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Characteristics and Performance of New Firms and Spinoffs in Sweden

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Key words: Sweden, spinoffs, new firm formation, entrepreneurship, performance, employment growth

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Abstract

We analyze the rate of formation, the characteristics, and the performance of different types of new firms in Sweden over a decade. Comparisons to Denmark, Brazil, and the U.S. suggest that the environment for new firm formation in Sweden is not markedly different than elsewhere. In line with previous studies, spinoffs of incumbents perform better than other types of new firms, particularly if their parent firm continues to operate. A novel findings is that the rate of employment growth of spinoffs is greater the larger the size of their parent, which contrast sharply with findings for firms with a single owner.

JEL classification: M13, J60

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[Running Title: Spinoffs in Sweden]

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1. Introduction

New firms are the lifeblood of any economy. While they come from many quarters, many are founded by individuals who are employees of private firms. Yet we know little about the process of employees leaving established firms to found their own firms. Which firms are more likely to have employees leave to found their own firms? What types of employees are more likely to found their own firms? What types of firms do they found—to what extent are they like the firms they leave? What is the impetus for employees to leave to found their own firms—to what extent are employees responding to positive opportunities to found new firms versus being pushed into founding their own firms due to the failure of their employers? How does the background of the employees and the firms they previously worked for affect the performance of the firms they found?

The purpose of this paper is to begin exploring these questions for Sweden. To make headway on the questions for any country or region, a comprehensive dataset on new firms and their employees is required. Sweden is one of the countries in the world where such information has been compiled for recent years in a dataset that matches employees to their employers, providing rich information on all establishments and firms in the economy and the individuals they employ. We exploit this dataset to identify all new firms in the private sector in Sweden annually for the period 1993 to 2005 and also new establishments created by existing firms.

New firms are divided into single-person firms and those that employ two or more individuals. The latter are further divided according to whether a majority of their founders came from the same firm, which we call spinoffs, and all other new firms.

Spinoffs are further distinguished according to whether the establishment they came from, which we call their parent, exited in the year the spinoff was founded. We also single out new firms that were divested by existing firms and new establishments created by existing firms. Our analysis focuses especially on spinoffs, exploring the inclination of employees to found them and the factors underlying their performance.

One of our goals is also to compare the process underlying the creation of new firms in Sweden with other countries. The Swedish economy has a number of distinctive characteristics related to how firms are governed and to public involvement in the industrial sector. We focus on how these characteristics may have influenced the creation and performance of spinoffs. We design our analysis to conform as closely as possible to a prior analysis of spinoffs that was conducted for Denmark using the Danish matched employer-employee dataset (Eriksson and Kuhn [2006]), facilitating a comparison of our findings with those for Denmark. We also compare our findings to a similar study recently conducted for Brazil using their matched employer-employee dataset (Hirakawa, Muendler, and Rauch [2009]). Elfenbein, Hamilton, and Zenger [2010] analyze the creation of new firms by scientists and engineers working for private firms in the U.S., and we compare out findings for Swedish scientists and engineers to Elfenbein et al.'s findings.

The paper is organized as follows. In Section 2 we review the main findings of prior studies of spinoffs and new firms at the national and industry level. In Section 3 we review industrial developments in Sweden and describe salient features of the modern Swedish industrial economy that might bear on the formation of spinoffs and other types of new firms. In Section 4 we describe the Swedish matched employer-employee dataset

and the types of new establishments that we distinguish. We also we provide statistics on the importance and nature of each type of new establishment and compare the patterns to other countries that have been studied similarly. In Section 5 we analyze the types of employees that found new establishments of varying kinds. In Section 6 we analyze the performance of the new establishments and how they relate to characteristics of the employees and their parents. In Section 7 we discuss our findings and offer concluding remarks.

2. Prior Spinoff Findings

Various empirical studies featuring spinoffs have been conducted. We first review the main findings of these studies and then discuss alternative theoretical interpretations of the findings.

A number of studies of spinoffs and new firm formation have been conducted at the level of entire countries using matched employer-employee datasets and at the level of industries using hand-collected data. Country studies have been conducted for Denmark (Eriksson and Kuhn [2006], Dahl and Reichstein [2007], Sørensen [2007], Sørenson and Phillips [2011]), Brazil (Hirakawa et al. [2009]), Norway (Hvide [2009]), and Portugal (Baptista and Karaöz [2006]). For the U.S., Elfenbein et al. [2010] used longitudinal survey data to study the formation of new firms by scientists and engineers. Industry studies have typically focused on new manufacturing industries during their early, formative era. Klepper [2009] provides a recent review of these studies and their theoretical implications.

The industry studies generally have data on the founders of all entrants and their backgrounds. In contrast, other than Hvide [2009] and Baptista and Karaöz [2006], the country studies cannot identify founders of incorporated firms and/or those with multiple initial employees. Either these firms were excluded from the analysis, as in Sørenson and Phillips [2011], or their founders were inferred through some kind of rule. Distinctions were generally made between self-employment (new firms with a single owner and/or a single employee), spinoffs (new firms typically with a majority of initial employees that previously worked at the same establishment, which was denoted as their "parent"), and other new firms. Further, spinoffs were typically distinguished according to whether their parent exited in the year they entered, which are called pushed spinoffs, and those whose parents continued after they entered, which are called pulled spinoffs.

A number of common findings emerge from the studies. High-level workers, including managers and technical specialists, are more likely to found firms. A number of the country studies examine the effect of a worker's tenure and the size of the worker's establishment on the probability of leaving his employer for various destinations, including founding a new firm. Both factors reduce the probability of leaving the worker's employer, and even more so reduce the probability of leaving to found a spinoff. The country studies commonly find that spinoffs, and in particular pulled spinoffs, are initially larger and perform better than all other types of startups, particularly at younger ages. They also find that spinoffs that enter the same industry as their parent perform better than other spinoffs, which is consistently found in the industry studies.

The main issue where the various studies diverge concerns the relationship between the size of the parent and the performance of its offspring. The country studies by Sørensen

[2007], Elfenbein et al. [2010], and Sørenson and Phillips [2011] find that the larger a new firm's parent is, then the worse on average its performance in terms of the income of its founders and the longevity of the firm. These three studies mainly focus on individually owned new firms. Hvide [2009], in contrast, focuses on incorporated spinoffs with two or more initial employees and a majority owner. He finds that the rate of return on assets of the spinoff is greater the larger its parent firm. The industry studies, which appear to involve mostly incorporated entrants with multiple employees, consistently find that spinoffs of larger, better performing firms in their industry perform better.

The common findings of the studies suggest that the work experience of employees conditions the quality of the firms they could form. High-level workers learn the most about the kinds of organizational challenges they will face in their own firms. An employee's experience is more valuable if he starts a firm in the same industry in which he previously worked. The performance of a new firm is better if it is motivated by a new idea rather than the preservation of jobs following the failure or imminent failure of its parent. One interpretation of the divergent findings about firm size is that the value of work experience in a smaller firm might depend on the type of firm an employee founds. Singly owned firms are smaller and founders of such firms might learn more from work experience in smaller firms, whereas founders of incorporated firms might learn more from experience in larger incorporated firms. Alternatively, it could be that larger firms are more bureaucratic and less able to spot good ideas, providing their employees with better ideas to found their own firms (Hvide [2009]).

3. The Swedish Economy and Issues Related to Spinoffs

Sweden has prospered over the last 150 years or so, but in modern times its growth slowed for a number of years before picking up again recently. This slowdown raised concerns about the environment for startups of all kinds, including spinoffs (Henrekson [2005]). In this section we consider distinctive features of the Swedish economy bearing on the formation of new firms.

We first consider recent macroeconomic developments in Sweden. Figure 1 reports GDP per capita (in 2011 U.S. dollars) from 1950 to 2005 in Sweden and on average in the other OECD countries. GDP per capita was greater in Sweden than the average OECD country from 1950 until the sharp recession of the Swedish economy in the early 1990s. From 1975 until 1993, however, growth in GDP per capita in Sweden slowed down relative to its past growth and relative to the other OECD countries (Henrekson [1996]). This caused Sweden to drop sharply in its ranking of GDP per capita among the most advanced countries in the world. Correspondingly, investment in Sweden as a percent of GDP also declined after 1975 both relative to its past and other advanced countries. As reflected in Figure 1, Sweden's performance improved after the early 1990s, and by 2004 its level of GDP per capita was again in line with its OECD counterparts.

One factor that may have contributed to the slow growth in Sweden in modern times is a low rate of self-employment and new firm formation. Sweden usually gets a low rank in international comparisons of rates of self-employment, new firm formation, and entrepreneurship. For example, Delmar and Davidsson (2000) found that Sweden had a low rate of nascent entrepreneurship compared to Norway and the US. The *Global*

Entrepreneurship Monitor (GEM), a survey-based study of entrepreneurship in different countries, rated Sweden lower than other innovation-driven countries in terms of "total early-stage entrepreneurship activity" in its recent 2010 report.[1] Consistent with a low rate of new firm formation, Sweden's leading firms are quite old. As of 2000, the 50 largest Swedish firms were all founded before 1970, with all but eight founded before 1946 and many founded in the nineteenth century (Högfeldt [2005]). Sweden's leading firms are predominantly concentrated in older, capital intensive industries dominated by large firms. Compared to other advanced countries, the Swedish firm-size distribution is tilted toward large firms (Davis and Henrekson [1999]), though the fraction of large firms has fallen in recent years (Henrekson and Stenkula [2006]). In part, this reflects the industries in which Sweden has specialized, including: paper, pulp, and related machinery; materials mining, processing, and related machinery; transportation equipment; power generation equipment; and telecommunications equipment (Sölvell, Zander, and Porter [1999]). These industries are capital intensive, pay above average but not the highest wages, and are characterized by firms of above average size. In modern times these industries have not grown rapidly and Swedish firms have been challenged by firms from developing countries, which may have contributed to the modern slowdown in Swedish growth. As noted in the prior section, larger firms also generate less spinoffs per employee, which may have contributed to a low rate of new firm formation in Sweden.

Swedish firms are also highly oriented internationally, which may have influenced the creation of new enterprises and growth in Sweden in recent years. Despite its small size, Sweden has been ranked as the tenth largest foreign investor in the world, led by many large multi-national enterprises (MNEs) (Blomström [2000]). In the mid-1990s Swedish

MNEs had more than 50% of their employees in foreign locations. This is nearly twice the percentage in 1970, with total employment of the MNEs falling in Sweden and growing markedly elsewhere in recent years. In contrast to the U.S., Swedish MNEs appear to be transferring more and more advanced operations abroad, as reflected in a sharp rise in the wages of labor employed by Swedish MNEs outside of Sweden both absolutely and relative to the wages paid by these firms in Sweden. Swedish MNEs still do the bulk of their R&D in Sweden, but seem to be transferring their other advanced activities, including more high-tech production, elsewhere (Blomström [2000], Braunerhjelm and Ekholm [1998]). This may have reduced the base of operations in Sweden from which new firms could emerge.

The Swedish policy environment is distinctive in ways that might also have discouraged the formation of new firms. In modern times, Sweden has had the highest ratio of taxes to GDP among OECD countries. The effective top marginal tax rate on labor income in Sweden exceeded 90% as late as 1983 (Du Rietz, Johansson, and Stenkula [2011a, p. 44]) and was even higher on capital income earned by entrepreneurs (Du Rietz, Stenkula, and Johansson [2011b, p. 27]). Furthermore, stock options were taxed unfavorably relative to the U.S. and other countries, which surely made it more difficult for new firms to recruit workers in industries that rely on stock options to motivate employees (Henrekson [2005]).

In 1991 Sweden engaged in a major tax reform that sharply reduced taxes on labor income and also on the returns to founding a new firm (Sørenson [2010]). This together with subsequent changes led to a fall of almost four percentage points in the ratio of tax revenues to GDP between 1990 and 2007. In contrast, the comparable tax burden for the

average OECD country increased by two percentage points in the same period. While this certainly improved the climate for entrepreneurship, tax rates and tax revenues relative to GDP remained high in Sweden relative to many other OECD countries (Sørenson [2010]).

Sweden has various employee security provisions and wage policies that may also discourage the formation of new firms (Davis and Henrekson [1999]). Strong employee security provisions may, for example, be harmful to new firms that need to modify their initial workforce. In recent years the regulations for temporary contracts have been relaxed, although Sweden's strong security provisions for permanent employees have remained intact (Skedinger [2012]). As of 2007 employees are granted tenure immediately or they are on temporary contracts for a maxium of two years. Concerns have also been raised that centralized wage setting could limit the extent to which smaller firms can pay lower wages, as occurs in other countries. Workers in Sweden are also subject to the last-in-first-out (LIFO) principle, which requires the firm to let go of the most recently hired worker if it downsizes. This may limit the ability of new firms to recruit seasoned workers.[2]

These characteristics of the Swedish economy raise a number of questions regarding spinoffs in Sweden that we focus on in our analysis.

- Does Sweden have a low rate of spinoffs from incumbent firms relative to other advanced countries after controlling for factors such as firm size that appear to negatively affect the spinoff rate?

- Has Swedish growth suffered until recent years because of a low rate of formation of spinoffs in the same industry as their "parent" firm (i.e., intra-industry spinoffs)?
- To what extent is the formation of new firms by employees in Swedish MNEs discouraged by the same factors that discourage the MNEs from performing downstream work in Sweden?
- Has there been a rise in the formation of new firms and spinoffs in particular during our sample period of 1993–2005 in response to the Swedish tax reforms initiated in 1991?

4. The Matched Employer-Employee Dataset and the Composition of New Establishments and New Firms

In this section we provide an overview of the various types of new establishments and new firms founded in Sweden over the period 1993 to 2005 and compare the rate of formation of new firms in Sweden with other countries.

4.1 Data

Our data on new establishments and firms are drawn from the Swedish matched employer-employee dataset for the period 1993–2005. The dataset comprises all establishments, firms, and employed individuals in the country. Each individual's employer (establishment/firm) is determined annually by his place of work in the month of November. For each establishment and firm, the total number of employees and sector affiliation at the 5-digit NACE level are reported. For 1997–2005, balance-sheet and

ownership data are available for every firm. The balance-sheet data provide information on sales, value added, gross profits, wages, and debts. The ownership data distinguish between non-affiliated firms and firms affiliated with domestic corporations, Swedish MNEs, and foreign-owned MNEs. For employees, gender, income, employment status, education (length and subject degree), and place of residence, birth, and study (for those attending universities) are reported annually.

4.2 Types of New Firms

We identify new establishments created by existing firms and new establishments founded by new firms on a yearly basis from 1993 to 2005. The identification of a new firm is based on a combination of the appearance of new firm id-codes (organization numbers) and information on employee-flows at the level of establishments between each pair of years.[3] Among the new establishments created by existing firms, we divide them into new establishments in the firm's main two-digit industry, which we consider expansions, and all other establishments, which represent diversifications.

New establishments founded by new firms are divided initially into five categories: divestitures; self-employed; pushed spinoffs; pulled spinoffs; and other new firms. Following Eriksson and Kuhn [2006], divestitures include all new firms with over 10 employees. These firms are assumed to be reorganizations of activities that previously took place at an incumbent firm. The self-employment category is composed of new firms with only one employee.[4] The other three categories are composed of new firms with between two and ten employees. We do not have information about the founders of these firms, which was the same situation faced by Eriksson and Kuhn [2006].

Consequently, we follow their strategy of defining spinoffs according to the origins of their initial employees. If more than 50% of the employees worked at the same establishment in the previous year and constituted 50% or less of the workforce at that establishment, we call this a spinoff and the establishment where they worked is called the spinoff's parent. If the parent establishment exited in the same year as the spinoff, the spinoff is classified as a pushed spinoff; otherwise it is classified as a pulled spinoff. All other new firms with two to ten employees that do not have a majority of their initial employees coming from one establishment are put into the residual category of other new firms. This residual category is further divided into two groups according to whether or not all their employees were not employed the previous year.

4.3 New Establishments, New Firms, and Spinoffs in Sweden – the Basic Pattern

For the period 1993 to 2005, Table 1 reports the annual number of new establishments created by existing firms in their main two-digit NACE industry and in other industries and the annual number of new firms that were divestitures, self-employed, pushed spinoffs, pulled spinoffs, composed initially of all previously not employed workers, and all other new firms. Table 2 reports the number of employees for each group of new establishments and firms in Table 1.

The annual number of new establishments of new firms was around 50,000 per year versus 200 to 300 new establishments per year created by existing firms outside their main two-digit industry and 2,000–3,000 new establishments per year created by existing firms in their main industry. The majority of the new establishments of new firms, around 42,000 per year, had only one employee. Among the other 8,000 or so new

establishments of new firms, in most years 400 to 500 were divestitures, 200 to 300 were pushed spinoffs, 900 to 1,000 were pulled spinoffs, 900 to 1,300 were composed of previously not employed individuals, and 5,000 to 6,000 were in the residual category of other new firms.

In terms of employment, Table 2 indicates that new establishments created by existing firms, and by definition divestitures, initially were markedly larger than the various types of new firms with employees, as is generally true in other countries. The new establishments created by existing firms, both in their main industry and otherwise, initially averaged around seven employees and divestitures averaged around 25 employees versus 2.2–3.5 employees for the various types of new firms with employees. Among the new establishments of new firms with employees, pushed and pulled spinoffs were initially the largest, averaging 3.5 and 3.3 employees respectively. The new firms founded by previously not employed individuals were the smallest with an average of 2.2 initial employees and the other new firms in the residual category averaged 3.1 employees initially.

Within our sample period, the most notable patterns were a decline over time in the number of new establishments created by existing firms outside their main industry and a rise over time in the number of pulled spinoffs. The former peaked at 599 in 1997 and reached a low of 162 in 2005 and the latter attained a low of 673 in 1995 and peaked at 1,049 in 2005. The number of divestitures also varied considerably over time, reaching a peak in the period 1999 to 2001. This corresponds to the dot.com bubble, and during this three-year period over 40% of the divestitures were in knowledge-based services (which includes IT services) versus 32% over the whole period. The number of new firms with

all previously not employed workers also varied considerably over time. Not surprisingly, it was highest during the early years of our sample when Sweden experienced a sharp recession and more individuals were unemployed.

The fall over time in the number of new establishments created by existing firms outside their main industry could reflect the increasing transfer of advanced activities by Swedish MNEs to other countries noted earlier. However, over the period 1997 to 2005 for which we have data on MNE affiliation, there is no clear trend in the percentage of these new establishments that were created by MNEs.[5] We also did not find that Swedish MNEs were less likely to spawn spinoffs over the period for which we had data on MNE affiliation (1997–2005).[6] The rise over time in the number of pulled spinoffs is intriguing and conceivably could be due to the fall in Swedish tax rates. However, there is no clear upward trend in the number of other types of new firms, and it is not clear why lower tax rates should have favored only the formation of pulled spinoffs.

4.4 The Swedish Pattern in a Comparative Perspective

We exploit studies of spinoffs and new firm creation in Denmark (Eriksson and Kuhn [2006]) and Brazil (Hirakawa et al. [2009]) using matched employer-employee datasets for those countries to put the Swedish patterns in perspective. The study of Denmark is especially useful for this purpose as it is much closer in size to Sweden than Brazil. We also followed many of the conventions adopted in the paper on Denmark, including using the same definition of pushed and pulled spinoffs, to facilitate the comparison of Sweden and Denmark.

The Danish study covers the period 1981 to 2000, and at its mid-point in 1990 the population of Denmark was approximately 5 million people. The midpoint of our study is 1999 when the population of Sweden was roughly 9 million people. So Sweden might be expected to have about twice as many firms in each category per year as Denmark.

The Danish study does not consider new establishments created by existing firms but only new firms that entered in the period 1981 to 2000. On an annual basis, the average number of new firms in Denmark was approximately 5,000 self-employed, 1,600 with a majority of employees not employed in the prior year, 107 pushed spinoffs, 351 pulled spinoffs, and 1,665 in the residual category of other new firms. The analogous figures for Sweden are 42,000 self-employed, 1,259 firms for which all the employees were previously not employed, 282 pushed spinoffs, 880 pulled spinoffs, and 5,578 in the residual category of other new firms. One pronounced difference between the two countries is the number of new self-employed firms, which are over five times as great in Sweden. This is suspect, though, as Denmark's self-employment rate is comparable if not greater than Sweden's.[7] We suspect the difference in the number of new self-employed firms is attributable to self-employed individuals being registered differently in the Danish dataset than in Sweden.

Where the figures should be most comparable is in pushed and pulled spinoffs, as the same definitions were employed. The average annual number of pushed and pulled spinoffs together is 458 in Denmark versus 1,161 in Sweden. Given that Sweden is roughly twice as large as Denmark, this suggests that Sweden had a comparable if not greater number of pushed and pulled spinoffs per capita than Denmark. The balance between pushed and pulled spinoffs is similar in the two countries, with both countries

having about three times as many pulled as pushed spinoffs. In terms of all other new firms, including both ones with all or majority of employees that were previously not employed, the average number in Denmark was 3,265 versus 6,837 in Sweden. This too is roughly in line with differences in the size of the two countries. In summary, apart from the number of new self-employed firms, the patterns in Denmark and Sweden regarding the entry of new firms are similar.

Brazil is much larger than Sweden, with a population of around 170 million in 1998, which is the midpoint of the time period 1995–2001 considered in the study of spinoffs in Brazil. Consequently, it might be expected that new firms in Brazil would be larger than in Sweden, and in the relevant analyses Hirakawa et al. [2009] consider only new establishments (or ventures, which include multiple new establishments by the same firm) with five or more employees. Regarding spinoffs, they define a spinoff as a new firm with five or more employees, with at least 25% of the employees previously employed at the same establishment and accounting for less than 70% of the workforce of that establishment. No distinction is made between pushed and pulled spinoffs. They use various criteria to identify new firms that were divestitures, which are excluded from the count of spinoffs. They also report the number of new establishments created by existing firms in their main four-digit industry and in other industries and the number of other new firms (with five or more employees).

In Brazil the average number of spinoffs was 13,893 per year and the average number of other new firms was 30,948 per year. This compares with 1,161 pulled and pushed spinoffs and 6,837 other new firms per year (including firms whose employees were all not employed in the prior year) in Sweden using the smaller cutoff of two initial

employees. The 13,893 spinoffs per year (with five or more employees) is roughly 12 times the annual number of spinoffs in Sweden (with two to ten employees) whereas the 30,948 other new firms (with five or more employees) per year in Brazil is only about 4.5 times the 6,837 other new firms (with two to ten employees) per year in Sweden. Expressed alternatively, Brazil has a much higher percentage of new firms with employees that are spinoffs (around 31%; 13,983/44,931) than Sweden (around 15%; 1,161/7,998), where both groups in Brazil are standardized by having five or more employees and in Sweden by having between 2 and 10 employees. Alternatively, if the base used for comparison is the number of new establishments founded by existing firms, the picture is different. The average annual number of new establishments outside their main industry founded by existing firms was 263 in Sweden versus 4,961 such diversification ventures with five or more employees in Brazil. Therefore, the number of spinoffs relative to diversifications was 4.4 for Sweden and 2.8 for Brazil. On this standard, the number of spinoffs is not low in Sweden relative to Brazil. However, this may also reflect that both spinoffs and the number of new establishments created by existing firms are low in Sweden relative to Brazil.

4.5 Distribution of New Establishments, Firms, and Incumbents by Broad Sectors

Table 3 provides information about the broad sectors entered by the various types of new establishments and firms in Sweden. Apart from the new establishments created by existing firms outside their main sector and new self-employed establishments, over 70% of the new firms entered in private services and another 5% to 10% in public services. These patterns reflect that the only sector that has grown in total employment since the

early 1990s in Sweden is services, which is a pattern also seen in other OECD countries.[8] Self-employed firms are distinctive in that nearly 30% entered in agriculture, fishing, and extraction. The new establishments of incumbent firms outside their main sector had much higher percentages in manufacturing and public services, roughly 21% in each, than the other types of new establishments.

An unreported breakdown of new firms in the manufacturing sector indicates that the spinoffs were somewhat more likely to enter more technologically progressive industries than other new firms. Over 50% of both pushed and pulled spinoffs entered the same two-digit sector as their parent establishment. This percentage is modestly higher for pushed spinoffs—60% versus 55% for pulled spinoffs—which might be expected if many of the pushed spinoffs were founded to preserve the jobs of employees at their (failed) parents.

The sectors and industries entered by the spinoffs in Sweden are similar to the spinoffs in Denmark and Brazil. In Sweden, about 10% of the pushed and pulled spinoffs entered in the manufacturing sector, which compares with 14% and 18% of the pushed and pulled spinoffs in Denmark respectively and 11% of all the spinoffs in Brazil. Breaking this down further in Sweden and comparing it to a breakdown reported for Brazil, about 1% of the spinoffs in Sweden entered in high-tech manufacturing industries and 28% in knowledge intensive services versus 2.4% and 15% respectively of the spinoffs in Brazil. The higher percentage of the Swedish spinoffs entering knowledge-based services is noteworthy, but the overall sector distribution of the spinoffs in Sweden is not markedly different from the spinoffs in Denmark and Brazil.

5. Employee Transitions

In this section we consider transitions of employees of incumbent firms during a representative year, 2004–2005, to gain insight into the types of employees that joined new firms. We analyze transitions for all employees and separately for those with a degree in science and engineering (S&E), which enables us to compare patterns in Sweden with those in the U.S. reported by Elfenbein at al. [2010]. The transition analyses consider 1,986,807 employees (132,785 in S&E) aged 20–64 working in NACE industries 15–74 in 2004 (but in any industry in 2005).[9]

We analyze the rate at which employees stayed with their employer, moved to another incumbent firm, were part of a divestiture, switched to self-employment, exited (in the sense of becoming not employed in the private sector), started a pushed spinoff, started a new pulled spinoff, or shifted to another new firm. Among the initial employees of pushed and pulled spinoffs, those coming from the parent were considered as starting their firm and the others were classified as shifting to another new firm.

Our comparisons with Denmark and Brazil suggested that the incidence of spinoffs in Sweden was comparable to Denmark but low compared to Brazil. As reported in the next section, pulled spinoffs outperformed the other types of new firms in Sweden, both with regard to survival and employment growth. Accordingly, in our discussion we focus on differences between the types of employees that started pulled versus those started pushed spinoffs or shifted to other new firms. We also compare our findings with a similar transition analysis that was conducted by Eriksson and Kuhn [2006] for Denmark, although they do not distinguish between movements to pulled versus pushed spinoffs.

5.1 Overview of Transition Frequencies

In Table 4, transitions for all employees and for selected employee breakdowns are reported. Not surprisingly, the vast majority of employees, 76%, do not change employers. Sixteen percent move to another incumbent firm, 6% become not employed, 0.27% are part of a divestiture, 0.77% become self-employed (i.e., start a firm with one person), 0.04% move to another new firm, and 0.03% and 0.11% start pushed and pulled spinoffs respectively. Clearly, very few employees start spinoffs of any kind. The comparable numbers for Denmark for 1997–1998 are 74% stay with their current employer, 15.5% move to another incumbent firm, 7% become not employed, 2.5% are part of a divestiture, 0.4% become self-employed, 0.4% move to another new firm, and 0.13% start a spin-off (Erikson and Kuhn [2006, p.1029]). Bearing in mind the differences in the rates of self-employment between the Danish and the Swedish dataset, these numbers are surprisingly similar. For example, the transition rates to spinoffs (pushed and pulled) in Sweden is 0.14%, which is nearly the same rate as reported for Denmark.

The next five columns reflect how transition rates in Sweden vary by selected sectors, occupations, and education. All types of movements are lower for employees in manufacturing firms and greater for employees of service firms. Employees in management and specialist positions are less likely to leave their employer but more likely to move to pushed and especially pulled spinoffs than the average employee. College educated employees are slightly more likely to leave their employer but less likely to start pushed spinoffs and slightly less likely to start pulled spinoffs than the average employee.

The remaining columns in Table 4 reflect how transition rates are affected by job tenure, establishment size, and MNE affiliation. Tenure is defined as the number of years the employee has been with his employer. Tenure is often assumed to reflect the quality of the match between the employee and the employer, where longer tenure indicates a better match (Farber [1994]). Tenure is particularly interesting in the case of Sweden given the legal provisions that favor longer-tenured workers in cases of downsizing. Not surprisingly, the likelihood of all the transitions declines monotonically with tenure, although initially less sharply for pulled spinoffs. For example, the percentage of employees that move to other new firms, become self-employed, or switch employers all decline by about 50% when going from employees with less than two years of tenure to those with 2–5 years of tenure. The corresponding reduction for pulled spinoffs is only about 27%.

A general finding in the literature is that employee turnover declines with firm size. Table 4 indicates that this holds for Sweden as well, with the probability of an employee staying with his employer monotonically increasing across the four size categories listed. Among the various transitions, all except being part of a divestiture and starting a pulled spinoff monotonically decline across the four size classes. This is perhaps not surprising in the case of divestitures, which are often the province of large firms, but it is notable that the likelihood of starting a spinoff rises going from the smallest to the next establishment size class before declining at the higher two establishment size classes.

The last column reports transition rates for employees of MNEs. All transition rates are lower for employees of MNEs, including starting a pushed or pulled spinoff, than for the

average employee. This may be due to the larger size of MNEs, which we can control for in the statistical analysis of transition rates, to which we turn next.

5.2 Determinants of Employee Transitions

To analyze the determinants of the different employee transitions we estimate a multinomial logit transition model. The estimates are presented in Table 5. The coefficient estimates are relative risk ratios that reflect the effect of each of the explanatory variables on the various transitions relative to staying with the same employer, which is the omitted category. A coefficient greater than one indicates a larger effect than staying with the same employer.

We include several explanatory variables reflecting characteristics of the employee and his employer as of 2004. They include a dummy for males, age and age-squared, a dummy for long university education (at least three years), dummies for employment in manufacturing and knowledge based services, and dummies for management, specialist, qualified, and office occupations.[10] We also control for the number of prior employers, tenure and tenure squared, number of employees at the employee's establishment and its squared value, a dummy for whether the employee's establishment experienced a drop in total employment in 2003–2004, and the fraction of employees with a long university education (at least three years) at the employee's establishment. A dummy for whether the employee worked for an MNE is also included.

Consider first the effects of employee characteristics. Men and employees that have held more jobs are significantly more likely to move to all types of new firms. Age significantly lowers transition rates to new firms except for starting pushed and pulled

spinoffs, especially at younger ages judging from the coefficient estimates of the quadratic term. Managers and specialists are more likely to move to pushed and pulled spinoffs, although the coefficient for pushed spinoff is not statistically significant for specialists. More educated workers are significantly more likely to switch employers or become self-employed but significantly less likely to start a pulled spinoff. Employees with longer tenure are less likely to move in general. This effect falls off as tenure increases judging from the coefficient estimates of the quadratic term, but these effects are less pronounced for pushed and particularly pulled spinoffs. These patterns are largely consistent with the patterns reported in Table 4.

Consider next the effect of employer characteristics on movements. Employees in manufacturing firms are significantly less likely and employees in knowledge-based service firms significantly more likely to move to a new firm other than starting a pushed or pulled spinoff. Employees in establishments experiencing drops in employment are significantly more likely to change employers and be involved in a divestiture or move to a new firm of any type, including starting a pushed or pulled spinoff. This suggests that adversity can stimulate employees to find alternatives to their current employment. The effect of establishment size differs by type of transition. At first, the likelihood of moving to a pulled spinoff rises significantly with size, but the coefficient estimate of the quadratic term indicates that this subsequently falls when the size becomes above about 240 employees, whereas size significantly lowers the likelihood of changing employers, becoming self-employed, or exiting. These estimates are consistent with the patterns reported in Table 4, where only the percentage of workers moving to a pulled spinoff

initially rises with establishment size. The estimates in Table 5 also confirm that employees of MNEs are less likely to switch to new firms, including starting a spinoff.

Overall the estimates in Table 5 are consistent with those reported for Denmark in Erikson and Kuhn [2006]. Other than a significant negative effect of establishment size on starting a spinoff at low sizes and a weak positive insignificant effect of education on founding a spinoff, their findings are similar to ours. Most interesting for comparison is the magnitude of the estimated effects of employee tenure on the various types of transitions. Whereas it is difficult to lay off longer tenured workers in Sweden, Denmark introduced the so-called "flexicurity" system in the beginning of the 1990s that was designed to make it easy to hire and lay off all types of workers. Consequently, tenure might be expected to lower mobility more in Sweden than Denmark. Consistent with this expectation, the linear coefficient estimate of tenure for changing employer was 0.84 for Denmark compared to 0.74 for Sweden, and this difference is significant given that the confidence intervals of the reported estimates do not overlap. The coefficient estimates of tenure for the transitions to all the different types of new firms are also lower for Sweden than Denmark, consistent with tenure having a more inhibiting effect on mobility in Sweden than Denmark.

5.3 Transitions of Science and Engineering Employees

We now proceed to study the same set of transitions for employees with a S&E degree. These employees would be expected to be more involved in high-tech startups that can serve as important engines of growth than the average employee (Baumol [1993]). Our

benchmark is a recent study by Elfenbein et al. [2010], who use biennial survey data to analyze the propensity of scientists and engineers in the U.S. to found their own firms and the performance of these firms. Their most prominent finding is that employees of smaller firms are more likely to found their own (wholly-owned) firms and to found better-performing firms.

We first computed transition rates for S&E employees analogous to those for all employees in Table 4 and found very similar patterns. To be able to compare patterns in Sweden with the main ones found by Elfenbein et al. [2010] for the U.S., in Table 6 we present the various transition probabilities in Sweden for S&E employees according to the same firm size categories used by Elfenbein et al. [2010]. Elfenbein et al. [2010] report biennial probabilities for changing employers and for starting a wholly-owned firm of .213 and .019 respectively. The latter includes becoming self-employed and founding a new firm or spinoff owned entirely by one person, which is not a category in our data. For Swedish S&E employees, the annual probability of switching employers is .169 and for becoming self-employed or starting a pushed or pulled spinoff is 0.0089. Given that these figures are yearly, it would appear that Swedish S&E employees change jobs more frequently than American S&E employees and found new firms at comparable rates. In terms of how firm size affects transition rates in Sweden, the probability of becoming self-employed declines by over 80% across the five firm size classes, which is similar for U.S. S&E employees, and the patterns for pushed and pulled spinoffs in Sweden are similar.

Thus, Swedish S&E employees do not appear to be markedly different from U.S. S&E employees or other types of Swedish workers in terms of their inclination to change jobs or found new firms.

6. The Performance of New firms – Survival and Employment Growth

In this section we analyze the performance of the different types of new firms with two or more employees in terms of survival and employment growth.[11] Table 7 provides a broad overview of survival rates and employment growth at ages 3, 6, 9, and 12 for the five different types of new firms with two or more employees, including divestitures. Each entry reflects only firms that could have survived to that age—for example, only firms that entered by 1999 could have survived at least six years and are included in the computations for age 6. The survival rate at age *a* is the number of firms surviving to age *a* divided by the number that could have survived to age *a*. The employment rate at age *a* is the total employment of survivors at age *a* divided by the total initial employment of all firms that could have survived to age *a*. Also computed for each age *a* is a hazard rate. This was computed as the difference between the survival rate to age $a-3$ and to age *a* divided by the survival rate to age $a-3$.

Consider first the patterns at age 3. Pulled spinoffs had the highest survival rate of .68, followed by pushed spinoffs at .61, divestitures at .58, other new firms at .56, and firms with all employees previously not employed at .43 (hazard rates at this age are just 1 minus the survival rates). The employment growth rates have the same ordering. Note that the pulled spinoff employment growth rate is above 1, which indicates that

employment growth at the survivors exceeded the total initial employment of those that exited. This is not true for any of the other types of new firms.

At higher ages hazard rates are lower as are employment growth rates, with even the pulled spinoffs showing a net employment decline at ages 9 and 12. But the rankings are largely the same at each age, with pulled spinoffs generally having the lowest hazard rate and highest employment growth rate, followed by pushed spinoffs, divestitures, other new firms, and firms with all employees previously unemployed. These patterns are similar to those for Denmark (Ericksson and Kuhn [2006]) and other countries (Klepper [2009]). Firms with more employees from a common "parent" firm perform better, especially when their parent does not fail. This supports the importance of inheritance of positive traits from a parent firm in terms of the performance of its offspring.

6.1 Survival analysis

We further analyze survival patterns by estimating piece-wise exponential firm hazard models that are similar to those estimated in Eriksson and Kuhn [2006]. The hazard of firm exit is constrained to be equal within each of the age brackets 0–1, 2–3, 4–6, and 7–12, but is allowed to differ across the age brackets. We also allow the hazard to be a function of various explanatory variables that reflect characteristics of firms when they entered. At first these variables are constrained to affect the hazard equally at all ages but then are allowed to affect the hazard differently for each age bracket. Firms that survived to 2005 or that exited but over 50% of their employees moved to the same employer (which we infer were ownership changes rather than deaths) were treated as censored.

We first present Kaplan-Meier survival curves for the five different types of new firms with two or more employees in Figure 2. These curves reflect the fraction of firms of each type surviving to each age with censoring taken into account. As in Table 7, the pulled spinoffs stand out as the best performers and firms with all employees previously not employed as the worst, with pushed spinoffs and divestitures performing somewhat better than other new firms.

The hazard estimates are reported in Table 8. The explanatory variables include: the age brackets; the log of the initial number of employees; the mean age of the firm's initial employees and its squared value; the fraction of the firm's initial employees that were males; the fraction of the firm's initial employees with a long university education ($\geq$ 3 years); dummies for firms that entered in the manufacturing, private services, or public services sectors, with the omitted reference category agriculture, fishery and extraction; and time period dummies for 1996–2000 and 2001–2005, with the 1993–1995 period when Sweden experienced a sharp recession the omitted reference category. Dummies are also included for each type of new firm, with the omitted reference group the residual category of other new firms. For pushed and pulled spinoffs, we also include a variable equal to the log of the number of employees of its parent establishment and a dummy equal to 1 if the spinoff entered the same two-digit industry as its parent establishment; both variables equal 0 for non-spinoffs. For spinoffs that entered in 1998 or later, we also include a dummy equal to 1 if their parent firm was an MNE (we do not have this information for earlier entrants).

The estimates in column 1 of Table 8 constrain all the variables to have the same effect at each age. The coefficient estimates for the age brackets indicate that the hazard

declines with age. This can be due to firm heterogeneity, with the firms most at risk of exit disproportionately exiting first, and/or firms learning from experience. New firms that are larger at the time of entry have significantly lower hazards, especially at lower initial firm sizes judging from the coefficient estimate of the quadratic term. New firms with older and more experienced employees, a higher fraction of males, and a higher fraction of employees with a long university education have significantly lower hazards. Firms that enter in manufacturing and public services have lower hazards (than the reference group) and firm hazards are lower after the recessionary period 1993–1995 (the omitted category), especially in the period 2001–2005.

In terms of the firm type variables, even after controlling for all of the above variables, pulled spinoffs have the lowest hazards of all firms, followed by divestitures, both of which have significantly lower hazards than the omitted group of other new firms. The firms with the highest hazard are the ones with all previously not employed workers, which have a significantly greater hazard than the omitted group of other new firms. For spinoffs, entering in the same 2 digit industry as their parent significantly lowers their hazard whereas the size of their parent has a negative but insignificant effect on the hazard. Spinoffs with an MNE parent have a significantly lower hazard.

The estimates in column 2 of Table 8 allow the firm types and the three spinoff variables to have different effects on the hazard for each age bracket. The significantly lower hazards of the pulled spinoffs and the significantly higher hazard of the firms with all employees that previously were not employed are manifested at all ages whereas the significantly lower hazards of divestitures hold only for ages 0–1. The significant

negative effect for spinoffs of entering in the same two-digit industry as their parent is manifested only at the youngest age brackets of 0–1 and 2–3 years of age.

Overall, the hazard estimates are similar to those reported by Eriksson and Kuhn [2006] for Denmark. They too found that pulled spinoffs had the lowest hazards and that entering in the same industry as their parent lower the hazard of spinoffs at younger ages. One difference between our estimates and theirs is that the lower hazard of pulled spinoffs shows up in Sweden at all ages, without having to take into account other factors such as firm heterogeneity, whereas in Denmark it persists at older ages only in frailty models that allow for unobserved firm heterogeneity. But the estimates for both countries suggest that heritage plays an important role in the performance of new firms, with firms performing better when more of their founders come from a common parent firm and they enter the same industry as their parent. Spinoffs of MNEs also performed better, which may reflect that their founders had a richer range of experiences to draw from to orient their firms (cf. Markusen [1995]).

6.2 Employment growth

Survival is one measure of performance, but survivors also differ in terms of how large they become. In this section we analyze the determinants of the rate of employment growth of survivors. By definition, these regressions involve selected samples of only survivors. To the extent the same factors influence survival as growth, their estimated effects in growth regressions will generally be biased toward zero due to induced correlations with unobservable determinants of survival and growth.[12]

We estimate growth regressions for firms at ages 3, 6, 9, and 12. In each, the dependent variable is the log of the firm's total employment at the respective age divided by its initial employment at entry. The explanatory variables are the same as in the hazard model except for the age brackets, which are no longer relevant as the firms in each regression are all the same age. Two sets of OLS estimates are reported in Table 9 according to whether the size of the parent establishment of spinoffs is included.

Consider first the estimates in columns 1 to 4 that do not include the size of the parent establishment of spinoffs. Most of the explanatory variables are significant in all the regressions. As in the hazard analyses, entrants with more educated employees and a greater fraction of males perform better, growing at significantly higher rates. Also similar to the hazard analyses, firms that enter in manufacturing and services perform better, growing at significantly higher rates. In contrast, firms with older employees grow at significantly lower rates whereas they had lower hazards of exit. Similarly, firms that are initially larger grow at significantly lower rates, whereas they had lower hazards of exit. This difference could be due to the construction of the dependent variable in the growth regressions, which includes the initial number of employees in the denominator. If the initial number of employees is measured with error, it will induce a negative correlation between the initial number of employees and the firm's measured growth rate, imparting a negative bias to the coefficient estimate of the initial number of employees.

In terms of the variables for the backgrounds of firms, pulled spinoffs perform best followed by pushed spinoffs, both of which grow at significantly higher rates than the omitted group of other new firms, and firms with all employees previously not employed performed worst, growing at significantly lower rates than the omitted group of other new

firms. These estimates are similar to the ones for the hazard, except now it is pushed spinoffs rather than divestitures that are the second best performers. There is no significant effect of spinoffs entering the same two-digit industry as their parent, which differs from the hazard analyses. The dummy for spinoffs of MNEs can only be included in the year 3 and year 6 regressions, as MNE affiliation is not known for older spinoffs. The coefficient estimate of the MNE dummy is negative and significant in the growth regression for age 6 when parent size is included but is otherwise insignificant, suggesting that spinoffs of MNEs grew at comparable rates to other spinoffs.

When the initial size of the spinoff's parent is included in the regressions, it consistently has a positive and significant effect, indicating that spinoffs of larger parents perform better. The inclusion of this variable eliminates the significance of the pulled and pushed spinoff dummies except for the pulled spinoff dummy at age 3, suggesting that the superior growth of the spinoffs is confined to those that came from larger parents. These estimates support the findings of the industry studies and Hvide's [2009] findings for Norway for spinoffs without a single owner and contrast with those for Denmark and for S&E employees in the U.S. pertaining to firms with a single owner.

7. Discussion and Concluding Remarks

Using matched employer-employee data spanning over a decade, we analyzed the incidence, characteristics, and performance of different types of new firms and establishments in Sweden. We focused especially on the characteristics of employees that found new firms of varying kinds and how the performance of the new firms relates to characteristics of their initial employees and their parent establishments. This section

discusses our main findings and conclusions, starting with the general patterns in Sweden and how they compare to other countries.

Our descriptive statistics on the distribution of new firms suggest that the patterns in Sweden are broadly in line with those observed in other countries. Annually about 8,500 new firms with two or more employees are founded in Sweden. Of these, about 14% are spinoffs, which by definition have a close attachment to a previous employer. About a fifth of the spinoffs are pushed in the sense that the parent establishment exited in the year the spinoff was founded. The largest category of new firms is a residual category of other new firms with no identifiable parent (65%). Similar to the findings of other studies, initially spinoffs are larger and new firms with all previously unemployed workers are smaller than all other types of new firms. Over 70% of all the new firms with two or more employees entered the private services sector, which reflects the general shift of employment towards private services taking place in most advanced economies. These patterns for Sweden are not markedly different from comparable ones reported for Denmark and Brazil.

Given that Sweden has a high tax burden relative to many other OECD countries as well as several labor market policies that may inhibit employee turnover (such as the LIFO principle), it might be expected that the rate of new firm formation would be relatively low in Sweden. However, we found that the differences between the number of new firms in Sweden and other countries are roughly in line with differences in country size. Furthermore, employee transitions rates and the proportion of pushed and pulled spinoffs are similar in Sweden to other countries. We did find some evidence that tenure has a more inhibiting effect on labor mobility (including founding a spinoff or other new

firm) in Sweden than in Denmark. This may be a reflection of differences in labor market institutions between the two countries, where employee seniority affords more protection in Sweden than Denmark.

One notable pattern in Sweden over our sample period is a significant increase in the number of pulled spinoffs. This might be a response to the major tax reform that Sweden undertook in 1991, although there is yet no comparable rise in other types of new firms. Alternatively, the increase in pulled spinoffs might simply reflect that opportunity-based new firm formation increases in periods of strong economic growth, which occurred in Sweden toward the latter part of our sample period.

A distinctive feature of the Swedish economy is a strong presence of MNEs, and we found a lower spinoff rate and lower mobility of employees in MNEs. This may reflect the declining attractiveness of locating advanced activities in Sweden by MNEs that has been documented in previous studies. The same phenomenon could also be behind the decline in the number of new establishments founded by existing firms outside their main two-digit sector in Sweden in the last years of our sample period, 2003–2005.

Our performance analyses showed that there are substantial differences across different categories of new firms regarding both survival and employment growth. While survival has been thoroughly studied in prior studies (although not for Sweden), there are few systematic analyses of employment growth after entry for different types of new firms. Both measures of performance are systematically related to the characteristics and work experience of their founders. Pulled spinoffs outperform all other types of new firms; they have lower hazard rates and generate more jobs at all ages than all other types of firms in our sample.

Spinoffs on average are larger and initially employ more advanced and experienced workers than other types of new firms. Even after controlling for these differences, pulled spinoffs still have significantly lower hazards than other types of new firms, especially if they enter the same sector as their parent. This is consistent with previous studies and provides additional evidence that spinoffs inherit competencies and knowledge from their parents, providing an advantage over other firms. We also find that the general advantage of spinoffs persists as firms age, although the benefit of entering the same sector as their parent vanishes after three years of age. The former result suggests that the competencies spinoffs inherit from their parents are tacit and not easily imitated. The latter result may reflect that industry-specific knowledge depreciates at a high rate and/or that other entrants quickly learn this knowledge through (industry) experience. Spinoffs with parents that are MNEs also perform better, which may reflect that MNEs in general have richer tangible and intangible resources that founders of spinoffs can draw upon.

An interesting and novel finding is that the same factors that influence survival also influence employment growth following entry through all ages, with pulled spinoffs outperforming all other types of new firms in terms of employment growth. Our analysis of employment growth confirmed that these patterns persisted even after controlling for initial firm size and several characteristics of firms' initial employees. The higher growth rate of spinoffs appears, however, to be confined to spinoffs with larger parents. The influence of parent size on the performance of spinoffs has been debated in the literature. Recent studies of self-employed firms (with or without employees) and firms with a single owner tend to find that parent size has a negative effect on the performance of spinoffs (e.g., Sørensen and Phillips [2011], Elfenbein et al. [2010]). In contrast, our

results for spinoffs suggest that for firms without a single-owner, which on average are larger, parent size has a positive influence on performance. These contrasting findings call for further analyses of how parent size conditions the performance of their offspring.

Sweden's sluggish performance in the 1980s and early 1990s relative to other OECD countries raised concerns about the rate of new firm formation in Sweden. However, we found that the rate of creation of spinoffs and other types of new firms in Sweden is in line with other advanced countries. It is possible, though, that our findings reflect an improvement in the environment in Sweden regarding the formation of new firms since the early 1990s. On the other hand, past concerns about new firm formation in Sweden have been based on limited international comparisons of rates of self-employment, and our study affords a much broader perspective on new firm formation in Sweden.

We noted a number of characteristics about Sweden that may bear on spinoffs, including labor market regulations and the strong presence of MNEs. Although we did not find a markedly lower spinoff rate and employee mobility in Sweden than other countries, tenure appears to have a more inhibiting effect on mobility, including founding a spinoff, in Sweden than in Denmark. This warrants further study. Regarding spinoffs of MNEs, though we found they perform better even though MNEs are less likely to spawn spinoffs. MNEs account for about 90% of Sweden's total business R&D investment and also employ a significant fraction of the country's white-collar workers in the private sector. Given their significance, measures to facilitate spinoffs from MNEs might be desirable. On the other hand, such measures might harm the incentives of MNEs to invest, and as such merit further study. Overall, the modern environment regarding spinoffs and new firm formation in Sweden appears to be healthier than perhaps generally

thought, but further tweaks to the labor market and policies toward MNEs might improve the climate further.

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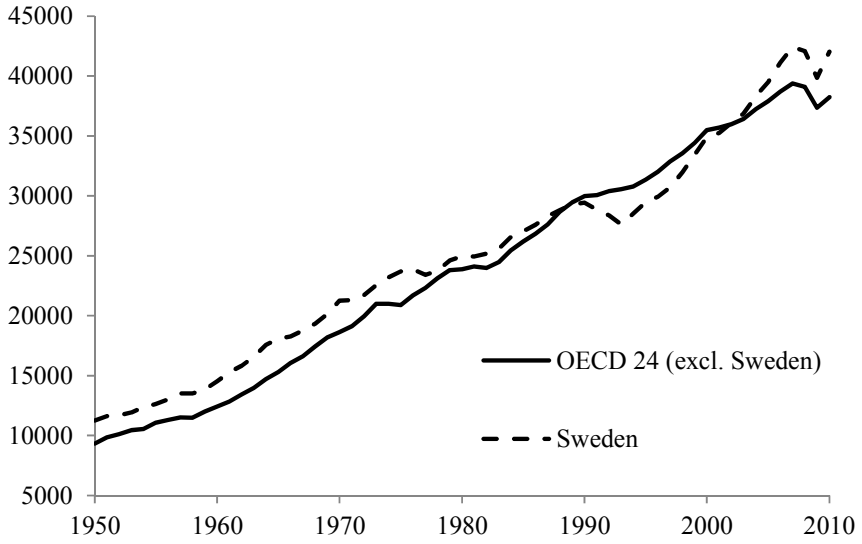

Figure 1: GDP per capita in OECD (excl. Sweden) and Sweden 1950–2010, in 2011 $, EKS PPPs.
(Source: The Conference Board Total Economy Database™, January 2012, http://www.conference-board.org/data/economydatabase/)

Table 1: Number of Firms by Type and year, 1993–2005.

Year	NE I	NE II	DIV	ONF	SE	NON-E	Push-SO	Pull-SO
1993	207	1 919	440	5 410	32 405	1 387	495	926
1994	276	2 670	410	6 125	50 680	2 555	275	698
1995	236	2 223	319	5 504	42 265	1 761	197	673
1996	361	2 325	291	4 773	40 754	1 213	214	725
1997	599	2 371	483	5 921	47 857	1 219	319	914
1998	286	2 785	521	5 322	43 294	1 407	219	799
1999	219	3 090	539	5 113	42 043	1 109	219	778
2000	205	2 267	798	6 093	42 469	1 084	251	1 010
2001	198	2 359	562	5 542	40 969	876	283	970
2002	221	2 432	441	4 987	39 699	855	307	942
2003	264	2 169	383	6 038	38 395	807	311	983
2004	188	2 013	408	5 365	41 175	891	311	972
2005	162	2 101	428	6 330	52 042	1 204	263	1 049
Total	**3 422**	**30 724**	**6 023**	**72 523**	**554 047**	**16 368**	**3 664**	**11 439**

Note: NE I and II refers to new establishments by incumbent firms outside and within the incumbent firm's main 2-digit NACE sector, respectively. DIV, ONF, SE and NON-E denote Divestitures, Other New Firm, new Self-Employed and other new firm where all employees were non-employed the prior year, respectively. Push-SO and Pull-SO are pushed and pulled spin-offs, respectively.

Table 2: Number of Employees of Firms by Type and Year, 1993–2005

Year	NE I	NE II	DIV	ONF	SE	NON-E	Push-SO	Pull-SO
1993	1 074	16 022	11 293	16 277	32 405	3 132	1 620	3 176
1994	2 208	21 945	9 104	18 726	50 680	5 632	894	2 263
1995	1 055	19 051	7 122	16 838	42 265	3 975	683	2 092
1996	1 140	19 278	6 266	14 043	40 754	2 687	717	2 348
1997	1 764	15 629	12 846	18 337	47 857	2 681	1 119	2 933
1998	3 906	25 062	12 634	16 641	43 294	3 082	767	2 736
1999	2 069	30 472	14 965	15 937	42 043	2 456	803	2 593
2000	1 313	18 385	19 541	20 023	42 469	2 433	907	3 446
2001	1 404	20 046	14 678	17 753	40 969	1 903	1 017	3 343
2002	2 311	21 861	10 644	15 833	39 699	1 850	1 160	3 250
2003	2 276	19 137	8 311	17 776	38 395	1 765	1 075	3 272
2004	1 684	16 149	10 228	16 401	41 175	1 950	1 094	3 262
2005	1 535	15 945	9 125	19 146	52 042	2 623	911	3 345
Total	**23 739**	**258 982**	**146 757**	**223 731**	**554 047**	**36 169**	**12 767**	**38 059**

Note: Firm acronyms in columns as in Table1.

Table 3: Distribution of New Firms and Establishments across Broad Sector Categories (Percent of Total).

	AFE	Manufacturing	Private services	Public services
NE I	10.61	21.07	47.11	21.22
NE II	4.42	10.12	74.84	10.62
DIV	5.26	12.50	73.47	8.77
ONF	9.16	7.55	75.09	8.19
SE	29.37	4.84	48.22	17.56
NE	13.72	8.28	71.69	6.32
Push-SO	7.12	11.24	75.79	5.84
Pull-SO	6.69	9.63	76.17	7.51

Note: Firm acronyms in rows as in Table1. AFE denotes Agriculture, Fishing and Extraction (NACE 1–14). Manufacturing comprise NACE sectors 15–16, Private Services 37–74 and Public Services 75–99. All data are based on new private firms, and public services refer to services sectors dominated by public organizations.

Table 4: Transitions (%) 2004-2005 by Employees Employed in the Private Sector (NACE 15–74) in 2004.

	All	Manu.	Serv.	Manag.	Spec.	University education	Tenure 0–1	Tenure 2–5	Tenure 6–9	Tenure ≥ 10	Size 0–9	Size 10–49	Size 50–249	Size ≥ 250	MNE
Switch employer	16.28	9.48	19.56	14.71	16.1	18.14	26.65	12.82	8.78	7.98	20.83	18.39	15.54	10.16	15.35
Pushed spinoff	0.03	0.01	0.03	0.05	0.03	0.02	0.05	0.02	0.02	0.01	0.08	0.03	0	0	0.01
Pulled spinoff	0.11	0.05	0.14	0.15	0.14	0.1	0.15	0.11	0.09	0.05	0.16	0.18	0.07	0.02	0.07
Be divested	0.27	0.24	0.28	0.24	0.25	0.28	0.42	0.22	0.14	0.13	0.19	0.31	0.32	0.2	0.25
Self-employed	0.77	0.51	0.89	0.97	1.04	0.95	1.22	0.63	0.49	0.35	1.49	0.83	0.53	0.36	0.52
Switch to new firm	0.4	0.17	0.52	0.41	0.31	0.34	0.76	0.3	0.18	0.08	1.04	0.41	0.21	0.11	0.2
Stay with firm	75.72	84.4	71.53	79.98	78.43	75.6	60.2	81.3	87.02	87.38	66.67	73.42	77.59	84.53	78.42
Exit	6.42	5.13	7.05	3.5	3.7	4.57	10.56	4.58	3.29	4.03	9.54	6.44	5.74	4.62	5.19

Note: Manu and Serv refers to employees working in manufacturing (NACE 15–36) and services (NACE 37–74), respectively. Manag and Spec. is management and specialist occupation, respectively. Management and Specialist occupations are defined as occupation code 1 and 2, respectively, at the 1-digit SSYK level Specialist occupations generally comprise work tasks requiring theoretical specialist knowledge. University education refers to employees with a university education of at least three years. Tenure is the number of years the employee has stayed with her current employer. The intervals are in years. Size refers to the size in terms of employees of the establishment the employee work at. MNE and non-MNE denote whether the employee work at a firm that is or is not affiliated to a MNE.

Table 5: Multinomial Logit Estimates of Transition Probabilities for Employees in Manufacturing and Services Sectors (NACE 15–74), 2004/2005.

	Switch employer	Pushed spin-off	Pulled spin-off	Be divested	Self-employed	Other new firm	Exit
Tenure	0.7358***	0.8278***	0.9015***	0.7472***	0.7774***	0.7514***	0.7225***
	−0.0011	−0.0275	−0.0132	−0.0081	−0.0048	−0.007	−0.0017
Tenure_sq	1.0157***	1.0067***	1.0036***	1.0138***	1.0111***	1.0122***	1.0145***
	−0.0001	−0.002	−0.0009	−0.0006	−0.0004	−0.0006	−0.0001
NP_jobs	1.0874***	1.0817***	1.0706***	1.1135***	1.1120***	1.1222***	0.9950**
	−0.0011	−0.0205	−0.01	−0.007	−0.0039	−0.0057	−0.0017
Age	0.8929***	0.9745	1.0501**	0.9074***	0.9539***	0.9156***	0.7351***
	−0.0013	−0.0308	−0.0172	−0.0087	−0.0056	−0.0077	−0.0015
Age_sq	1.0011***	1.0001	0.9991***	1.0009***	1.0007***	1.0006***	1.0038***
	0	−0.0004	−0.0002	−0.0001	−0.0001	−0.0001	0
Male	1.0557***	1.2545*	1.8820***	1.3438***	1.4110***	1.3882***	0.7105***
	−0.0047	−0.1233	−0.0998	−0.0419	−0.0267	−0.0356	−0.0046
University ed.	1.2384***	0.9215	0.8064**	0.9526	1.2080***	0.9874	0.9597***
	−0.0091	−0.1508	−0.0658	−0.0467	−0.0371	−0.0473	−0.0119
Management	0.9824	1.6528**	1.4215***	0.9323	1.0708*	1.034	0.5458***
	−0.0094	−0.2534	−0.1202	−0.0607	−0.0354	−0.0509	−0.0093
Specialist	0.9077***	1.0706	1.8116***	0.7273***	1.2370***	0.7902***	0.5292***
	−0.0079	−0.1773	−0.1449	−0.0423	−0.0396	−0.0395	−0.0078
Qualified	0.7858***	0.799	1.1185	0.9199*	0.9071***	0.7642***	0.5643***
	−0.0051	−0.1135	−0.0714	−0.0381	−0.0227	−0.0278	−0.0058
Office	1.4740***	0.5641**	0.6858***	0.8684**	0.8260***	0.8023***	0.9113***
	−0.0092	−0.1167	−0.0675	−0.0445	−0.0273	−0.0356	−0.0091
Manufacturing	0.7725***	1.0945	0.6266***	1.1528***	0.9575	0.6559***	0.992
	−0.0045	−0.1273	−0.0398	−0.0391	−0.0215	−0.0234	−0.008
KBS	1.9854***	1.247	1.0946	1.7586***	1.3772***	1.1981***	1.5128***
	−0.0109	−0.1557	−0.0661	−0.0641	−0.0314	−0.0379	−0.0132
MNE	1.2714***	0.5080***	0.7484***	0.8685***	0.8152***	0.7291***	0.9869
	−0.006	−0.0566	−0.0356	−0.0273	−0.0158	−0.0209	−0.0071
Log size	1.0172***	14.6756***	3.2340***	1.6851***	0.7684***	0.5625***	0.7316***
	−0.0046	−6.7853	−0.251	−0.0601	−0.0112	−0.0114	−0.0044
Log size_sq	0.9816***	0.5074***	0.8075***	0.9441***	1.0042*	1.0317***	1.0262***
	−0.0005	−0.0543	−0.0107	−0.0039	−0.002	−0.0031	−0.0007
Neg Δemp	1.2913***	1.5792***	1.1561**	1.3808***	1.1342***	1.2278***	1.2227***
	−0.0056	−0.1402	−0.0524	−0.0392	−0.0202	−0.0311	−0.0078
Educ emp.	0.4079***	1.56	0.7532	0.9526	0.8485**	0.8127*	0.7918***
	−0.0067	−0.4556	−0.1166	−0.0941	−0.0471	−0.0676	−0.0194
Pseudo R−sq	0.1013						

Note: The table reports relative risk ratios (rrr) obtained from a multinomial logit model estimated on 1,986,807 employees employed in sectors NACE 15–74 in 2004. NP_jobs refer to the number of prior employers and University ed is a dummy variable taking the value 1 if the employee has a long university education of at least three years. Management, Specialist, Qualified and Office are occupation dummy variables at the one-digit level of the SSYK classification system. KBS is a dummy for knowledge-based services and MNE is a dummy for whether the employee works at a firm that is affiliated to a MNE. Neg Δemp is a dummy taking the value 1 if the establishment where the employee works experienced negative employment change between 2003 and 2004, i.e. the pair of years before the transition is made. Educ emp. denotes the fraction of employees with a long university education at the establishment where the employee works. Standard errors are presented below each parameter estimate. *** p<0.01, ** p<0.05, *p<0.1.

Table 6: Fraction of Employees Working in Different Size-classes of Firms in 2004 and Transitions (%) 2004–2005, Science and Engineering Employees.

	All	Size 1–25	Size 25–100	Size 101–1000	Size 1001–5000	Size >5000
Fraction of employees in 2004	–––––	15.90	14.63	31.71	19.95	17.80
Switch employer	16.94	24.4	20.49	18.26	14.44	7.81
Pushed spin-off	0.03	0.15	0.02	0.01	0	0
Pulled spin-off	0.10	0.23	0.17	0.11	0.02	0.02
Be divested	0.31	0.29	0.48	0.38	0.21	0.17
Become self-employed	0.76	1.8	0.92	0.53	0.56	0.35
Switch to other new firm	0.29	0.77	0.34	0.18	0.19	0.12
Stay with firm	77.69	66.3	73.71	77.33	81.05	88.03
Exit	3.87	6.06	3.87	3.2	3.53	3.49

Note: The table reports the fraction of employees that transcend to different states between 2004 and 2005 for all S&E employees and by size class of the firm they were employed by in 2004.

Table 7: Employment, Mean Size, and Fraction of Survivors at Different Ages.

Age	Number of potential survivors	Fraction of survivors	Hazard rate	Employment fraction	Mean size of survivors
			Divestitures		
3	4 804	0.58	0.42	0.77	33.13
6	3 003	0.39	0.33	0.60	37.94
9	1 460	0.29	0.25	0.54	43.16
12	440	0.22	0.24	0.35	40.04
			Other new firms		
3	54 790	0.56	0.44	0.86	4.83
6	38 168	0.38	0.32	0.71	5.72
9	21 812	0.29	0.24	0.61	6.38
12	5 410	0.22	0.23	0.50	6.71
			New firms by non-employed		
3	13 466	0.43	0.57	0.56	2.91
6	10 651	0.27	0.37	0.45	3.69
9	6 916	0.19	0.30	0.37	4.39
12	1 387	0.16	0.17	0.32	4.57
			Pushed spinoffs		
3	2 779	0.61	0.39	0.88	5.05
6	1 938	0.46	0.24	0.78	5.74
9	1 181	0.35	0.23	0.66	6.20
12	495	0.29	0.18	0.69	7.72
			Pulled spinoffs		
3	8 435	0.68	0.32	1.20	5.89
6	5 513	0.51	0.26	1.07	6.93
9	3 022	0.40	0.21	0.99	8.09
12	926	0.34	0.15	0.93	9.36

Note: Number of potential survivors is the number of firms that entered early enough in the sample period to be able to reach the respective ages. The hazard rate is computed as the difference between the survival rate to age $a-3$ and to age a divided by the survival rate to age $a-3$. Employment fraction refers to employment of the group of firms surviving to a given age divided by the initial number of employees in those firms that could potentially survive to that age.

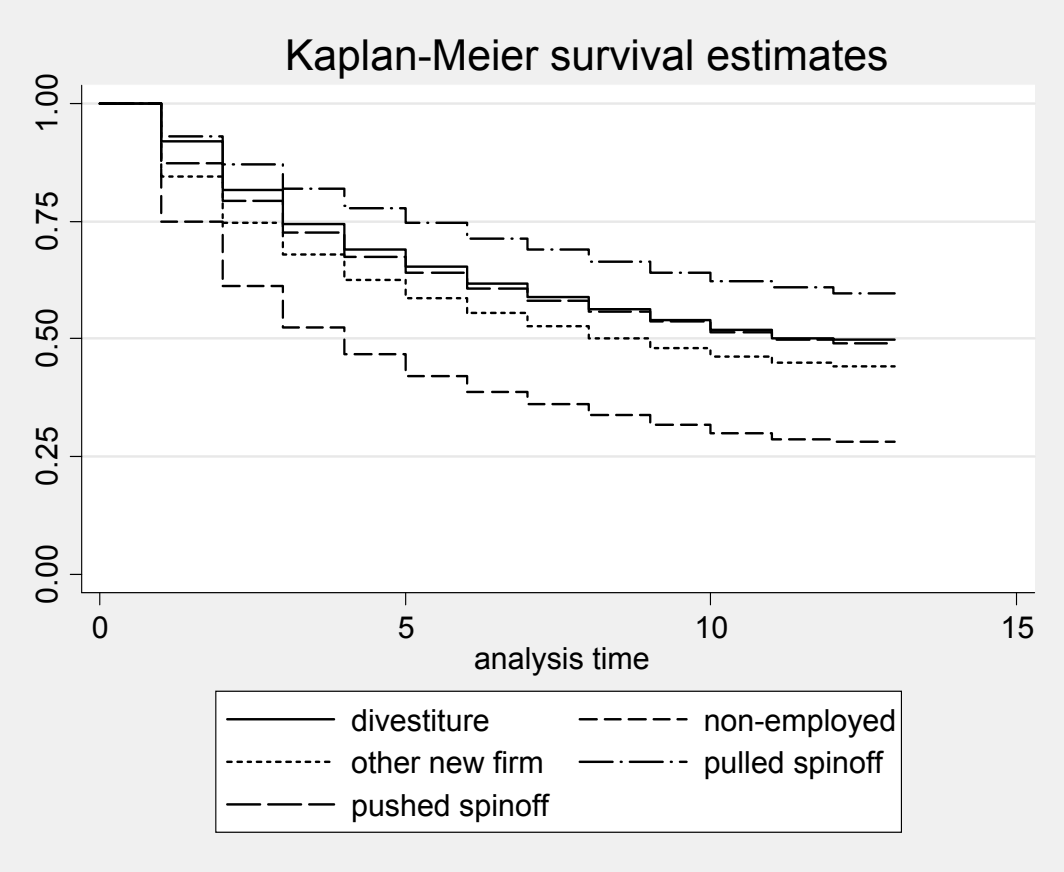

Figure 2: Kaplan-Meier Survival Estimates for Five Types of New Firms.

Table 8: Coefficient Estimates of the Piecewise Exponential Hazard Model

	1	2
Age (0–1 year)	0.638***	0.649***
	−0.0529	−0.0533
Age (2–3 year)	0.286***	0.255***
	−0.0535	−0.0538
Age (4–6 year)	−0.252***	−0.285***
	−0.0543	−0.0547
Age (7– year)	−0.802***	−0.851***
	−0.0578	−0.0599
Period 2 (1996–2000)	−0.00478	−0.00495
	−0.0111	−0.0111
Period 3 (2001–2005)	−0.322***	−0.321***
	−0.0135	−0.0135
Size (log)	−0.0444***	−0.0445***
	−0.0123	−0.0123
Mean age	−0.0989***	−0.0982***
	−0.00243	−0.00243
Mean age_sq	1.135***	1.126***
	−0.028	−0.028
Share male	−0.208***	−0.207***
	−0.0142	−0.0142
Share highly educated	−0.163***	−0.163***
	−0.0238	−0.0238
Parent size (log)	0.000509	−0.00051
	−0.0138	−0.0138
MNE_parent	−0.171**	−0.144**
	−0.0689	−0.069
Manufacturing	−0.362***	−0.361***
	−0.0226	−0.0226
Services	−0.233***	−0.232***
	−0.0153	−0.0153
Public services	−0.396***	−0.396***
	−0.0236	−0.0236
Same sector as parent	−0.230***	−
	−0.0321	−
Pulled spinoff	−0.352***	−
	−0.0502	−
Pushed spinoff	0.0451	−
	−0.0468	−
Non-employed	0.327***	−
	−0.0129	−
Divestiture	−0.141***	−
	−0.0331	−
Age 0–1 same sector	−	−0.502***
	−	−0.0573
Age 2–3 same sector	−	−0.177***
	−	−0.0531
Age 4–6 same sector	−	−0.0778
	−	−0.0635
Age 7 same sector	−	0.0651
	−	−0.121
Age 0–1 pulled spinoff	−	−0.468***
	−	−0.0614
Age 2–3 pulled spinoff	−	−0.337***
	−	−0.0612

Age 4–6 pulled spinoff	−	−0.250***
	−	−0.0683
Age 7 pulled spinoff	−	−0.232**
	−	−0.113
Age 0–1 pushed spinoff	−	0.159**
	−	−0.063
Age 2–3 pushed spinoff	−	0.019
	−	−0.0664
Age 4–6 pushed spinoff	−	−0.0207
	−	−0.0793
Age 7 pushed spinoff	−	−0.0573
	−	−0.138
Age 0–1 non-employed	−	0.328***
	−	−0.0189
Age 2–3 non-employed	−	0.336***
	−	−0.0211
Age 4–6 non-employed	−	0.298***
	−	−0.029
Age 7 non-employed	−	0.316***
	−	−0.0588
Age 0–1 divestiture	−	−0.558***
	−	−0.0521
Age 2–3 divestiture	−	0.0696
	−	−0.0425
Age 4–6 divestiture	−	0.0272
	−	−0.0536
Age 7 divestiture	−	0.0512
	−	−0.11
# of observations	254 626	254 626

Note: Standard errors are presented below each parameter estimate. *** p<0.01, ** p<0.05, *p<0.1.

Table 9: Ordinary Least Squares Estimates of Employment Growth from the Initial Year up to 3, 6, 9 and 12 Years, respectively.

	Year 3	**Year 6**	**Year 9**	**Year 12**	**Year 3**	**Year 6**	**Year 9**	**Year 12**
Initial size (log)	−0.0606***	−0.0698***	−0.0607***	−0.145***	−0.0635***	−0.0769***	−0.0701***	−0.163***
	−0.00767	−0.0127	−0.0209	−0.0466	−0.00768	−0.0127	−0.021	−0.0469
Mean age	−0.00489**	−0.0188***	−0.0260***	−0.0295*	−0.00494**	−0.0187***	−0.0264***	−0.0294*
	−0.0023	−0.00406	−0.00708	−0.0159	−0.0023	−0.00406	−0.00708	−0.0159
Mean age sq	−0.0722**	0.0272	0.0839	0.149	−0.0719**	0.0252	0.0873	0.145
	−0.0282	−0.0504	−0.0891	−0.202	−0.0282	−0.0504	−0.089	−0.202
Share male	0.0908***	0.0996***	0.0988***	0.225***	0.0897***	0.0968***	0.0959***	0.221***
	−0.00979	−0.0159	−0.0262	−0.0627	−0.00979	−0.0159	−0.0262	−0.0626
Share highly educated	0.0598***	0.0872***	0.0941**	0.0262	0.0541***	0.0761***	0.0807*	0.00748
	−0.0145	−0.0256	−0.042	−0.105	−0.0146	−0.0256	−0.0421	−0.105
Parent size (log)	–	–	–	–	0.0348***	0.0716***	0.0780***	0.119***
	–	–	–	–	−0.00678	−0.0109	−0.0172	−0.0392
MNE_parent	−0.00988	−0.0846	–	–	−0.0442	−0.162**	–	–
	−0.0291	−0.0739	–	–	−0.0299	−0.0748	–	–
Manufacturing	0.216***	0.286***	0.357***	0.423***	0.217***	0.287***	0.358***	0.417***
	−0.0155	−0.0237	−0.0365	−0.0822	−0.0155	−0.0237	−0.0365	−0.0821
Services	0.140***	0.199***	0.255***	0.291***	0.141***	0.200***	0.257***	0.288***
	−0.012	−0.0183	−0.0281	−0.0649	−0.012	−0.0183	−0.0281	−0.0648
Public services	0.132***	0.148***	0.193***	0.326***	0.131***	0.146***	0.188***	0.321***
	−0.0162	−0.0254	−0.0416	−0.1	−0.0162	−0.0254	−0.0416	−0.1
Same sector as parent	0.0176	−0.00799	0.0173	0.0689	0.0317*	0.0206	0.0411	0.0832
	−0.0164	−0.0259	−0.0416	−0.082	−0.0166	−0.0263	−0.0419	−0.0819
Pulled spinoff	0.182***	0.199***	0.170***	0.196***	0.0725***	−0.0263	−0.0721	−0.15
	−0.0141	−0.0222	−0.0359	−0.0715	−0.0256	−0.041	−0.0643	−0.135
Pushed spinoff	0.0532***	0.0787**	0.0697	0.198**	−0.03	−0.0921**	−0.113*	−0.0777
	−0.0203	−0.0312	−0.0478	−0.0888	−0.026	−0.0406	−0.0624	−0.127
Divestiture	0.0311	0.0441	0.104*	0.184	0.0366*	0.0572*	0.122**	0.218*
	−0.02	−0.0337	−0.0572	−0.127	−0.02	−0.0337	−0.0572	−0.127
Non-employed	−0.110***	−0.0916***	−0.0743***	−0.116*	−0.110***	−0.0932***	−0.0764***	−0.118*
	−0.0103	−0.0162	−0.0256	−0.0658	−0.0103	−0.0162	−0.0256	−0.0656
# of observations	46431	22207	9657	1978	46431	22207	9657	1978
R square	0.038	0.049	0.054	0.066	0.039	0.051	0.056	0.07

Note: The dependent variable is the log of the ratio of the number of employees at year 3, 6, 9 and 12, respectively, since entry and initial employment. Only firms surviving up to each corresponding age are included. Standard errors are presented below each parameter estimate. *** p<0.01, ** p<0.05, *p<0.1.

[1] A number of studies in the 1990s and early 2000s on the contribution of different firms to employment in Sweden also showed that the contribution of high-growth firms to employment was relatively limited in Sweden (Davidsson et al. [1994, 1996]; Davidsson and Delmar [2000]). This raised concern that small and young firms in Sweden face difficulties in trying to expand or that they are not willing to grow (Henrekson [2001]).

[2] In 2001, a rule was established that small firms with a maximum of 10 employees could disregard the LIFO principle for two employees. This rule was implemented to stimulate employment in small firms and make it easier for them to keep key personnel. Using matched employer-employee data for the period 1996-2005, von Below and Skogman Thoursie [2010] found modest effects of the new rule on labor turnover at smaller firms.

[3] We make use of the so-called FAD (*Företagens och Arbetsställens Dynamik)* coding scheme for establishments to distinguish various types of new firms based on worker flows (see Andersson and Arvidsson 2011).

[4] For all newly self-employed individuals that previously worked for another firm, some may have previously had a minority of their income from their self-employed business.

[5] In the period 2003 to 2005, though, when the number of the new establishments created by existing firms outside their main industry fell by about a third, this percentage dropped from 72% to 55%.

[6] Among the pulled and pushed spinoffs combined, 15% had parents that were MNEs, which is somewhat higher than the fraction of all Swedish firms with four or more employees (the minimum size of parents given the way we defined spinoffs) that were MNEs of 11%.

[7] For example, Davis and Henrekson [1999] present data on non-agricultural self-employment as a fraction of civilian employment for OECD countries in 1973, 1979, 1986 and 1990, respectively. In all years, Sweden has a significantly lower self-employment rate than Denmark.

[8] The pattern of spinoffs also reveals a shift from manufacturing to services. Of all spinoffs (pushed and pulled) with parent establishments in the manufacturing sector (about 14%), more than 50% end up in services sectors. However, among spinoffs with parent establishments in services sectors, about 96% end up in services.

[9]The sample of employees is restricted to those for which we have education (length and specialization) information. This information is absent for about 56,000 employees aged 20-64 in NACE industries 15-74 in 2004.

[10] Specialist and qualified occupations comprise jobs that typically require theoretical specialist knowledge and shorter university education respectively. Occupational categories are based on the one-digit Swedish (SSYK) occupation coding scheme.

[11] As in Erikson and Kuhn [2006], self-employed firms are not included in the survival analysis. We exclude these firms from the survival analysis for data comparability reasons. An employee may switch to/from self-employment depending on whether her business income exceeds her labor income, which makes survival comparisons to the other types of new firms (with at least two employees) difficult.

[12] A firm that survives to a particular age that is low on characteristics conducive to survival (and growth) will on average have higher compensating values of unobservables conducive to survival (and growth). This will induce a negative correlation between these unobservable and observable determinants of growth, which will bias their coefficient estimates in the growth regressions toward zero.

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