmetric information (Skedinger, 2010).

We also analyzed the hiring decision of HGFs in 2001 and 2002 to investigate whether HGFs hire different types of employees during their high-growth episode. HGFs were shown to be less likely than non-HGFs to hire unemployed individuals when they experienced rapid growth. Instead they were more prone to hire individuals that already had a job. One possible interpretation is that potential HGFs (i.e. firms with growth ambitions) need to employ unemployed individuals to grow from

<sup>12</sup>An alternative explanation would be that they have no particular "skill" but are just lucky in picking employees.

the start (i.e. as they begin their high growth). Once they start to experience high growth, however, they are able to attract individuals that already have a job. From a theoretical perspective, this pattern suggests an evolutionary view in that the hiring decisions in HGFs will differ depending on their stage of development. As such, our study also adds to research in evolutionary economics that stresses the need to examine both the sources of variation in firm practices and the sources of variation in firm output (Nelson and Winter, 1982).

Even for these slightly more established HGFs, we found them to be more likely to hire immigrants from Asia, Africa, and Latin America compared with non-HGFs. Immigrants from these regions are those that have the hardest time to enter the Swedish labor market (Statistics Sweden, 2010). This indicates that HGFs are important for creating job opportunities for individuals that are born outside Sweden. These are interesting results from a public policy perspective in the sense that employment rates for immigrants in Sweden are on average 30% lower than among native Swedes (Statistics Sweden, 2010), and similar figures have been reported throughout the European Union.

Our results thus imply that in addition to HGFs creating many jobs, they also play a role in providing job opportunities for immigrants, less-educated, younger individuals, and the unemployed. Our finding that HGFs take on marginal individuals is consistent with two interpretations. On the one hand, we might suspect that HGFs choose marginal employees because there is an urgent need to quickly find new employees, and that they cannot afford to spend much time searching for employees. Alternatively, it could be that HGFs are virtuous heroes who take the outcasts and motivate them into becoming “revolutionaries” and “superstars.” Although we think the first interpretation is more realistic, both interpretations have similar implications for policy.

Our article also comes with limitations, all of which offer interesting ideas for future studies. For example, our data are limited to knowledge-intensive industries. Previous studies have shown that HGFs seem to be present in all industries, and anecdotal evidence suggests that many of the most famous HGFs in recent times (such as Wal-mart or IKEA) may be found in the retail industry. However, our focus on the knowledge intensive industries—defined as industries characterized by high rates of R&D and skilled labor usage—mean that our findings regarding the prevalence of outsiders being hired by HGFs are conservatively estimated. Extending the research on hires in HGFs to other industries would be a valuable complement to our findings in this article.

Second, the detailed longitudinal data used in this article may also be expanded to other areas, for example, by looking at the financial and legal structures of rapidly growing firms (Myers, 2001). Third, the wage policy of HGFs compared with other firms is largely unexplored. Previous research shows that wages generally are higher in larger firms than in smaller ones. Are HGFs growing from smaller to larger size more like small or large firms in this sense? The answer has implications for the

understanding of the competitive advantage of HGFs: HGFs' impact on overall economic performance and economic policy. The study by Halabisky *et al.* (2006) indicates that HGFs initially pay lower wages but that their wages grow faster: "This suggests that firms that might have started out small and paid lower wages can afford to increase wages faster as the company grows and becomes more successful and productive." (p. 265). In a dynamic setting, HGFs may therefore be critical for economic development and overall economic growth. It is an important task for future research to investigate whether this is the case or not. Fourth, it would be of interest to investigate in more detail what types of jobs are actually created by HGFs, and whether recruits come from different or similar industries (cf. Roberts *et al.*, 2011). Similarly, future work could investigate if work tasks and occupational characteristics differ between HGFs and non-HGFs. Furthermore, if those already employed before being hired by HGFs come from other industries, this may indicate that HGFs may also act as important agents in realizing structural change in the economy.

Finally, despite the detailed longitudinal data, our research has yet to resolve the difficult issue of whether (and how) policy interventions can effectively help HGFs achieve higher performance than they would have otherwise experienced. The theoretical literature on HGFs suggests several institutional mechanisms that may enhance the emergence and growth of HGFs (Henrekson, 2005; Henrekson and Johansson, 2009). Hence, there are ample opportunities for further research looking into the internal structures and evolution of HGFs, and the external institutional conditions shaping those structures and firm evolution. This article represents a first step in such a direction.

## Acknowledgements

We gratefully acknowledge comments by participants at the RATIO workshop on "High Growth Firms," held in Stockholm in May 2011, as well as by Werner Hölzl (guest editor) and two anonymous referees. Research funding from the Ragnar Söderberg Foundation is gratefully acknowledged. A.C. also gratefully acknowledges financial support from the ESRC, TSB, BIS, and NESTA on grants ES/H008705/1 and ES/J008427/1 as part of the IRC distributed projects initiative, as well as from the AHRC as part of the FUSE project. Any remaining errors are ours alone.

## References

- Abowd, J. M. and F. Kramarz (1999), 'The analysis of labor markets using matched employer-employee data,' Chapter 40 in O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Vol. 3(Part 2), North Holland: Amsterdam, pp. 2629–2710.
- Acs, Z. J. and P. Mueller (2008), 'Employment effects of business dynamics: mice, gazelles and elephants,' *Small Business Economics*, **30**(1), 85–100.

- Acs, Z. J., W. Parsons and S. Tracy (2008), 'High impact firms: Gazelles revisited,' *An Office of Advocacy Working Paper*. U.S. Small Business Administration.
- Ahmad, N. (2006), 'A proposed framework for business demographic statistics,' *OECD Statistics Working Paper Series, STD/DOC(2006)3*. Paris, France.
- Almus, M. (2002), 'What characterizes a fast-growing firm?' *Applied Economics*, **34**(12), 1497–1508.
- Anyadike-Danes, M. and M. Hart (2011), 'Does it do what it says on the can?: Taking the OECD "high growth" metric seriously'. Paper presented at the RATIO conference on High-growth firms, Stockholm, Sweden, May 2011.
- Barney, J., M. Wright and D. J. Ketchen Jr (2001), 'The resource based view of the firm: ten years after 1991,' *Journal of Management*, **27**(6), 625–641.
- Barringer, B. R., F. F. Jones and D. O. Neubaum (2005), 'A quantitative content analysis of the characteristics of rapid-growth firms and their founders,' *Journal of Business Venturing*, **20**(5), 663–687.
- Bassanini, A. (2010), 'Inside the perpetual-motion machine: cross-country comparable evidence on job and worker flows at the industry and firm level,' *Industrial and Corporate Change*, **19**(6), 2097–2134.
- Batt, R. (2002), 'Managing customer services: human resource practices, quit rates, and sales growth,' *Academy of Management Journal*, **45**(3), 587–597.
- Becker, B. and B. Gerhardt (1996), 'The impact of human resource management on organizational performance: progress and prospects,' *Academy of Management Journal*, **39**(4), 779–801.
- Blatter, M., S. Muehlemann and S. Schenker (2012), 'The costs of hiring skilled workers,' *European Economic Review*, **56**, 20–35.
- Bos, J. and E. Stam (2014), 'Gazelles and industry growth: A study of young high-growth firms in the Netherlands,' *Industrial and Corporate Change*, **23**(1), forthcoming.
- Birch, D. L. and J. Medoff (1994), 'Gazelles,' in C. S. Lewis and A. R. Levenson (eds), *Labor Markets, Employment Policy and Job Creation*. Westview Press: Boulder, CO, and London, UK, pp. 159–167.
- Brüderl, J. and P. Preisendörfer (2000), 'Fast-growing businesses: empirical evidence from a German study,' *International Journal of Sociology*, **30**(3), 45–70.
- Coad, A. (2007), 'A closer look at serial growth rate correlation,' *Review of Industrial Organization*, **31**, 69–82.
- Coad, A. (2009), *The Growth of Firms: A Survey of Theories and Empirical Evidence*. Edward Elgar: Cheltenham, UK.
- Coad, A. and W. Hözl (2009), 'On the autocorrelation of growth rates,' *Journal of Industry Competition and Trade*, **9**(2), 139–166.
- Coad, A. (2010), 'Exploring the processes of firm growth: evidence from a vector autoregression,' *Industrial and Corporate Change*, **19**(6), 1677–1703.

- Colombelli, A., J. Krafft and F. Quatraro (2014), 'High-growth firms and technological knowledge: do gazelles follow exploration or exploitation strategies?' *Industrial and Corporate Change*, **23**(1), Forthcoming.
- Dahl, M. S. and S. Klepper (2007), 'Whom do new firms hire?' Paper presented at *Harvard Business School (Entrepreneurship Management Seminars)*. Cambridge, MA, September 26.
- Daunfeldt, S. O. and D. Halvarsson (2012), 'Are high-growth firms one-hit wonders? Evidence from Sweden,' *HUI Working Paper 67, HUI Research*. Stockholm, Sweden.
- Daunfeldt, S. O., N. Elert and D. Johansson (2013), 'The economic contribution of high-growth firms: Do policy implications depend on the choice of growth indicator?' *Journal of Industry Competition and Trade*, Forthcoming.
- Daunfeldt, S. O., D. Halvarsson and D. Johansson (2013), 'A cautionary note on using the Eurostat-OECD definition of high-growth firms,' *Journal of Entrepreneurship and Public Policy*. forthcoming.
- Davila, A. and G. Foster (2005), 'Management accounting systems adoption decisions: evidence and performance implications from early-stage/startup companies,' *Accounting Review*, **80**(4), 1039–1068.
- Delmar, F. and P. Davidsson (1998), 'A taxonomy of high-growth firms,' in P.D. Reynolds et al. (eds), *Frontiers of Entrepreneurship Research*. Babson College: Wellesley, MA, pp. 399–413.
- Delmar, F., P. Davidsson and W. B. Gartner (2003), 'Arriving at the high-growth firm,' *Journal of Business Venturing*, **18**(2), 189–216.
- Delmar, F. and K. Wennberg (2010), *Knowledge Intensive Entrepreneurship: The Birth, Growth and Demise of Entrepreneurial Firms*. Edward Elgar: Cheltenham, UK.
- Delmar, F., K. Wennberg and K. Hellerstedt (2011), 'Endogenous growth through knowledge spillovers in entrepreneurship: an empirical test,' *Strategic Entrepreneurship Journal*, **5**(3), 199–226.
- Dierickx, I. and I. Cool (1989), 'Asset stock accumulation and sustainability of competitive advantage,' *Management Science*, **35**(12), 1504–1511.
- Eisenhardt, K. M. and C. Schoonhoven (1990), 'Organizational growth: linking founding team, strategy, environment, and growth among U.S. semiconductor ventures, 1978–1988,' *Administrative Science Quarterly*, **35**(3), 504–529.
- Feldman, D. C. and T. W. H. Ng (2007), 'Careers: mobility, embeddedness, and success,' *Journal of Management*, **33**(3), 350–377.
- Foss, N. and I. Ishikawa (2007), 'Towards a dynamic resource-based view: insights from Austrian capital and entrepreneurship theory,' *Organization Studies*, **28**(5), 749–772.
- Foss, N. J., P. G. Klein, Y. Y. Kor and J. T. Mahoney (2008), 'Entrepreneurship, subjectivism, and the resource-based view: toward a new synthesis,' *Strategic Entrepreneurship Journal*, **2**, 73–94.
- Garen, J. E. (1985), 'Worker heterogeneity, job screening, and firm size,' *Journal of Political Economy*, **93**(4), 715–739.



- Giuliano, L., D. I. Levine and J. Leonard (2009), 'Manager race and the race of new hires,' *Journal of Labor Economics*, **27**(4), 589–631.
- Greiner, L. E. (1972), 'Evolution and revolution as organizations grow,' *Harvard Business Review*, **50**(4), 37–46.
- Götzfried, A. (2004), 'European employment increasing in services and knowledge-intensive services,' *Statistics in Focus: Science and Technology 10*. Eurostat, Luxembourg: Eurostat, KS-NS-04-010-ENN.
- Halabisky, D., E. Dreessen and C. Parsley (2006), 'Growth in firms in Canada, 1985–1999,' *Journal of Small Business and Entrepreneurship*, **19**(3), 255–268.
- Hall, B. H. and J. Lerner (2010), 'The financing of R&D and innovation,' in B. H. Hall and N. Rosenberg (eds), *Handbook of the Economics of Innovation*. Elsevier-North Holland: Amsterdam, The Netherlands and; London, UK.
- Henrekson, M. (2005), 'Entrepreneurship: A weak link in the welfare state,' *Industrial and Corporate Change*, **14**(3), 437–467.
- Henrekson, M. and D. Johansson (2009), 'Competencies and institutions fostering high-growth firms,' *Foundation and Trends in Entrepreneurship*, **5**(1), 1–80.
- Henrekson, M. and D. Johansson (2010), 'Gazelles as job contributors: a survey and interpretation of the evidence,' *Small Business Economics*, **35**(2), 227–244.
- Henrekson, M. and D. Johansson (2011), 'Firm growth, institutions and structural transformation,' in M. Fritsch (eds), *Handbook of Entrepreneurship and Regional Development*. Edward Elgar: Cheltenham, UK.
- Holzer, H. and D. Neumar (1996), 'Are affirmative action hires less qualified? Evidence from employer-employee data on new hires,' *NBER Working Paper No. 5603*.
- Hölzl, W. (2009), 'Is the R&D behaviour of fast-growing SMEs different? Evidence from CIS-III data for 16 countries,' *Small Business Economics*, **33**, 59–75.
- Hölzl, W. (2014), 'Persistence, survival and growth: a closer look at 20 years of fast-growing firms in Austria,' *Industrial and Corporate Change*, **23**(1), Forthcoming.
- Kazanjian, R. K. and R. Drazin (1989), 'An empirical test of stage of growth progression model,' *Management Science*, **35**(12), 1489–1503.
- Kremer, M. (1993), 'The O-ring theory of economic development,' *Quarterly Journal of Economics*, **108**(3), 551–576.
- Lepak, D. and S. Snell (1999), 'The human resource architecture: toward a theory of human capital allocation and development,' *Academy of Management Review*, **24**(1), 31–48.
- Littunen, H. and T. Tohmo (2003), 'The high growth in new metal-based manufacturing and business service firms in Finland,' *Small Business Economics*, **21**(2), 187–200.
- Lockett, A. (2005), 'Edith Penrose's legacy to the resource-based view,' *Managerial and Decision Economics*, **26**(2), 83–98.
- Lockett, A. and S. Thompson (2004), 'Edith Penrose's contributions to the resource-based view: an alternative perspective,' *Journal of Management Studies*, **41**(1), 193–203.

- Mahoney, J. T. (2005), *Economic foundations of strategy*. Sage Publications: Thousand Oaks, CA.
- Martinsson, G. (2010), 'Equity financing and innovation: is Europe different from the United States?' *Journal of Banking and Finance*, **34**(6), 1215–1224.
- McKelvie, A. and J. Wiklund (2010), 'Advancing firm growth research: a focus on growth mode instead of growth rate,' *Entrepreneurship Theory and Practice*, **34**(2), 261–288.
- Miller, D. and P. H. Friesen (1984), 'A longitudinal study of the corporate life cycle,' *Management Science*, **30**(10), 1161–1183.
- Mortensen, D. T. and C. A. Pissarides (1999), 'New developments in models of search in the labor market,' in C. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*. Elsevier North-Holland: Amsterdam, The Netherlands, pp. 2567–2627.
- Myers, S. C. (2001), 'Capital structure,' *Journal of Economic Perspectives*, **15**(2), 81–102.
- Nelson, R. R. and S. G. Winter (1982), *An Evolutionary Theory of Economic Change*. Belknap Press of Harvard University Press: Cambridge MA.
- Nyström, K. (2011), 'Labor mobility and entrepreneurship: who do new firms employ?' *Working Paper no. 250, CESIS Electronic Working Papers Series*. the Royal Institute of Technology: Stockholm, Sweden.
- Oi, W. and T. L. Idson (1999), 'Firm Size and Wages,' in O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Vol. 3, Elsevier: Amsterdam, The Netherlands, pp. 2165–2214.
- Penrose, E. (1959), *The Theory of the Growth of the Firm*. Basil Blackwell: Oxford, UK.
- Rajan, R. G. and L. Zingales (2001), 'The firm as a dedicated hierarchy: a theory of the origins and growth of firms,' *Quarterly Journal of Economics*, **116**(3), 805–851.
- Roberts, J. (2004), *The Modern Firm: Organizational Design for Performance and Growth*. Oxford University Press: Oxford, UK.
- Roberts, P. W., S. Klepper and S. Hayward (2011), 'Founder backgrounds and the evolution of firm size,' *Industrial and Corporate Change*, **20**(6), 1515–1538.
- Santarelli, E. and M. Vivarelli (2007), 'Entrepreneurship and the process of firms' entry, survival and growth,' *Industrial and Corporate Change*, **16**(3), 455–488.
- Schreyer, P. (2000), 'High-Growth Firms and Employment,' *OECD Science, Technology and Industry Working Papers*, No. 2000/03.
- Shepherd, D. and J. Wiklund (2009), 'Are we comparing apples with apples or apples with oranges?: Appropriateness of knowledge accumulation across growth studies,' *Entrepreneurship Theory and Practice*, **33**(1), 105–123.
- Skedinger, P. (2010), *Employment Protection Legislation: Evolution, Effects, Winners and Losers*. Edward Elgar: Cheltenham, UK; Northampton, MA.
- Statistics Sweden (2002), Arbetskraftsinvandring—en lösning på försörjningsbördan?. Demografiska rapporter 2002:6 [Migrant workers—a solution to the aging population dilemma?]. [www.scb.se/statistik/BE/BE0701/2000I02/BE51ST0206.pdf](http://www.scb.se/statistik/BE/BE0701/2000I02/BE51ST0206.pdf).

- Statistics Sweden (2010), Integration—ett regionalt perspektiv [Integration—a regional perspective]. [www.scb.se/statistik/\\_publikationer/LE0105\\_2010A01\\_BR\\_BE57BR1001.pdf](http://www.scb.se/statistik/_publikationer/LE0105_2010A01_BR_BE57BR1001.pdf).
- Stuart, T. E. (2000), 'Interorganizational alliances and the performance of firms: a study of growth and innovation rates in a high-technology industry,' *Strategic Management Journal*, **21**(8), 791–811.
- Wennberg, K. (2005), 'Entrepreneurship research through longitudinal databases: measurement and design issues,' *New England Journal of Entrepreneurship*, **8**, 9–18.
- Wennberg, K. (2009), 'Knowledge combinations and the survival of financial service ventures,' *Journal of Evolutionary Economics*, **19**(2), 259–276.
- Wennberg, K., J. Wiklund, D. R. DeTienne and M. S. Cardon (2010), 'Reconceptualizing entrepreneurial exit: divergent exit routes and their drivers,' *Journal of Business Venturing*, **25**, 361–375.
- Wernerfelt, B. (1984), 'A resource based view of the firm,' *Strategic Management Journal*, **5**(2), 171–180.
- Witt, U. (2000), 'Changing cognitive frames—changing organizational forms: an entrepreneurial theory of organizational development,' *Industrial and Corporate Change*, **9**(4), 733–755.

## Appendix

**Table A1** Number and %age of employees and the firms in which they work by 2-digit industries (2002)

2-digit industry	Industry name	Employees 2002		Firms 2002	
		#	%	#	%
N/A	Unreported industry	848	0.17	330	0.82
1	Agriculture and hunting	894	0.18	226	0.56
2	Forestry and logging	72	0.01	37	0.09
5	Fishing	30	0.01	23	0.06
11	Extraction of petroleum and gas	2	0	1	0.00
13	Mining of metal ores	192	0.04	2	0.00
14	Other mining and quarrying	56	0.01	3	0.01
15	Manufacture of food products and beverages	1186	0.23	39	0.10
16	Manufacture of tobacco products	291	0.06	2	0.00
17	Manufacture of textiles	175	0.03	21	0.05
18	Manufacture of wearing apparel	5	0	3	0.01
20	Wood products	471	0.09	68	0.17
21	Pulp and paper	1833	0.36	16	0.04
22	Publishing, printing, recorded media	2763	0.55	204	0.51
23	Manufacture of petroleum products	14	0	1	0.00
24	Manufacture of chemicals and pharmaceuticals	5307	1.05	73	0.18
25	Manufacture of rubber and plastics	2354	0.47	53	0.13
26	Manufacture of other non-metallic mineral products	547	0.11	29	0.07
27	Manufacture and casting of metals	700	0.14	12	0.03
28	Manufacture of fabricated metal products	4086	0.81	231	0.57
29	Manufacture of machinery and equipment	16,423	3.25	397	0.98
30	Manufacture of office machinery and computers	3156	0.63	116	0.29
31	Manufacture of electrical machinery and apparatus	22,283	4.41	548	1.36
32	Manufacture of radio, television and communication	12,145	2.41	262	0.65
33	Manufacture of medical, precision and optical instruments	16,591	3.29	905	2.24
34	Manufacture of motor vehicles	42,071	8.33	93	0.23
35	Manufacture of other transport equipment	11,527	2.28	72	0.18
36	Manufacture of furniture	13,397	2.65	68	0.17
37	Recycling	91	0.02	5	0.01
40	Gas, water and electricity	1277	0.25	20	0.05
41	Distribution of water	7	0	1	0.00
45	Construction and other engineering activities	11,831	2.34	589	1.46
50	Sale, maintenance and repair of motor vehicles	1602	0.32	121	0.30
51	Wholesale and commission trade	15,466	3.06	755	1.87
52	Retail trade	9539	1.89	376	0.93
55	Hotels and restaurants	4573	0.91	191	0.47
60	Land transports	2155	0.43	118	0.29

(continued)

Table A1 Continued

2-digit industry	Industry name	Employees 2002		Firms 2002	
		#	%	#	%
61	Water transports	183	0.04	10	0.02
62	Air transports	95	0.02	3	0.01
63	Travel agencies	2404	0.48	105	0.26
64	Post and telecommunications	22,059	4.37	79	0.20
65	Financial Services	3001	0.59	221	0.55
66	Insurance	171	0.03	21	0.05
67	Auxiliary Financial Services	6102	1.21	660	1.64
70	Real estate	35,409	7.01	4347	10.77
71	Renting of machinery and equipment	415	0.08	89	0.22
72	Computers and related activities	51,283	10.16	3706	9.18
73	Research and development	5066	1	308	0.76
74	Business services	147,051	29.13	21,845	54.12
75	Public administration	9	0	1	0.00
90	Sanitation services	168	0.03	8	0.02
91	Voluntary Organizations	1247	0.25	45	0.11
92	Recreational, culture and sports	22,921	4.54	2791	6.91
93	Other services	1,220	0.24	113	0.28
Total		504,764	100	40,363	100.00

*Notes:* Since the unit of analysis in our article is employees, the number of firms represents firms in which employees work, and thus do not correspond to the total universe of firms in those sectors.

**Table A2** Firm-level summary statistics

Variable	Observations	Mean	Standard deviation	Skewness	Kurtosis	Median	Min	Max
ALL FIRMS								
Employees 1999	40,363	15.639	259.359	84.898	10,415.620	2	1	36,594
Employees 2002	40,363	17.218	279.238	66.072	5,903.325	2	1	31,888
Turnover 1999	40,363	29,900,000	606,000,000	71.094	7305.803	1,210,542	1	7.72E+10
Turnover 2002	40,363	37,000,000	742,000,000	71.839	7549.939	1,295,630	1	9.55E+10
Annual sales growth	40,363	0.088	0.890	-0.707	31.456	0.102085	-16.2069	16.809
Annual empl. growth	40,363	0.020	0.515	-0.360	15.453	0	-5.71373	6.072
Firm age	39,677	9.703	3.554	-0.186	1.586	10	4	14
1% Empl HGFs								
Employees 1999	415	8.340	52.158	17.746	339.581	2	1	1 017
Employees 2002	415	118.376	1083.868	17.493	326.483	15	5	20,826
Turnover 1999	415	46,800,000	490,000,000	18.500	359.568	2,097,594	5496	9.67E+09
Turnover 2002	415	150,000,000	1,040,000,000	11.149	133.594	1.12E+07	9000	1.40E+10
Annual sales growth	415	1.653	1.375	0.633	4.574	1.417888	-3.50656	6.452
Annual empl. growth	415	2.052	0.704	2.484	11.072	1.791759	1.410987	6.072
Firm age	412	7.670	3.759	0.575	1.741	6	4	14
5% Empl HGFs								
Employees 1999	1889	18.788	235.757	34.642	1346.425	2	1	9 415
Employees 2002	1889	67.433	711.451	24.597	671.041	8	3	20,826
Turnover 1999	1889	85,600,000	1,840,000,000	39.322	1635.343	2476574	5496	7.72E+10
Turnover 2002	1889	155,000,000	2,460,000,000	32.913	1217.516	6946418	1159	9.55E+10

(continued)

Table A2 Continued

Variable	Observations	Mean	Standard deviation	Skewness	Kurtosis	Median	Min	Max
Annual sales growth	1889	1.030	1.077	0.863	11.277	0.873414	-8.94058	7.203
Annual empl. growth	1889	1.270	0.554	3.087	17.826	1.098612	0.699378	6.072
Firm age	1859	8.437	3.600	0.289	1.630	8	4	14
1% turnover HGFs								
Employees 1999	401	15.736	160.579	17.832	337.708	1	1	3 090
Employees 2002	401	84.504	1053.133	19.170	377.195	2	1	20.826
Turnover 1999	401	2,902,919	26,000,000	15.814	272.857	102,000	1	4.72E+08
Turnover 2002	401	151,000,000	949,000,000	9.505	102.204	4,958,462	14,740	1.23E+10
Annual sales growth	401	3.922	1.469	3.479	24.032	3.59136	2.615304	16.809
Annual empl. growth	401	0.673	1.163	1.614	6.945	0.204794	-3.3673	6.072
Firm age	393	8.008	3.802	0.389	1.578	7	4	14
5% turnover HGFs								
Employees 1999	2041	11.412	120.019	25.732	731.000	1	1	3815
Employees 2002	2041	32.660	483.813	39.474	1677.278	2	1	20826
Turnover 1999	2041	12,600,000	250,000,000	39.351	1662.746	489,233	1	1.07E+10
Turnover 2002	2041	79,700,000	980,000,000	29.622	1062.178	3,632,356	2496	3.75E+10
Annual sales growth	2041	2.124	1.151	3.546	27.304	1.739	1.228	16.809
Annual empl. growth	2041	0.516	0.826	1.355	7.983	0.223	-3.367	6.072
Firm age	2004	7.864	3.732	0.489	1.700	7	4	14

