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Spin-out activities in the wage mergers and acquisitions ? an investigation into causes and contingencies

Monia Lougui
KTH Royal Institute of Technology
Department of industrial economics and management
monia.lougui@indek.kth.se

Anders Broström
KTH, the Royal Insitute of Technology
Div. of Entrepreneurship and Innovation
anders.brostrom@indek.kth.se

Abstract

Monia Lougui
PhD student
Year of enrollment: May 2012
Expected final date: September 2017
Monia.lougui@indek.kth.se
Department of Industrial Economics and Management
Div. Entrepreneurship and Innovation
Co-author: Anders Broström

The current study embarks from the industrial organization perspective and ties two separate concepts together by investigating to which extent mergers and acquisitions (M&A) affect spin-out activities in knowledge intensive sectors. The impact of M&As - as a central mechanism of market based economies- on industry competition and consumer welfare is a crucial issue. In fact, Williamson (1968) suggests that a horizontal M&A participates to the increase of economic efficiency if the gains from exploiting previously unutilized economies of scale exceed the losses incurred by the merged firms increased market power. Furthermore, M&As are considered to have the potential to effect the long-term economic development by transforming the conditions for industry-wide level innovation activities. Yet, accumulated evidence suggests that the net impact is subject to a number of contingencies (Cassiman & Colombo, 2006; Cloodt et al., 2006).
This paper explores an under-researched route through which M&A activities may affect the evolution of an industry:

that of opportunity creation. In particular, this paper suggests that M&As affect employees? decisions of whether to spin-out in a newly formed firm.

In fact, M&As are perceived as creating room for niche markets (Luksha, 2008) and hence offering new opportunities which may be identified by Kirznernian entrepreneurs. In addition, parallel arguments from the literature on the creation and identification of entrepreneurial opportunity suggest that M&A activities can be conceptualized as affecting the individuals? inclination to pursue entrepreneurial activities. Indeed, disagreements within incumbent firms on the nature and potential of opportunities, or miss-match between an opportunity for new business and the incumbents? general strategy and existing line of products have been identified as typical drivers of spin-out activity (Klepper & Sleeper, 2005; Klepper & Thompson, 2010).

We examine the spawn-rate of spin-off firms from incumbents during post-merger and acquisition periods. Empirically, we investigate Swedish knowledge intensive firms being involved in a M&A during the time period 2000-2009. The data consists of 12 587 observations including 7 684 unique firms and 1 315 M&A operations. We apply a negative binomial regression in order to reveal the set-up implicated in the shift into self-employment after an M&A. Drawing on the industrial organization literature, we expect spin-off patterns to be determined by industry-specific conditions for entry such as the structure and the growth of the industry, the number of actors, the intensity of the competition, and exit barriers. Control variables corresponding to these factors are included throughout the analysis. Moreover, we control for industry-normalized average wage differentials of all individuals who leave the firm in response to the conjecture that in association with M&As, employees of the involved firms may experience increased opportunities inside the company or may face a deterioration of the working conditions and consider an alternative occupation and hence affecting the average opportunity costs for entrepreneurship.

Our results confirm that the number of spin-outs spawned by a specific incumbent increases following a M&A. This effect is furthermore found to be influenced by the activity match, productivity and size difference of the merging firms. In particular, in line with theoretical predictions, it appears that M&As involving firms with similar activities and different productivity and size are more likely to spark spin-out activities by creating novel entrepreneurial opportunities.

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Monia Lougui and Anders Broström

CESIS and Division of Entrepreneurship and Innovation, KTH

ABSTRACT

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In fact, M&As are perceived as creating room for niche markets (Luksha, 2008) and hence offering new opportunities which may be identified by Kirznernian entrepreneurs. In addition, parallel arguments from the literature on the creation and identification of entrepreneurial opportunity suggest that M&A activities can be conceptualized as affecting the individuals' inclination to pursue entrepreneurial activities. Indeed, disagreements within incumbent firms on the nature and potential of opportunities, or miss-match between an opportunity for new business and the incumbents' general strategy and existing line of products have been identified as typical drivers of spin-out activity (Steven Klepper & Sleeper, 2005; Steven Klepper & Thompson, 2010).

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Our results confirm that the number of spin-outs spawned by a specific incumbent increases following a M&A. This effect is furthermore found to be influenced by the activity match, productivity and size difference of the merging firms. In particular, in line with theoretical predictions, it appears that M&As involving firms with similar activities and different productivity and size are more likely to spark spin-out activities by creating novel entrepreneurial opportunities.

INTRODUCTION

Mergers and acquisitions (M&As) are identified as a central mechanism of market based economies. The impact of M&As on industry competition and consumer welfare is a central problem in the industrial organization literature. As demonstrated by Williamson (1968), a horizontal merger or acquisition may increase economic efficiency if it allows for the exploitation of previously unutilized economies and scale and scope which may well be greater than the efficiency loses incurred by the merged firm's increased market power. Furthermore, M&As potentially affect long-term economic development through transforming the conditions for industry-wide level innovation activities, but again accumulated evidence suggests that the net impact is subject to a number of contingencies (Cassiman & Colombo, 2006; Cloodt et al., 2006). Recent research inspired by evolutionary theory has suggested an additional route through which M&A activity may affect the evolution of an industry: that of opportunity creation.

As argued by Luksha (2008), a newly merged firm may choose to abandon smaller segments in order to focus on markets and products where significant economies of scale and scope can be realised (albeit often with considerable uncertainty and/or delay).[1] M&As can thus be conceived as creating room for niche markets and as creating novel opportunities which may be identified by Kirznernian entrepreneurs. Such opportunities are first and foremost identified by individuals with first-hand information about pre-merger activities, i.e. by employees of the merged firms. Parallel arguments suggests that M&As can be expected to also drive entrepreneurship of a Schumpeterian nature. Disagreement within a firm on the nature and potential of opportunities, or miss-match between an opportunity for new business and the incumbent's general strategy and existing line of products have been identified as important drivers of spin-out activity (Klepper & Sleeper, 2005; Klepper & Thompson, 2010). As M&As typically involve and bring about shifts in strategy, such tendencies can be expected to be reinforced in their wake.

Empirical results have verified that, in line with these predictions, the rate of spin-out formation increases following M&As (see review in Klepper, 2007). This paper investigates the strength of the claim that it is indeed though the creation of novel opportunities that M&As spur increased entrepreneurial activity, by suggesting and testing alternative explanations and contingencies.

First, we note that the average opportunity costs for entrepreneurship for employees may be affected by M&A activity. In association with a merger or an acquisition, employees of the involved firms may experience increased career opportunities inside the company or (perhaps at least a as often) may face a deterioration of the working conditions and consider an alternative occupation, making the choice of pursuing entrepreneurship more attractive all else equal. This argument offers an alternative explanation for why spin-out activity increases after an M&A – through deterioration of local labour

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[1] Consistent with this view, Gugler et al. (2003) report evidence from an extensive international survey that mergers on average do result in significant increases in profits, but reduce the sales of the merging firms – in particular in conglomerate mergers

conditions rather than through the creation of novel opportunities – than the one offered by i.e. Klepper and colleagues, and one with considerably different implications. If the average impact of M&As on opportunity costs is positive, M&As may be more important for opportunity creation than indicated by previous estimates.

Second, drawing on the industrial organization literature, we expect industry structure (concentration, entry conditions) to determine both spin-off patterns and the likelihood of M&As. An observed relationship between M&As and spin-out activity may therefore be partly biased by unobserved industry-level developments.

We investigate the effect of mergers and acquisitions (M&A) on spin-out activities in knowledge intensive sectors. Empirically, we investigate the spawn-rate of spin-off firms from Swedish firms during the time period 2000-2009. The data consists of 12 587 observations including 7 684 unique firms and 1 315 M&A operations. We apply a negative binomial regression in order to reveal the set-up implicated in the shift into self-employment after an M&A. Control variables capturing changes in opportunity costs and industry structure are included throughout the analysis.

Our results confirm that the number of spin-outs spawned by a specific incumbent increases following a M&A, albeit with a delay of two years.

THEORETICAL CONTEXT

The motivation for our study departs from the coupling of the two concepts of spin-outs and M&A. Although most often treated separately, we strive to provide evidence of their liaison through a common dominator: entrepreneurial opportunities. By highlighting features of both spin-outs and M&As together with their connection to entrepreneurial opportunities, we outline the approach of our study and we expose our hypotheses.

The opportunity to spin out

Klepper & Thompson (2007) investigate the motives behind spin-outs in high-tech industries. According to their logic, spin-outs are results of disagreement among firm employees. Businesses are launched starting from a "neutral" state having employees sharing common goals and objectives for the firm. With diversified tasks, responsibilities and positions, the information and perception differences among employees gaps will bloom and insight into the accessible opportunities vary causing conflicts among employees. Klepper and Thompsons' description of the spin-out process coincide with its view as an entry strategy relying on the industry-specific knowledge and the individual networks (Helfat & Lieberman, 2002; Jovanovic, 2012; Pakes & Ericson, 1998). The disagreement factor is also discussed as a major driver of spin-out activity in human capital-intensive industries by Garvin (1983).

Particular industry conditions, different from the circumstances involving regular firm entry, interfere and develop spin-outs. The entrepreneurial opportunities perceived in connection to spin-outs are presumed to be different from the opportunities seized by regular entrants. The (potential) existence of multiple market niches and absence of dominant product design are conditions promoting entry by spin-outs (Garvin, 1983).

It appears that spin-outs and self-employment can be interpreted referring to an individual and an environmental aspect. From an individual perspective, the personal drive of the employees and the factors with impact on their social and emotional sphere, such as knowledge and disagreements, are

spin-out drivers. The environmental dimension of this issue covers the changes an industry endures during its life cycle stiring the structures and provoking modification in the opportunities as well as the complexity of firm entry.

A typical factor with impact on both these aspect is merger and acquisition (M&A). From a market-based perspective, M&As have two general purposes: to increase efficiency by exploiting economies of scale and to increase the market power of the firm. If either of these objectives are realized, an M&A will all else equal have made entry into the industry less attractive. There is, however, a possibility that M&As may create new entrepreneurial opportunities and encourage new entry by transforming the industry, in particular by creating room for niche markets. A newly merged firm may choose to abandon smaller segments in order to create focus. The creation of entrepreneurial opportunities may consequently be analyzed as an externality of M&As.

Entrepreneurial opportunities, a product of knowledge and information

The concept of entrepreneurial opportunity can be traced back to Austrian economics (Buenstorf, 2007). Hayek (1945) initiated the notion of opportunity describing the entrepreneur as an agent detecting, exploiting and improve the deficiency on a market. The foundations for these activities are exclusive information and knowledge of the conditions of a market. Timing and location are, according to Hayek's reasoning, crucial factors allowing for the discovery of opportunities. The argument motivating the significance of these two features is the variation in prices over time and space. The entrepreneur, in Hayek's eyes, was merely an arbitrageur and was never granted the central position as occupied by Kirzner's entrepreneur. Hayek's perception was that market equilibrium was reached through individuals acting instinctively at the recognition of opportunities and neglects the individual qualities of entrepreneurs. Kirzner (1997, 1973) adopts a different view of the entrepreneur and assigns a greater weight to the capacities of the individuals and their ability to distinguish the opportunities. Imperfect information and knowledge is again at the origins of the activities and opportunity spotting of the entrepreneurs. Hayek and Kirzner treat opportunities as exogenous and the individuals' role is to detect and exploit these opportunities, unlike the entrepreneur based on Schumpeter's approach. Schumpeter (1911) includes the notion of innovation in his analysis of entrepreneurship implying the involvement of the entrepreneurs in the creation of opportunities. However, this interpretation of the Schumpeterian entrepreneur has been criticized and Witt (2002) claims that the opportunities are still pre-supposed just that in this specific case, entrepreneurs detect opportunities that are outside the market and the price system.

The discussion relating to the formation of entrepreneurial opportunities stretches beyond the consideration of entrepreneurs and their knowledge to involve factors rooted in different dimensions. Exogenous macro factors are part of the structure behind entrepreneurial opportunities. Venkataraman (2007) explores the underlying drivers for entrepreneurship and focuses on opportunities and the opportunity creation process. In addition to individual factors, Venkataraman highlights the role of change in exogenous macro factors affecting demand such as demographic factors, income, health, education and employment as opening up opportunities for entrepreneurs.

Following the reasoning above, entrepreneurial opportunities arise with respect to external macroeconomic factors that are out of the control of individuals. The nature of a market and the evolution of an industry are then determinants providing a favorable or a hostile entrepreneurial environment considering the opportunities they bring. Supporting this conjecture, Hayek's and

Kirzner's perception of the process behind entrepreneurial opportunities underlines the weight of timing and location. The two factors could be associated with the evolution of an industry and a market. The changes observed in an industry incites modifications in the structures defining the conditions for entrepreneurial opportunities and hence an alternation in the amount and nature of entrepreneurial activities of the individuals. Opportunities are generated out of the perception of actual inefficiencies or newly emerged inefficiencies spawn from changes.

The development of entrepreneurial opportunities

The attractiveness of an industry is associated with the unexplored opportunities and the potential profits to retrieve. Firm entry often comes in waves and varies over the life cycle of an industry (Geroski, 1995). In what follows we analyze the fluctuation of firm entry and the concentration of an industry as an indicator of entrepreneurial opportunities.

Competition and entry are bonded to the structure of an industry shaped by the number of actors operating and interacting on the market. The adjustments observed in an industry enhance its image as a non-static process such as promoted by Robert Gibrat in inégalités économiques (1931). By depicting the different phases an industry undergoes, its development can be traced through what is defined as the product life cycle (PLC). The PLC such as advertised by Dean (1950), Levitt (1965), Vernon (1966) and Cox (1967) gives a standardized representation of the evolution of a new industry pointing at three distinguished stages (Williamson, 1975): an early exploratory stage, an intermediate development stage, and a mature stage. Klepper (1997) summarizes how industry structure evolves through these phases. This first stage of the PLC attracts new entrants and a competition mainly emerging from product innovation. The second and intermediate phase witnesses a stabilization, a decrease in the rate of innovation but is still described as a growth stage with high output growth. Entry at this stage drops off and there is a remarkable drawdown in the number of active firms. The final phase of the PLC is a maturity phase characterized by a slow growth pace, a continuous decrease in entries, stable market shares and an insignificant number of innovations.

The PLC exposes a fluctuation in the rate of firms and firm entry over the life cycle of an industry. Klepper (1996) summarizes the evolution of the market structure of technologically progressive industries by outlining firm entry, exit and number of producers from birth through maturity. The entry pattern suggests a decrease of number of entrants over time. The composite representation of the industry evolution illustrates two different entry patterns, (1) the number of entrants can initially peak followed by a decline over time or (2) the number can take off by an increase, reach a peak and then decrease. Independently of the initial trend, the number of firms entering the market decreases over time. These observed patterns coincide with Klepper's (1997) description of the industry phases.

Assuming that firm entry is an indicator of an industry's available opportunities, the above described trends insinuate that entrepreneurial opportunities are mainly concentrated during the starting phases of an industry. The previously described connection between knowledge, information and entrepreneurial opportunities reinforces this perception of variation of opportunities along the PLC. The industry life cycle depicts two technological regimes (Bos et al. 2013), at two different phases of the cycle, resulting from the upsurge and detection of opportunities. At the early stages of the cycle, the first regime is distinguished by innovative entries and entrepreneurs with inventive knowledge. The second regime comes at a later stage, in the mature and declining phase of the industry life cycle. The latter entry trend differs from the first in the nature of the innovations developed (Agarwal &

Audretsch, 2001; Winter, 1984). The entrepreneurial opportunities forming the two prominent entry trends arise at two different and contradicting stages with distinct prerequisites transforming the interception of these opportunities to become selective. Reconnecting the observed entry trends with the description of the PLC phases, it is obvious that entry is important in the first stages of an industry as there are so many unexplored opportunities whereas the opportunities in the maturity phase are rather restricted. Klepper (1996) describes the innovation in the later phase as process innovation consisting of improvements applied to existing products and processes in contradiction to the product innovation charectarizing the initial phase of the cycle. A great deal of late phase innovations are heavily information dependent in the sense that they depend on the knowledge of the actors and their ability to detect the particular opportunities.

The entry patterns and the nature of innovations in the different life cycle phases suggest that during the maturity phase of industries, incumbent firms have access to information giving them the advantage to spot opportunities that are unreacheable to external actors or new entrants. Adding the Austrian theories highlighting the importance of information and knowledge in the creation of opportunities for entrepreneurs, it cannot be denied that previous experience of the individuals matter and shape their capacities to detect and exploit information. Entrepreneurship in the maturity phase is therefore very likely to take the form of spin-outs from incumbent firms.

Mergers and acquisitions as industry dynamics

Gort (1969) analyses the foundations causing M&As. He points at the opportunity cost as a factor stimulating the upsurge of a seller and a buyer. Gort sets up two conditions for a transaction to take place: "(a) a non-owner must have an estimate of an asset's value that is higher than that of some owner, and (b) the buyer's "investor's surplus," that is, the difference between his estimate of the value of the asset and its market price, must be greater than his investor's surplus for every other asset he can buy within the limits of his budget" (p.626). Hence, an M&A is trigged by dissimilarities in valuation among sellers and buyers together with an unpredictable future. Gort argues that the expectations and valuations of the actors fluctuate with consideration to economic shocks such as technological changes and security prices variation. The technology change is according to Gort one of the factors with greatest impact on M&A: it gets difficult to predict the demand and the costs associated to new products and processes stimulating different value predictions and sets up optimal conditions for trade. Hence, the greater the technological change, the more complicated it gets to predict the future values and the greater the trade opportunities and M&A rates.

Exploring the occurrence of mergers typically incites the distinction of merger waves observed on an aggregate level. The discussions regarding non-stationary performance of aggregate merger activities has been around for a while (Blair et al., 1991; Golbe & White, 1993; Scherer & Ross, 1990) and long before it became common to refer to the merger waves in economic history (Sleuwaegen & Valentini, 2006), Nelson (1959, 1966) verified the wave trend in aggregate mergers. Nelson (1959) illustrates the dominance of merger activities in eight out of twenty seven industries during the period 1895-1920. In addition, during the same time period, Nelson observes an alternation in the share of merger of the industries and motivates it by relating to the particular growth rate of each industry. The distinction between the industries and the shift in inter-industry merger trends suggest the involvement of underlying factors, of inter-industry nature, influencing the mergers in specific industries.

Mitchell & Mulherinb (1996) highlight the impact of industry shocks on the merger and acquisition behaviors. The investigation involves 51 US industries and reveals a fluctuation in the timing and the intensity of the takeover and restructuring activities that is explained by referring to industry specific economic shocks. By economic shocks, Mitchell and Mulherin refer to the neoclassic definition of factors, manipulating the structure of an industry, including technology, policies, demand and supply. The results indicate a concentration of the takeovers and restructuring in an industry for a certain time span of the studied period. Moreover, the study reveals an inter-industry difference in the takeover activities. These results insinuate the importance of timing for M&A activities. Lambrecht (2004) constructs models confirming the timing feature of M&As, showing that mergers, attracted by economies of scale, are active in rising product markets and high output prices whereas low output prices are coupled with inactive merger activities. Hence, mergers are more frequent during economic expansion periods. These studies, among others, confirm the cyclic behavior of M&A and the inter-industry variation in the trends. Investigating the processes underlying the M&A trends claims the consideration of industry factors as forces controlling the M&A activities. Schoenberg & Reeves (1999) tempted the challenge of identifying the industry factors manipulating M&A activities. Using data from UK industries, three factors could be identified as contributing to the industry variation in M&A waves: deregulation, industry concentration and industry growth rate. The deregulation of an industry is an external factor whereas industry growth and concentration are two dependent features blooming within an industry.

In summary, M&As are more likely to occur in phases of industry consolidation, in the wake of technological change and during periods of economic expansion. These conditions are clearly conducive also for spin-out activities. While general entry levels can be expected to go down as industries are consolidated and competitions hardens, niche creation will - as argued above – increase, off-setting some if not all of this disadvantage to spin-out entrants. Fastened technological change and an increased rate economic expansion is generally conducive for entry. Industry dynamics thus provide a set of alternative, non-causal arguments for a linkage between the occurrence of M&As and the spawning of spin-out firms.

The investigation of previous findings insinuates that together with M&As, opportunity cost, industry attributes, and individual elements represent a combination of factors defining and reforming entrepreneurial opportunities under the cover of spin-outs. By defining and structuring the context for our research, we could present a logic line of thoughts contributing to the formation of our research question and assumptions. In the following part of the paper, we investigate the potential of M&A to incite the generation of spin-outs.

Working conditions in post-M&A firms

[placeholder: discussion about why M&As would seem to be associated with a change (potentially either negative or positive) on working conditions in the merged firms, and how we try to capture this with a measure of wage changes of staff observed to leave the firm, normalised by industry].

EMPIRICAL ANALYSES

The empirical model

The dependent variable Y_{it} is a count variable following a Poisson distribution with overdispersed variance suggesting the application of a negative binominal regression to our panel data. The following model is applied:

$$y_{it} = \alpha + \mu_i + t + \vartheta C_{it} + \left(\beta + \theta(|C_{it} - D_{it}|)\right)S_{it} + E_{it}$$

i: firms

t: time

C_{it}: variables characterizing one of the merging firms

D_{it}: variables characterizing the other merging firms

S_{it}: variable describing structural changes, the occurence of M&A activity

E_{it}: variables capturing time varying industry-specific and/or year-specific conditions

Our dependent variable is the number of firms spawned from each firm in each observed year. Spin-outs are identified through observing shifts from paid-employment to self-employment of the firm's employees.

The independent variables report information concerning the firms, the employees and the industry:

- ➢ Firm size: The size of the firms is represented by the number of employees.
- ➢ Turnover per employee: A measurement of the annual turnover per employee of the firms.
- ➢ Distance between the merging firms: This variable reports the distance between the merging firms.
- ➢ Mergers and acquisitions: A dummy variable indicating the occurrence of a merger or acquisition operation.
- ➢ Sector of activity: The data reports the sector of activity of each firm and is represented through a two digit industry code (initially a 5 digit code that was reduced to the two digit level and hence represents the main activity group).
- ➢ Knowledge intensity of the employees: The knowledge intensity of the employees is reflected in two variables, the first reporting the share of employees with a university education level and the second reports the share of employees with a high school degree.
- ➢ Herfindahl index: A measurement of the concentration of the industry.
- ➢ Foreign owned: A dummy indicating foreign owned firms.
- ➢ Gains from employment shift: This variable is used as a proxy for opportunity cost. It reports the average difference in wages for all individuals leaving the firm in year i to take up employment in a different firm. The measure is normalized on the industry level.
- ➢ The rate of new firms in the industry: This industry level variable captures the rate of new entry relative to the total number of firms in the industry.

The selection of the variables to be included in the model relies on our assumptions and previous literature on entrepreneurship and spin-outs. The size of the firm is predicted to have a significant

effect on the shift of employment from paid employment to self-employment. However, theories and previous research do not seem to unite concerning the sign of this relationship. Elfenbein, Hamilton, & Zenger (2010) find evidence suggesting that due to labor market sorting (the share of individuals with entrepreneurial) and learning, small firms generate more spin-outs relatively to large firm. Opposing these results, Ernst & Vitt (2000) suggest that the retention of employees is higher in merger between small firms than mergers involving big firms.

The sector of activity of the merging firms appears to interfere in the outcome of an M&A. As the knowledge of the employees is often the target of an M&A (Cohen & Levinthal, 1989; Huber, 1991; Granstrand, Håkanson, & Sjölander, 1993), it makes sense that M&As involving firms with similar activities tend to keep preserve their employees (Ernst & Vitt, 2000). This draws our attention to knowledge and knowledge intensity. Gompers et al. (2005) establish a positive relationship between the knowledge intensity of a firm and the level of generated spin-outs.

In addition, as the location appears to restrict the entrepreneurial activities (Armington & Acs, 2002; Stuart & Sorenson, 2003), a region variable seems to be appropriate to introduce in our model. The industry variable such as the Herfindahl index and the new entry of the industry are aimed to control for industry effect on spin-out.

The data

In our empirical analyses we use data from Statistic Sweden reporting the activities of registered firms over a nine year period (2000-2009). The data is extracted from a large database with firm level information reporting the development of size, performance, location, level of education of the employees, and activity of the firms over the studied period. In addition to the characteristics of the firms and their performance, we include measurements revealing the annual merger and acquisition activity of each firm. Further details related to M&A are taken into consideration exposing the difference in size, difference in value added, difference in turnover, the activity match and the distance between the merging firms. We restrict our analyses to firms with more than 50 employees operating in human-capital intensive industries yielding a total number of 12 587 observations on 7 684 unique firms and 1 315 mergers and acquisitions. Our firm data is merged to a second database with individual information from Statistics Sweden. Linking the two databases provides details on the employees' movement and employment shift. We use these measures to identify spin-outs, meaning a shift from paid employment to self-employment. We associate the yearly number of spin-outs with the parent firm. In addition, industry specific indicators for each year are added to the final database. The industry indicators are the Herfindahl index, the rate of new firms, and the shift of employment cost. Two digit NACE-codes are used to identify industries.

Statistical analysis

The tables below provide descriptive statistics of our dependent and independent variables.

Table 1: Variables summary

Variable	Type	Mean	Std. Dev.	Min	Max
Spin-out number	Count variable	.9610462	3.375359	0	119
Employees of reference firm	Discrete variable	229.6512	762.1971	50	32864
M&A	Dummy variable	.0461064	.2097191	0	1
Foreign M&A	Dummy variable	.01217	.1096	0	1
Size difference	Continous variable	32.89745	367.1206	0	13444.03
Turnover difference	Continous variable	75.97008	1014.361	0	50706.41
Turnover of reference firm	Continous variable	2784.709	6731.727	-951.907	688795
Distance	Continous variable	1.358663	20.26707	0	903.1221
Activity match	Continous variable	.0347742	.1820419	0	1
less 2 yr post-secondary per employee	Continous variable	.2017751	1.739512	0	267
more 2 yr post-secondary per employee	Continous variable	.2342168	1.439912	0	188
Herfindahl index	Continous variable	.008343	.0218358	.0001885	.2125312
Industry rate of new firms	Continous variable	.1933483	.0750881	0	.8413323
Gains from employment shift	Continous variable	-.8789759	.2414787	-11.91101	8.269028
Foreign owned firms	Dummy variable	.2840363	.4509621	0	1

Table2: M&A and spin-out summary sorted by M&A

Total number of MA operations	1315
Total number of spin-outs	27410
Total number of spin-outs the same period as an M&A	4289
Number of spin-out occurrences	9973
Number of spin-out occurrences the same period as an M&A	727

Table3: Correlation matrix

	Spin-out number	Employees of reference firm	M&A	Size difference	Turnover difference	Turnover of reference firm	Distance	Activity match	less 2 yr post-secondary per employee	more 2 yr post-secondary per employee	Herfindahl index	Industry rate of new firms	Cross border M&A	Gains from employment shift	Foreign owned firms
Spin-out number	1.0000														
Employees of reference firm	0.5106	1.0000													
M&A	0.1498	0.1569	1.0000												
Size difference	0.4099	0.4861	0.4049	1.0000											
Turnover difference	0.2655	0.3456	0.3322	0.7088	1.0000										
Turnover of reference firm	-0.0138	-0.0095	0.0004	-0.0070	0.0581	1.0000									
Distance	0.0234	0.0395	0.2974	0.1076	0.0775	0.0418	1.0000								
Activity match	0.1310	0.1353	0.8627	0.3506	0.2713	0.0074	0.2681	1.0000							
less 2 yr post-secondary per employee	0.0057	-0.0083	-0.0001	-0.0032	-0.0023	0.0763	0.0295	0.0012	1.0000						
more 2 yr post-secondary per employee	0.0080	-0.0116	0.0072	-0.0051	-0.0051	0.0589	0.0076	0.0002	0.9277	1.0000					
Herfindahl index	0.0385	0.1169	-0.0051	-0.0034	-0.0006	-0.0213	-0.0086	-0.0088	0.0026	0.0097	1.0000				
Industry rate of new firms	0.0258	0.0015	-0.0290	-0.0132	-0.0211	-0.0790	-0.0309	-0.0256	0.0142	0.0235	0.1598	1.0000			
Cross border M&A	0.235	0.014	0.0196	0.0152	0.0145	0.0016	-0.0019	0.019	0.0504	0.0437	0.0057	-0.0196	1.0000		
Gains from employment shift	0.0190	0.0183	-0.0041	0.0073	0.0103	0.0214	-0.0048	0.0022	-0.0017	0.0044	-0.0102	0.0539	-0.012	1.0000	
Foreign owned firms	0.0256	0.0379	0.0375	0.0251	0.0224	0.0865	0.0197	0.0287	0.0155	0.0092	0.0148	-0.0270	0.1826	-0.0194	1.0000

The regression model

We regress the data using a negative binomial regression where the firms are identified as panel data with annual observations. We apply a Hausman test to determine the existence of firm fixed effects. The results of the Hausman test reveal that a fixed effect negative binomial regression is the most appropriate for our study.

Table 4: negative binomial regression

Variable	Basic model — Coefficient estimate (standard error)	Model with differences — Coefficient estimate (standard error)
Employees of reference firm	0,00013	0,0001341
	(0,0000264)**	(0,000029)**
Foreign owned firms	0,107046	0,058423
	(0,0833146)	(0,0620847)
M&A	-0,36904	-0,4007989
	(0,2679837)	(0,2692169)
L1.M&A	-0,02683	-0,1513752
	(0,0353422)**	(0,072922)*
L2M&A	0,107046	0,1403032
	(0,0336497)	(0,0653103)*
Cross-border M&A	-0,05738	-0,0413551
	(0,0994479)	(0,1075941)
L1. Cross-border M&A	-0,10596	-0,1832986
	(0,0925336)	(0,1044517)
L2. Cross-border M&A	-0,08196	-0,2568454
	(0,095576)	(0,1114099)
Turnover per employee of reference firm	-0,00179	-0,0015693
	(0,0035239)	(0,003412)
L1.TO/emp of refrence firm	-0,00401	-0,003515
	(0,0035534)	(0,0036324)
L2.TO/emp of refrence firm	-0,00393	-0,0040757
	(0,0043807)	(0,0045463)
less 2 yr post-secondary per employee	-0,01158	-0,0023084
	(0,0316012)	(0,0318054)
more 2 yr post-secondary per employee	0,007084	0,0009083
	(0,0264267)	(0,0264943)
Herfindahl index	2,368292	2,385753
	(1,421359)	(1,425345)*
Industry rate of new firms	0,275249	0,3126883
	(0,5116148)*	(0,5108676)
Gains from employment shift	-0,08685	-0,0869885
	(0,0619752)	(0,0620002)
Year dummies	Included	Included
Sector dummies	Included	Included
_cons	1,270515	1,31971
	(0,350828)	(0,361758)

Size difference	181,2001
	(174,12)
L1.Size difference	23,8946
	(195,7525)
L2.Size difference	-2,097558
	(171,4325)
Turnover per employee difference	0,0000136
	(0,000065)
L1.TO/emp difference	0,0001075
	(0,000074)
L2.TO/emp difference	-0,0000682
	(0,0000689)
Distance	-0,0006105
	(0,0003979)
L1.Distance	-0,0004573
	(0,0003696)
L2.Distance	-0,0001358
	(0,0003055)
Activity match	0,0279966
	(0,0767716)
L1.Activity match	0,1073247
	(0,0723919)
L2.Activity match	-0,0058211
	(0,0670672)

**: Coefficient significant at a 5% level
*: Coefficient significant at a 10% level

Discussion

The application of a negative binomial regression to our panel data reveals two factors with statistically significant impact on the number of spin-outs spawn from Swedish firms in the knowledge intensive sector during the period 2000-2009. The M&A factor is, in line with previous findings, statistically significant and triggers spin-outs. The inclusion of measures for changes in opportunity costs and changes in industry structure in the model do not remove the "raw" effect of the occurrence of an M&A, seemingly confirming the interpretation of Klepper & Sleeper (2005) and others of M&As as generating externalities in the form of entrepreneurial opportunities. Our regression reports that the measures of opportunity cost, industry conditions and sector generally do not have a significant impact on the number of spin-outs.

Notably, in our sample the effect of M&As on spin-out spawn rates is delayed with one to two years. This observed result suggests that the response to M&A in form of shift in employment requires an adaption period indicating that the decision to leave the firm, in form of an exit through a spin-out, is not taken immediately at the announcement of an M&A such as it might have expected considering the negative impact of such an announcement on employees (Souder & Chakrabarti, 1984; Lindholm, 1994; Hussinger, 2007). Klepper & Sleeper (2005) and Klepper & Thompsons' (2007) findings from the laser, automobile and semiconductor industries implying a correlation between M&As and spin-outs are confirmed in our study.

A preliminary conviction would be that our observed effects of M&As are the effects generated by a miss-match and disagreement that flourish when different firms are unified. It is then interesting to observe how this effect is not immediate but requires a certain time period to first be revealed as having a negative impact on spin-outs before it is reversed to a positive effect.

The positive significant Herfindahl index indicates that a concentrated industry provokes spin-outs. This reflects the common features of a market and its entry trends relating to the industry structure (Garvin, 1983).

CONCLUSION

Mergers and acquisitions are key activities in theories of industrial evolution, through which consolidation and restructuring take place. Recent studies have emphasized a further role of M&As; that of the fosterer of new entrepreneurial opportunities.

Either by creating room for niche markets (Luksha, 2008) or by provoking a miss-match and disagreement inside the firm (Steven Klepper & Sleeper, 2005; Steven Klepper & Thompson, 2010), M&As are claimed to encourage firms spin-out. Our present study, although yet a work in progress, develops and confirms Klepper's (2007) assertion about the increase of spin-outs in connection to M&As. We find evidence of a tardy response to M&A postponing the spin-out effects to one and two periods after the merger operation. In addition, our results insinuate that the observed effect of M&As on entrepreneurial opportunities can only be confirmed for the domestic M&As.

As mentioned, this paper is a work in progress and we have the intension to better exploit the data and develop our interpretation and findings. In particular, the next version will contain further analysis of the contingency relationships, implementation of a count data GMM estimator and additional robustness analysis.

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