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ABSTRACT

This paper analyzes the relationship between exporters, spin-outs and firm performance. A large body of research has shown that exporters perform better than non-exporters. But are also firms spawn out from exporters better than other new firms in terms of survival, productivity and growth? Using a panel of about 2,000 ex-employee starts ups, their parent companies and 10 000 other new firms in Sweden observed over a sequence of 5 years, we provide new evidence on spinouts as a channel of transferring knowledge from exporting firms to new ventures.

Keywords: Exports, new firms, spin-out, spillovers, productivity

JEL: J24, L26, M13, O31, O32

1. INTRODUCTION

A rich literature has shown that exporters are more competitive than non-exporters (see the extensive research following a seminal paper by Barnard and Jensen, 1999). But are the descendents of exporters also better than other new ventures?

In order to compete successfully on the global market, a firm must be more productive than firms serving only domestic markets. What determines a firm's productive capacity? The literature suggests that many of the factors that create competitiveness are cumulative and contains complex knowledge-bases on various areas such as technology, innovation, management and market. To a large extent this knowledge is firms-specific and difficult to diffuse (Dosi and Nelsen, 2010, provides an extensive review of the state-of the art research on heterogeneity and firm performance). The literature on entrepreneurship suggests, however, that spinoff processes can be considered an efficient mechanism for spillover effects (Nicolau and Birely, 2003, Acs. et al 2009). When employees consider the opportunity cost of leaving and starting up a new venture, they walk out with inherited accumulated knowledge from the incumbent company.

With an explicit focus on exports, this paper is an attempt to analyze spinouts as a channel of transferring knowledge from exporting firms to new ventures. We define new ventures as companies five years old or younger. Based on three strands of research: international trade, economics of innovation and entrepreneurship, we formulate our basic hypotheses on survival and performance and test them on a panel of Swedish firm level data.

In total 11,727 spinoffs were created in the Swedish economy over the period 1998-2008 by 8,542 incumbent firms. In order to have sufficient information on both the parents and their descendants, we restrict the analysis to five consecutive cohorts. Hereby, we are able to track incumbent characteristics three years before spawning out and the start-up characteristics during the first five years of existence. The study is restricted to firms with at least one employee, which results in a panel consisting of 2,083 spinouts surviving their first five years and a reference group of close to 10,600 other new ventures.

Three different econometric techniques are implemented to test our hypotheses. First, we explore the survival rate of new start-ups conditional on the export characteristics of the spawning firm and on the new firm. Second, we estimate a multinomial model and investigate the link between the export characteristics of the incumbents and the export intensity for the

new firms. Third, in order to analyze the influence of parents on productivity and growth of the spawning firms, a linear panel data approach is applied.

The study shows that more than 90 percent of the exporting new firms have exporting parents, while 60 percent of the non-exporting new firms are spawn-out from a non-exporting incumbent. The fraction of exporters is three times larger among spin-outs compared to other new ventures. The typical new exporter surviving over the initial five-year period tends to keep the fraction of exports to sales almost constant during the period, and it is about the same for spinouts as for other new firms (around 15 percent).

We find that association to a parent firm positively influences the survival of new ventures, their productivity and growth. Conditional on productivity, physical capital, human capital, firm size, accessibility to external knowledge, ownership and sector classification, firms spawn out from non-exporters are 17 percent more likely to survive than start-ups not tied to any incumbent firm. Spinouts from exporting firms are 30 percent more likely to survive. No difference in the survival rate can be established between spinouts competing in the same or outside the parent's industry.

The second part of the study considers what happens to new firms subsequent to their establishment. Applying a multinomial model, the results suggest that firms spawn out from non-exporting parents have a low propensity to become exporters themselves, while spinouts from exporting parents typically are shipping not more than five products to a few countries. Concerning economic performance, linear panel data estimates suggest substantial post entry differences in productivity among the start-ups. A firm not spawn out an exporter has a premium on productivity of about 13 percent. For spinouts from exporting parents, the figure is doubled. The study also considers the impact of the exporting activity of the new ventures themselves. First we see that the export premium is about 20 percent for independent firms, when the reference group is non exporting not linked to any incumbent. Notable is that the productivity level for exporting independent firm is significantly larger than the productivity level for spinouts from not exporting incumbents. The difference is about 3 percent, controlling for differences in firms characteristics. The results shows that the superior group of new entrants are spinouts from exporting companies. They have 30 percent higher level of productivity than the reference group consisting of new ventures not defined as exporters.

The structure of the rest of this paper is as follows. The next section provides some background on spinouts and draws from three strands of the literature to develop the hypotheses. Section 3 describes the data and the description of variables. In section 4 the methodology is presented. Section 5 reports the results. A concluding discussion is provided in Section 6.

2. PREVIOUS LITERATURE AND HYPOTHESES

The past few years have seen an upsurge of attention from researchers to a special group of entrants into industries, namely spin-outs. Entry into an industry via spinoff (entrepreneurial ventures founded by ex-employees of incumbent firms) is a widespread phenomenon in many industries such as semiconductors (Brittain and Freeman, 1986), disk drives (Christensen, 1993; Agarwal et al., 2004), lasers (Klepper and Sleeper, 2005), biotechnology (Mitton, 1990; Stuart and Sorenson, 2003), medical devices (Chatterji, 2009), and automobiles (Klepper, 2007).

The dominant theoretical line of thought in the literature goes back to biological theories of evolution where employees inherit valuable knowledge from their place of employment (Klepper and Sleeper, 2005). In this vein, characteristics of employers such as their size (Sorensen, 2007; Elfenbein, Hamilton, and Zenger, 2010), stock of knowledge (Gompers, Lerner, and Scharfstein, 2005; Klepper and Sleeper, 2005) as well as their strategies in utilizing their knowledge in the market (Agarwal et al. 2004) influence employees' knowledge and entrepreneurial behavior.

This research suggests that employee start-ups inherit knowledge from their parents. Such knowledge inheritance is expected to have a positive influence on the performance of new firms (Klepper and Sleeper, 2005; Acs et al., 2009). Since exporters are more productive than other firms, we could also expect that their spinouts are more competitive than other new firms.

An extensive literature has convincingly demonstrated a close link between export performance and productivity, and between productivity and knowledge as well (Keller 2010; Bernard and Jensen 1999; Geroski et al 1993 among many others). Many of the factors that create long-term competitiveness are knowledge-based and firm-specific (Pavitt 1991; Klette and Johansen 1998).

Thus, firms' knowledge building is a core process that creates performance differences and heterogeneity also within narrow segments of a market. Knowledge is often linked to firms' long-term ambitions regarding R&D and innovation and lasting differences are observed with regard to firms' innovation strategies (Klette and Kortum, 2004; Dosi and Nelson, 2010).

Employees of firms that persistently undertake R&D are more likely to be exposed to new knowledge and ideas and are thus in a better position to recognize entrepreneurial opportunities emanating from unexploited knowledge of incumbents (Andersson et al. 2012). These employees could also be expected to choose to transcend to entrepreneurship only if they find good business ideas. As the entrepreneurial act is characterized by uncertainty, the expected net present benefits are weighted by the probability of success. At the same time, high level of opportunity costs could act as a form of threshold and sorting out potentially viable business ideas (Nicolau and Birley, 2003).

The assumption that spillovers allow spinouts to achieve better economic performance than other start-ups by capitalizing on the resources and capabilities of the parent companies has also been confirmed in the empirical literature (Klepper 2001; Agrawal et al. 2004; Andersson et al 2012)

Nevertheless, in contrast to the importance of the incumbents' knowledge base in determining entrepreneurial spawning, relatively little attention has been paid to the explicit relation between exports and entrepreneurial spawning. A small strand of the entrepreneurship literature studies presence of spinoffs on international markets. This research suggests that new ventures gain additional knowledge as they diversify further into international markets (Oviatt and McDougall, 1997; Barkema and Vermeulen 1998, Zahra et al. 200; Westhead et al 2001).

Moreover, the existing literature is also weak in terms of systematic evidence on the relationship between the parent company's export activity and the potential existence of internal spillovers through ex-employee start-ups. International trade acts as a channel for technology transfer and the literature has studied various sources of diffusion such as imports, exports, FDI and labour turnover. But to the best of our knowledge, very few studies have examined how this transfer of international technology may spread to new firms by ex-employees.

Our contribution to uncover the relationship between knowledge diffusion through both exporting firms their spin-outs, and between the spin-outs and their own exporting activities is

based on empirical test of five main hypothesis: (1) New ventures firms have higher probability of survival if they have been spawn out from exporting firms, (2) the likelihood of survival is greater for spin-out entrants than for all other types of entrants, when spin-outs are competing in the same industry as the exporting incumbent firm, (3) the likelihood of survival is greatest for spin-outs that both serve foreign markets themselves and have exporting parents, (4) the intensity of exports in terms of sales, products and destination countries is highest for spinouts linked to exporting incumbent firms competing in the same industry, and (5) spinouts are more productive and grow faster than other new ventures if they are formed by ex-employees from an incumbent firm, compete within arm lengths distance from the parent and serve foreign markets.

3. DATA

3.1 Sample

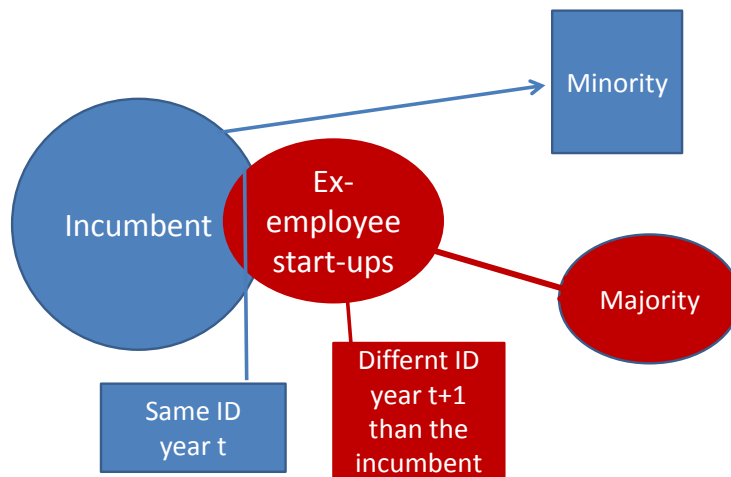
Our data is assembled from several sources. The first is register information on firms provided by Statistics Sweden and constructed from audited information based on annual reports. The second is trade data, originally registered by the Swedish Customs Department. The third data source is official information on people employed in the Swedish labor market.

Our original data set includes observations on virtually all Swedish manufacturing and service firms between 1997 and 2008 and information on all people in these firms. We consider both established companies and new entrants. Based on both firm and individual data the new firms are classified into two different categories: Employee-start ups and other new ventures which are not directly tied to any existing firms through the employment migration. We label these firms as *independent*¹.

¹ This definition ignores the ownership aspects and aims only to distinguish these companies from spin-outs

Figure 1

Spin-outs defined as ex-employee start ups



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The employee start-ups are identified by observing ex-employees in both the mother company and the new firm. If they were in minority of the mother firm the year before the transition to self-employment, and they are in majority in the new firm the year after the transition, we consider these firms as entrepreneurial spawning firms or spin-offs, see Figure 1 below. We also distinguish between spin-offs in the same 3-digit industry as the parent firm, and spin-outs outside the 3-digit industry of the parent firm.

In total 11,727 spin-offs were created in the Swedish economy over the period 1998-2008 by 8,542 incumbent firms. In order to have sufficient information on both the parents and their descendants, we restrict the analysis to five cohorts where we can track the incumbents for three years before the spawning and the new firms over a five year period. The first cohort starts with the year 2000 spinouts and the last cohort is the year 2004 spinouts. For each one of the five cohorts, we track the parent companies back three years before the year of spawning, see Table 1.

Table 1

Cohorts of spin-outs born 1998-2008, their survival rate year 2008, and year of observation of parent firms and spinouts in the study.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Surv
1998		992	933	856	783	709	645	617	584	558	540	496	0.50
1999			1042	999	906	817	760	705	652	609	573	542	0.52
2000				1142	1114	1001	921	856	808	754	706	671	0.59
2001					1099	1061	975	883	830	766	733	700	0.64
2002						1116	1061	968	899	830	781	737	0.66
2003							989	951	862	797	742	714	0.72
2004								1069	1034	950	878	825	0.77
2005									1024	969	885	823	0.80
2006										987	917	874	0.89
2007											1003	995	0.99
2008												1014	1.00

In the first analysis we consider the likelihood that the firms in each cohort will survive over a five-year period, which is our definition of a new venture. Our panel consists of 5,415 unique spinouts and their parents. The survival rates of spin-outs are compared to independent new ventures. The number of start-ups in this category is substantially larger than the spinouts and amounts to about 25,000 annually.

The two subsequent analyzes, carried out by multinomial logit and linear panel data models, restrict the panel to companies with at least one employee and the firms that survived the first five years on the market. The motivation for the first limitation is that our research focus here is to investigate the performance of surviving firms. The second limitation has two explanations: to construct a labour productivity measure and to ensure the quality of export data. With this restriction, the panel consists of 2,081 unique spinouts and 10,561 unique independent start-ups.

The choice of variables follows the literature on international trade, economics of innovation and entrepreneurship. The key variables are two categorizations of incumbent firms, four different categorizations of spinouts, two different categorizations of independent new ventures, exports measured by an indicator variable, products, countries of destination, sales, labour productivity and employment. The variables are winsorized, eliminating the influence

of the lowest and highest percent of the observations. The economic variables are expressed in real prices.

In order to be classified as an exporter, the incumbent must have served foreign markets throughout the considered three-year period. The new ventures are classified as exporters if they have export revenues for at least three years of the first five years on the market.

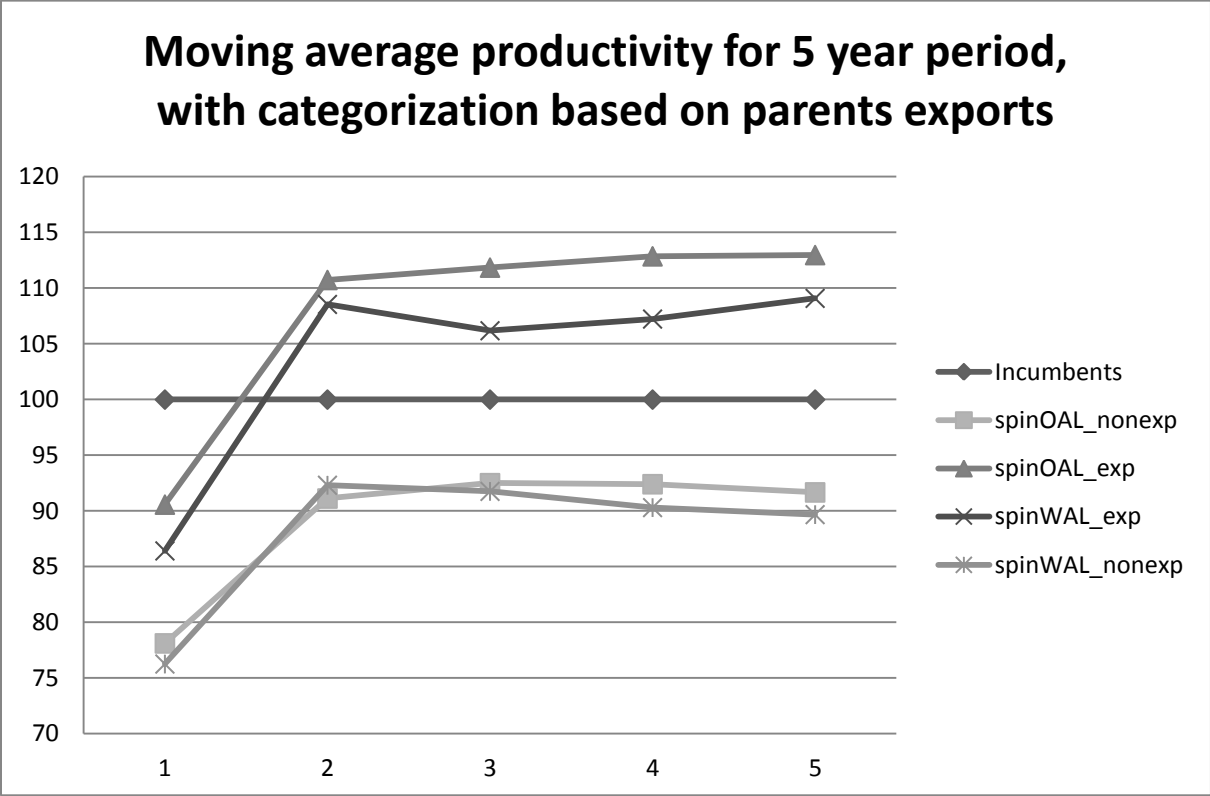
We distinguish between spin-outs competing in the same 3-digit industry as the parent company, and firms competing outside this 3-digit industry. Spin-outs are considered to typically operate at arm's length from their parent organizations.

3.2 Summary statistics

Table 2 provides definition of the article's key concepts, while Tables 2 and 3 summarize the variables we use in the analysis. Table 3 sorts the firms by two dimensions. The first separates the new ventures depending on whether they compete inside or outside the same industry as the parent. The second dimension is based on whether the parent company is an exporter or not. The table shows that spinouts from an exporting parent have higher productivity than spinouts from a non-exporting parent. Moreover, their productivity growth is higher and their size larger. Spinouts are typically non-affiliate firms, but those with an exporting parent tend to belong to a multinational group in a much greater extent than companies with a non-exporting parent. The vast majority of the ex-employee firms are services.

Figure 2 shows a moving average labour productivity for the different groups of spinouts relative to the incumbent firms, where the latter is normalized to 100. On average, the ex-employees from non-exporting incumbents enter the market with a productivity level that is more than 20 percent inferior to the parent's. After only one year, the gap is reduced to less than 10 percent. Over the next four years, this difference remains largely intact. The descendants of the exporting companies also have a lower productivity level than the parents. But our data show that the average new company has almost 10 percent higher productivity after one year, and among the companies competing at arm length's distance from the parent, this difference tends to increase somewhat over the next four years.

Figure 2



Note:
 spin WAL: New ventures Within Arm’s Length distance from the parent firm (3 digit industry).
 spin OAL: New ventures Outside Arm’s Length distance from the parent firm (3 digit industry).

Table 4 provides summary statistics organized after the three main categories of independent firms, spinouts within the same 3-digit industry as the parent company and spinouts outside the 3-digit industry. The six columns report statistics for non-exporters and exporters among these firms. The upper part of the table shows that the fraction of exporters is 6 percent among independent new ventures, compared to 14 percent for spinouts competing in the same industry as their parents and 21 for those competing outside. The next part reveals that more than 90 percent of the exporting spinouts have exporting parents, while 60 percent of the non-exporting new firms are spawn-out from a non-exporting incumbent. The typical new exporter that survives over the initial five-year period tend to keep the fraction of exports to sales almost constant during this period (Table II in the appendix reports the annual figures), and it is about 15 percent on average for all the three categories of exporting new ventures.

Also when we study the new firms after their own export activity, a clear pattern is revealing that exporting firms have higher productivity, faster productivity growth and higher

employment. Employment growth is, however, less obvious. Among independent firms, growth is fastest for exporters, while there is an opposite case for spin-outs.

4. EMPIRICAL STRATEGY

The objectives are to analyze how export activities of incumbents influence the performance of employee start-ups, and how the exports of new ventures correlate with their productivity and growth.

Three different econometric techniques are implemented to test our hypotheses. First, we explore the survival rate of the new start-ups conditional on the export-characteristics of the spawning firm and on the new firm. Second, we estimate a multinomial model and investigate the link between export-characteristics of the incumbents and export-intensity for new firms. Third, in order to analyze the influence of exporting on productivity and growth of the spawning firms, a linear panel data approach is applied.

There is a growing interest in determinants of firm survival and different models have been used to explore the propensity to survive among both exporters and new firms. To mention a few, Bernard and Jensen (1999) show that, conditional on size, exporters are 10% more likely to survive than non-exporters, Agarwal et al. (2004) and Andersson et al (2012), find that the likelihood of survival is greater for ex-employees competing in the same industry as the incumbent firm, than for all new entrants.

Following Audretsch and Mahmood (1994, 1995), Honjo (2000) and others, we will apply the Cox-regression model (Cox, 1972) in order to analyze survival rates among non-exporting and exporting independent new firms, non-exporting and exporting spin-outs within the same industry as the parent firm, and non-exporting and exporting spin-outs competing in other industries than the incumbents.

The set of control variables that could bias our results are similar in all three econometric approaches: firm size, human capital and physical capital, ownership, accessibility to external knowledge defined as the number of knowledge providing service firms in the region, sector classification, year dummies, and labour productivity.

In order to formally test the role of exporting incumbent parents on the decision of new firms to become exporters, we apply the multinomial logit, MNL estimation method. Each firm can decide to be non-exporter, low exporter, medium exporter or high exporter. The choice set of

all firms is $C=\{\text{Non-Ex, Low-Ex, Med-Ex, High-Ex}\}$. We have three different ways of measuring the export intensity: sales, products and destination countries.

The general model that we use for our empirical analysis of firm performance is a standard Cobb-Douglas production function. The data are repeated measurements at different points in time for the same firms. Variation in data can be decomposed into variation between firms of different sizes and characteristics such as industry classification, and variation within firms. Employing a logarithmic transformation, the basic model can be expressed as:

$$Q_{it} = \log \hat{Q}_{it} = X'_{it}\beta + Z'_i\alpha + \varepsilon_{it}$$

where \hat{Q}_{it} denotes the output of firm i at time t , X'_{it} are K time-variant regressors, $Z'_i\alpha$ the individual effect where Z includes a set of time-invariant individual-specific variables, of which some may be observed such as the classification of new ventures while others are unobserved such as entrepreneurial culture. The Z variables are taken to be constant over time t . The term ε_{it} represents the idiosyncratic errors.

The basic model provides two reasons for correlation in Q over time. The first obtains directly through time-variant observables X and time-invariant variables in Z , and indirectly through the time-invariant individual effect (unobserved heterogeneity). We use three different models for comparing possible effects of endogeneity on the results. The first is a pooled OLS, which do not account for endogeneity, at all (and not the unobserved firms specific effect as well). The second is the random-effects model, which assume that there is no correlation between the X -variables and the unobserved firm heterogeneity. The third model is the instrumental variable Hausman-Taylor model.

5. RESULTS

So far we have a positive association between descendants of exporting incumbent and firm performance using descriptive statistics. Now we test our five hypotheses using the different econometric approaches and a set of control variables.

5.1 Survival analysis

We start with the Cox proportional hazard estimates presented in Table 5, where the reference group is uniquely new firms and their hazard ratio is equal to one. The hypotheses derived from the literature are that (i) a new venture firm has higher probability of survival if it has an exporting parent, that the likelihood of survival is greater for spin-out entrants than for all

other types of entrants, (ii) when spin-outs are competing in the same industry as the exporting incumbent firm, and (iii) that the likelihood of survival is greatest for spin-outs that both serve foreign markets themselves and have exporting parents.

A lower hazard rate indicates that the firm that is more competitive and more likely to survive. A hazard rate larger than one has the opposite interpretation. The left part of the table reports results without controlling for labour productivity, firm size, human capital, physical capital and accessibility to knowledge intensive service providers. All these five covariates are included in the regression results displayed in the right part of Table 5.

The point estimates shown in the two upper rows suggest that spinouts have a significantly larger propensity to survive compared to other new ventures. There is also an interesting difference between the companies started by ex-employees depending on whether the parent company is an exporter or not. The equality of means, reported in the bottom of the table, show that descendants of exporting incumbent have likelihood of surviving the first five year on the market compare to spin-outs from exporting industries. Without controlling for observed firm heterogeneity, spinouts with non exporting parents have 40 percent larger to survive than independent new firm. The survival rate for ex-employees from exporting firms is 50 percent larger than the reference group. Taking the firm controls into account, the differences reduce to 18 and 30 percent, respectively.

Columns 2 and 4 reveal the coefficients for those spinouts competing in the same industry as the parent, and the ones competing outside. Using more limited samples the ours, Agrawal et al. (2004) and Andersson et. al (2012) suggest that the survival rate is new firms competing in the same industry as their parents. Controlling for incumbent exports and, we find that there is no difference in survival rate depending on arms lengths distance from the father or not.

5.2 Export intensity

The continued analysis concerns only those companies that have celebrated their fifth birthday. It should be noted that non survival need not be interpreted as a failure. In some cases, companies have disappeared from the market because of acquiring. But for the vast majority of businesses, closing down is the result weak performance.

Table 6 presents three measures of export intensity: export as a fraction of sales, number of export products and number of export countries. We define a new venture as exporter if it is present on foreign markets at least during three years during the five period considered. The fraction of exporters is three times larger among spinouts than other new firms. The mode

among the young exporters is that they are shipping 1-2 products to 1-2 countries. Now we investigate the impact of background of the firms.

The first row and the third row in each one of the three panels, indicate that new firm formed by non-exporting parents has a high propensity to be non-exporters. In contrast, ex-employees from exporting firms have a low likelihood to be non-exporters. Controlling for various firm-characteristics, the table show that they typically export more than one product and the export can be to one country or several. The main sales income is not from foreign markets. Thus the results from the multinomial model reject the hypothesis that the intensity of exports in terms of sales, products and product destinations is linked to the closeness to the industry of the exporting parent. The import determinant is only whether or not the parent is exporting

5.3 Productivity and growth

Most previous studies on spinout performance are based on small samples, selected samples or case studies. Tables 7 and 8 presents labour productivity coefficients for five successive cohorts who survived the first five years. In Table 7 the categorization of spinouts is based on the export-status of the parent companies, while we in Table 8 switch to consider the export-status of the new firms.

The main message from Table 7 is that spinouts from non exporting parents on average have 13-14 percent higher productivity than other independent new ventures. The results are almost identical across the three models. The coefficient estimates for new firms linked to exporting incumbents suggest that they have about 25 percent higher level of labour productivity than the reference group. The estimates are highly significant.

Table 8 considers the impact of the exporting activity of the new ventures themselves. Interestingly, we see that exporting is associated with a higher productivity for both spinouts and independent new firms. Once again, the estimates are fairly equal across the different models. First we see that the export premium is about 20 percent for independent firms. Notable is that the productivity level for exporting independent firm is significantly larger than the productivity level for spinouts from not exporting incumbents. The difference is about 3 percent, controlling for differences in firms characteristics. The table also reports that the superior group of new entrants is spinouts from exporting companies. They have 30 percent higher level of productivity than the reference group consisting of new ventures not defined as exporters.

Our final analysis is presented in Table II of the appendix. It confirms previous studies that spinouts tend to grow faster than other companies. No significant difference in employment growth between ex-employee start ups from exporting and non-exporting companies can be established. However, now ventures spawn by exporting firms and active on the foreign markets themselves or growing faster than other new ventures.

6. CONCLUSIONS

This paper provides systematic evidence on the relationship between the parent firm's export activity and internal spillovers through ex-employee start ups. We define spinout as a firm formed when an employee or group of employees leaves an existing entity to form an independent start-up firm. The parent entity can be either an exporting firm or a non-exporting firm.

We examine a Swedish dataset with originally consists of five cohorts of spinouts and other new firms and we estimate the likelihood that they will survive the five years on the market. The results shows that spinouts from exporting parents have 30 percent larger chance to survive compared to a new firm with no employee-link to a parent firm.

Using a panel of 2,000 surviving spinouts and about 10,000 other surviving entrants, we find that firms with an exporting parent have a large likelihood to become exporters themselves. Considering productivity and growth of the new firms, the results indicate a strong influence from exporting parents to competitive descendants.

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TABLES

Table 2

Definition of the key-variables in the study.

Variable label	Definition	Variable name
New Venture Firm	New company not more than 5 years old	
New venture background <i>a</i>	Unique new venture firms, no parent	
New venture background <i>b</i>	Parent firm not exporting during a three year period	
New venture background <i>c</i>	Parent firm exporting during a three year period	
Non exporting new venture	Exporting < 3 year during a five year period	
Exporting new venture	Exporting ≥ 3 year during a five year period	
Within arm's length distance	Firm operating within arm's length from their parent industry; within the same 3-digit industry-code (NACE)	
Outside arm's length distance	Firm operating at arm's length from their parent industry: outside the 3-digit industry-code (NACE)	
Independent new venture firms	New venture not classified as a spin-out	
New venture started by ex-employees in the same 3 digit industry as the parent company (Spin-out)	New venture firm started ex-employees that were in the minority of a firm period t-1 and who are in the majority of a new firm period t, and the new firm has a different identification than the parent firm. See fig 1.	
New venture started by ex-employees outside the 3 digit industry of the parent company (Spin-out)	New venture firm started ex-employees that were in the minority of a firm period t-1 and who are in the majority of a new firm period t, and the new firm has a different identification than the parent firm. See fig 1.	
Reference group	Independent new venture, Non exporter	Indep_ NoEx
Reference group	Independent new venture, Exporter	Indep_ Ex
Key-variable	Spin-out, Within Arm's Lengths distance, Non exporter	SpinWAL_ NoEx
Key-variable	Spin-out, Within Arm's Lengths distance, Exporter	SpinWAL_ Ex
Key-variable	Spin-out, Outside Arm's lengths distance, Non exporter	SpinOAL_ NoEx
Key-variable	Spin-out, within arm's lengths distance, Exporter	SpinOAL_ Ex
<i>Export/Sales</i>		
Low	The lowest 33	
Medium	Higher than 33 percentile and lower than 66 percentile	
High	Highest 33 percentile	
<i>Export products</i>		
Low	1 product	
Medium	More than 1 and less than 5	
High	5 or more products	
<i>Export countries</i>		
Low	1 country	
Medium	More than 1 and less than 5 countries	
High	5 or more countries	

Table 3

Summary statistics. Firm characteristics for spin-outs with different categorization of father-companies. Five-year period average. All survived spinouts five year after entry.

	Spin-out Same 3 digit as parent firm		Spin-out Other 3 digit than parent firm	
	Parent non exporter	Parent exporter	Parent non exporter	Parent exporter
Obs	2,835	2,334	2,755	2,491
Productivity, level (log)	12.81	12.96	12.82	13.03
Productivity, annual growth, %	5.59	7.78	5.57	6.74
Employment	9.84	37.96	32.22	25.09
Employment, annual growth, %	13.15	13.57	14.23	13.02
Human capital, fraction	0.11	0.18	0.20	0.14
Physical capital (log)	12.00	11.96	11.73	12.21
Accessibility to external knowledge	0.26	0.29	0.37	0.27
UNI-national	0.17	0.17	0.20	0.18
Domestic MNE	0.02	0.12	0.03	0.13
Foreign MNE	0.02	0.10	0.02	0.14
Non-affiliate	0.79	0.61	0.75	0.55
<i>Manufacturing</i>				
High technology	0.00	0.01	0.00	0.02
High medium technology	0.00	0.05	0.00	0.08
Low medium technology	0.02	0.05	0.02	0.08
Low technology	0.04	0.06	0.04	0.04
<i>Services</i>				
Knowledge intense	0.26	0.28	0.22	0.36
Other services	0.67	0.55	0.70	0.40
<i>Extractive and other</i>	0.01	0.00	0.02	0.02

Table 4

Summary statistics. New venture firms companies with different export-status.

Five-year period average. All survived firms five year after entry

	Indep		Spin-out Same 3 digit as parent firm		Spin-out Other3 digit than parent firm	
	Non-exporter	Exporter	Non-exporter	Exporter	Non-exporter	Exporter
Obs	49,970	2,835	4,533	636	4,337	909
Fraction exporters, %		5.7		14.0		21.0
Export/sales, exporters, %		13.1		14.9		15.2
<i>Conditional on parent firm is exporter</i>						
Fraction non exporters and exporters, %			38.1	95.1	38.7	89.2
<i>Conditional on parent firm is nonexporter</i>						
Fraction non exporters and exporters, %			61.8	4.9	61.3	10.8
Productivity, level (log)	12.72	12.91	12.85	13.05	12.87	13.10
Productivity, annual growth, %	4.72	7.76	6.26	8.83	5.90	7.19
Employment, number	5	17	10	109	19	75
Employment, annual growth, %	9	15	14	11	14	10
Human capital, fraction	0.16	0.10	0.15	0.10	0.19	0.12
Physical capital (log)	11.45	12.19	11.75	13.57	11.63	13.54
Accessibility to external knowledge	0.31	0.27	0.28	0.26	0.35	0.23
UNI-national	0.10	0.10	0.17	0.19	0.20	0.15
Domestic MNE	0.01	0.05	0.04	0.22	0.06	0.19
Foreign MNE	0.01	0.12	0.04	0.23	0.04	0.25
Non-affiliate	0.88	0.73	0.75	0.35	0.70	0.41
<i>Manufacturing</i>						
High technology	0.00	0.02	0.00	0.02	0.01	0.04
High medium technology	0.01	0.05	0.01	0.18	0.02	0.16
Low medium technology	0.02	0.07	0.02	0.13	0.03	0.12
Low technology	0.03	0.10	0.04	0.11	0.02	0.09
<i>Services</i>						
Knowledge intense	0.31	0.14	0.29	0.10	0.31	0.19
Other services	0.59	0.61	0.64	0.46	0.59	0.39
<i>Extractive and other</i>	0.03	0.01	0.01	0.00	0.02	0.01

Table 5

Firm survival. Cox hazard survival rate. Survival first 5-year period.

2. Parent NoEx	0.598*** (0.019)		0.825*** (0.027)	
3. Parent Ex	0.509*** (0.019)		0.701*** (0.027)	
4. SpinWAL_ NoEx		0.622*** (0.028)		0.788*** (0.036)
5. SpinWAL_ Ex		0.528*** (0.027)		0.690*** (0.039)
6. SpinOAL_ NoEx		0.576*** (0.026)		0.866*** (0.039)
7. SpinOAL_ Ex		0.488*** (0.027)		0.711*** (0.037)
Lab prod, log			0.982*** (0.001)	0.982*** (0.001)
Firm size, log			0.835*** (0.008)	0.835*** (0.008)
Human cap, %			0.718*** (0.012)	0.718*** (0.012)
Physical cap, log			0.992*** (0.001)	0.992*** (0.001)
Accessibility	0.985 (0.010)	0.985 (0.010)	0.997 (0.010)	0.997 (0.010)
Domestic MNE ¹	1.279*** (0.064)	1.278*** (0.064)	1.390*** (0.070)	1.389*** (0.070)
Foreign MNE ¹	1.077 (0.049)	1.076 (0.049)	1.177*** (0.054)	1.176*** (0.054)
Non-affiliate ¹	1.076*** (0.024)	1.076*** (0.024)	0.826*** (0.019)	0.826*** (0.019)
Manu: HT ²	1.031 (0.060)	1.030 (0.060)	1.135** (0.066)	1.134** (0.066)
Manu: HMT ²	1.056 (0.041)	1.056 (0.041)	1.137*** (0.045)	1.137*** (0.045)
ManuLMT ²	1.307*** (0.039)	1.307*** (0.039)	1.356*** (0.041)	1.356*** (0.041)
Manu: LT ²	1.303*** (0.028)	1.303*** (0.028)	1.416*** (0.031)	1.416*** (0.031)
Service: KIS ²	1.262*** (0.025)	1.262*** (0.025)	1.340*** (0.027)	1.340*** (0.027)
Service: OS ²	0.985 (0.010)	0.985 (0.010)	0.982*** (0.001)	0.982*** (0.001)
<i>Equality of means</i>				
3=2	0.005***		0.001***	
7=6		0.019**		0.003***
7=5		0.291		0.682
7=4		0.197		0.131
6=5		0.000***		0.001***
6=4		0.212		0.130
5=4		0.013**		0.061*

Notes

seEform in parentheses *** p<0.01, ** p<0.05, * p<0.1

(1) Reference is domestic firms belong to a group with only domestic affiliates, (2) Reference is other industries
Year dummies included.

Indep: No majority employment ties to a parent firm

Spin WAL: New ventures Within Arm's Length distance from the parent firm (3 digit industry).

Spin OAL: New ventures Outside Arm's Length distance from the parent firm (3 digit industry).

Table 6

Exports and new ventures. Multinomial logit model. Marginal effects. Reference group is uniquely new ventures

<i>Export/sales</i>	Non	Low	Medium	High
2. SpinWAL_ NoEx	0.069*** (0.004)	-0.019*** (0.003)	-0.027*** (0.002)	-0.023*** (0.001)
3. SpinWAL_ Ex	-0.111*** (0.009)	0.042*** (0.005)	0.042*** (0.006)	0.027*** (0.004)
4. SpinOAL_ NoEx	0.049*** (0.004)	-0.013*** (0.003)	-0.019*** (0.003)	-0.016*** (0.002)
5. SpinOAL_ Ex	-0.188*** 0.069***	0.075*** -0.019***	0.072*** -0.027***	0.041*** -0.023***
<i>Export products</i>	Non	Low	Medium	High
2. SpinWAL_ NoEx	0.025*** (0.006)	-0.006 (0.004)	-0.013*** (0.004)	-0.006*** (0.001)
3. SpinWAL_ Ex	-0.302*** (0.011)	0.074*** (0.007)	0.162*** (0.008)	0.066*** (0.005)
4. SpinOAL_ NoEx	0.059*** (0.005)	0.000 (0.004)	-0.049*** (0.002)	-0.010*** (0.001)
5. SpinOAL_ Ex	-0.200*** (0.010)	0.048*** (0.007)	0.094*** (0.007)	0.058*** (0.005)
<i>Export countries</i>	Non	Low	Medium	High
2. SpinWAL_ NoEx	0.028*** (0.006)	-0.014*** (0.005)	-0.014*** (0.003)	-0.000 (0.002)
3. SpinWAL_ Ex	-0.295 (0.265)	0.129 (0.102)	0.146 (0.094)	0.019 (0.459)
4. SpinOAL_ NoEx	0.060*** (0.005)	-0.018*** (0.005)	-0.037*** (0.001)	-0.005*** (0.000)
5. SpinOAL_ Ex	-0.191 (0.287)	0.083 (0.071)	0.091 (0.060)	0.018 (0.417)

Notes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Covariates included: Human capital, Physical capital, Firm size, accessibility, Corporate ownership structures, sector dummies and year dummies.

Spin WAL: New ventures Within Arm's Length distance from the parent firm (3 digit industry)

Spin OAL: New ventures Outside Arm's Length distance from the parent firm (3 digit industry)

Table 7

Dependent variable: Log labour productivity.

Categorization of the spin outs based on the export-status of father companies

	Pooled	Random	Hausman-Taylor
1. Indep			
2. SpinWAL_ NoEx	0.127*** (0.012)	0.128*** (0.019)	0.121*** (0.020)
3. SpinWAL_ Ex	0.217*** (0.013)	0.253*** (0.021)	0.250*** (0.022)
4. SpinOAL_ NoEx	0.121*** (0.012)	0.135*** (0.019)	0.134*** (0.020)
5. SpinOAL_ Ex	0.222*** (0.013)	0.250*** (0.020)	0.243*** (0.021)
Firm size, log	-0.072*** (0.003)	-0.068*** (0.003)	-0.059*** (0.005)
Human cap, %	0.385*** (0.009)	0.332*** (0.011)	0.245*** (0.016)
Physical cap, log	0.033*** (0.001)	0.027*** (0.001)	0.027*** (0.001)
Accessibility	0.026*** (0.005)	0.033*** (0.009)	0.037*** (0.009)
Domestic MNE ¹	0.156*** (0.019)	0.099*** (0.023)	0.090*** (0.023)
Foreign MNE ¹	0.237*** (0.016)	0.188*** (0.021)	0.182*** (0.021)
Non-affiliate ¹	-0.201*** (0.008)	-0.126*** (0.009)	-0.118*** (0.010)
Manu: HT ²	-0.189*** (0.039)	-0.163*** (0.061)	-0.151** (0.064)
Manu: HMT ²	-0.146*** (0.024)	-0.126*** (0.038)	-0.125*** (0.039)
ManuLMT ²	-0.146*** (0.020)	-0.131*** (0.031)	-0.130*** (0.032)
Manu: LT ²	-0.252*** (0.019)	-0.219*** (0.030)	-0.213*** (0.031)
Service: KIS ²	-0.127*** (0.015)	-0.114*** (0.024)	-0.091*** (0.026)
Service: OS ²	-0.226*** (0.015)	-0.216*** (0.023)	-0.211*** (0.025)
<i>Equality of means</i>			
5=4	0.000***	0.000***	0.000***
5=3	0.789	0.905	0.793
5=2	0.000***	0.000***	0.000***
4=3	0.000***	0.000***	0.000***
4=2	0.752	0.782	0.606
3=2	0.000***	0.000***	0.000***
Observations	63,22	63,22	63,22
Unique obs	12,644	12,644	12,644

Notes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

(1) Reference is domestic firms belong to a group with only domestic affiliates, (2) Reference is other industries

Indep: No majority employment ties to a parent firm

Spin WAL: New ventures Within Arm's Length distance from the parent firm (3 digit industry).

Spin OAL: New ventures Outside Arm's Length distance from the parent firm (3 digit industry).

Table 8

Dependent variable: Log labour productivity

Categorization of the spin outs based on the export-status of the new ventures

	Pooled	Random	Hausman-Taylor
2. Indep_ Ex	0.195*** (0.012)	0.210*** (0.020)	0.208*** (0.021)
3. SpinWAL_ NoEx	0.166*** (0.010)	0.183*** (0.016)	0.179*** (0.017)
4. SpinWAL_ Ex	0.286*** (0.021)	0.330*** (0.033)	0.322*** (0.034)
5. SpinOAL_ NoEx	0.169*** (0.010)	0.177*** (0.015)	0.171*** (0.016)
6. SpinOAL_ Ex	0.289*** (0.025)	0.364*** (0.037)	0.357*** (0.039)
Firm size, log	-0.074*** (0.003)	-0.070*** (0.003)	-0.061*** (0.005)
Human cap, %	0.386*** (0.009)	0.334*** (0.011)	0.247*** (0.016)
Physical cap, log	0.033*** (0.001)	0.027*** (0.001)	0.026*** (0.001)
Accessibility	0.026*** (0.005)	0.033*** (0.009)	0.037*** (0.009)
Domestic MNE ¹	0.144*** (0.019)	0.089*** (0.023)	0.081*** (0.023)
Foreign MNE ¹	0.204*** (0.016)	0.164*** (0.021)	0.160*** (0.021)
Non-affiliate ¹	-0.199*** (0.008)	-0.125*** (0.009)	-0.117*** (0.010)
Manu: HT ²	-0.221*** (0.039)	-0.197*** (0.061)	-0.183*** (0.064)
Manu: HMT ²	-0.180*** (0.025)	-0.163*** (0.038)	-0.161*** (0.039)
ManuLMT ²	-0.165*** (0.020)	-0.150*** (0.031)	-0.149*** (0.032)
Manu: LT ²	-0.276*** (0.019)	-0.242*** (0.030)	-0.236*** (0.031)
Service: KIS ²	-0.125*** (0.015)	-0.111*** (0.024)	-0.088*** (0.026)
Service: OS ²	-0.232*** (0.015)	-0.221*** (0.023)	-0.216*** (0.024)
<i>Equality of means</i>			
6=5	0.000***	0.000***	0.000***
6=4	0.910	0.416	0.413
6=3	0.000***	0.000***	0.000***
6=2	0.000***	0.000***	0.000***
5=4	0.000***	0.000***	0.000***
5=3	0.823	0.792	0.721
5=2	0.076*	0.168	0.149
4=3	0.000***	0.000***	0.000***
4=2	0.000***	0.001***	0.003***
3=2	0.051*	0.251	0.253
Observations	63,22	63,22	63,22
Unique obs	12,644	12,644	12,644

Notes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

(1) Reference is domestic firms belong to a group with only domestic affiliates, (2) Reference is other industries

Indep: No majority employment ties to a parent firm. Spin WAL: New ventures Within Arm's Length distance from the parent firm (3 digit industry). Spin OAL: New ventures Outside Arm's Length distance from the parent firm (3 digit industry).

APPENDIX

Table I

Summary statistics. Development of productivity, employment and exports year 1-5.

	Year 1		Year 2		Year 3		Year 4		Year 5	
	Mean	Stdv	Mean	Stdv	Mean	Stdv	Mean	Stdv	Mean	Stdv
<i>Productivity</i>										
Indep_ NoEx	12.58	0.67	12.78	0.65	12.77	0.62	12.76	0.63	12.77	0.66
Indep_ Ex	12.72	0.72	12.97	0.62	12.96	0.64	12.98	0.65	13.03	0.68
SpinWAL_ NoEx	12.72	0.61	12.90	0.49	12.92	0.48	12.95	0.50	12.96	0.53
SpinWAL_ Ex	12.91	0.69	13.12	0.64	13.15	0.58	13.18	0.59	13.22	0.56
SpinOAL_ NoEx	12.69	0.57	12.91	0.51	12.91	0.52	12.92	0.50	12.94	0.54
SpinOAL_ Ex	12.90	0.62	13.10	0.49	13.09	0.51	13.13	0.49	13.23	.46
<i>Employment</i>										
Indep_ NoEx	4	13	5	17	5	17	5	19	6	23
Indep_ Ex	14	112	18	115	19	115	18	94	18	92
SpinWAL_ NoEx	16	81	19	78	19	77	21	85	24	115
SpinWAL_ Ex	78	346	81	340	79	340	72	329	73	339
SpinOAL_ NoEx	9	30	11	33	12	36	11	20	12	24
SpinOAL_ Ex	87	399	104	450	106	433	122	444	117	443
<i>Exp/sales%</i>										
Indep_ Ex	13.71	0.30	14.72	0.28	12.49	0.28	14.72	0.28	13.72	0.27
SpinWAL_ Ex	13.68	0.25	16.99	0.29	18.00	0.27	17.70	0.28	17.90	0.31
SpinOAL_ Ex	14.99	0.28	16.23	0.25	16.97	0.26	18.10	0.32	15.33	0.26

Notes

Indep: No majority employment ties to a parent firm

Spin WAL: New ventures Within Arm's Length distance from the parent firm (3 digit industry).

Spin OAL: New ventures Outside Arm's Length distance from the parent firm (3 digit industry).

Table II

Dependent variable: Annual labour productivity growth.

	Categorization of the spin outs based on the export-status of father companies		Categorization of the spin outs based on the export-status of the new ventures	
	Pooled	Random	Pooled	Random
Indep	Ref	Ref		
Indep_ NoEx			Ref	Ref
Indep_ Ex			0.075*** (0.010)	0.093*** (0.012)
SpinWAL_ NoEx	0.108*** (0.010)	0.164*** (0.012)	0.139*** (0.008)	0.205*** (0.010)
SpinWAL_ Ex	0.140*** (0.011)	0.217*** (0.013)	0.129*** (0.017)	0.216*** (0.021)
SpinOAL_ NoEx	0.140*** (0.010)	0.210*** (0.012)	0.124*** (0.008)	0.184*** (0.010)
SpinOAL_ Ex	0.120*** (0.011)	0.184*** (0.013)	0.163*** (0.021)	0.279*** (0.025)
Firm size t_{-1} log	-0.116*** (0.002)	-0.196*** (0.003)	-0.117*** (0.002)	-0.197*** (0.003)
Δ Human cap, %	0.036*** (0.014)	0.027** (0.013)	0.036*** (0.014)	0.027** (0.013)
Δ Physical cap	0.018*** (0.001)	0.016*** (0.001)	0.018*** (0.001)	0.016*** (0.001)
Accessibility	-0.015*** (0.004)	-0.009 (0.005)	-0.014*** (0.004)	-0.008 (0.005)
Domestic MNE ¹	0.086*** (0.015)	0.145*** (0.017)	0.079*** (0.015)	0.132*** (0.017)
Foreign MNE ¹	0.056*** (0.013)	0.094*** (0.015)	0.043*** (0.013)	0.076*** (0.015)
Non-affiliate ¹	-0.070*** (0.006)	-0.097*** (0.007)	-0.069*** (0.006)	-0.096*** (0.007)
Observations	50,576	50,576	50,576	50,576
Unique obs	12,644	12,644	12,644	12,644

Notes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

(1) Reference is domestic firms belong to a group with only domestic affiliates, (2) Reference is other industries
Year dummies and sector dummies included

Indep: No majority employment ties to a parent firm

Spin WAL: New ventures Within Arm's Length distance from the parent firm (3 digit industry).

Spin OAL: New ventures Outside Arm's Length distance from the parent firm (3 digit industry).