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When and Who Survive from Post-Acquisition Restructuring? ? The Perspective of Acquired Entrepreneurial Firms

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Considering the potential disturbance from post-acquisition restructuring process is argued to be important when scholars want to detect the ?real? effect of an acquisition. This paper explores the length of this process and what firm heterogeneity contributes to survive from the process by following post-acquisition dynamics of acquired firms. Depending on a comprehensive micro-level dataset, this paper identifies the entire sample of Swedish entrepreneurial firms entering from 1991 to 2002 in manufacturing and some selected services sectors and follows them until 2009. By applying a discrete-time duration analysis, the paper finds that post-acquisition restructuring process takes about 4-6 years after acquisitions. During the process, acquired firms? operation is temporally disrupted and they may face a very active selection from acquirers. Firm heterogeneity from both acquires and targets is found to contribute variations in terms of post-acquisition survival performance. An attention should be paid to firms acquired by Swedish MNEs who pick firms with the best technology properties but seem not intend to ?incubate? them afterwards. It is possible that Swedish MNEs use acquisitions to pre-empt potential entries in technology markets. Another explanation is that Swedish MNEs may use acquisitions to pick some critical resources which are usually difficult to obtain from factor markets.

When and Who Survive from Post-Acquisition Restructuring? – The Perspective of Acquired Entrepreneurial Firms¹

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Considering the potential disturbance from post-acquisition restructuring process is argued to be important when scholars want to detect the “real” effect of an acquisition. This paper explores the length of this process and what firm heterogeneity contributes to survive from the process by following post-acquisition dynamics of acquired firms. Depending on a comprehensive micro-level dataset, this paper identifies the entire sample of Swedish entrepreneurial firms entering from 1991 to 2002 in manufacturing and some selected services sectors and follows them until 2009. By applying a discrete-time duration analysis, the paper finds that post-acquisition restructuring process takes about 4-6 years after acquisitions. During the process, acquired firms’ operation is temporally disrupted and they may face a very active selection from acquirers. Firm heterogeneity from both acquires and targets is found to contribute variations in terms of post-acquisition survival performance. An attention should be paid to firms acquired by Swedish MNEs who pick firms with the best technology properties but seem not intend to “incubate” them afterwards. It is possible that Swedish MNEs use acquisitions to pre-empt potential entries in technology markets. Another explanation is that Swedish MNEs may use acquisitions to pick some critical resources which are usually difficult to obtain from factor markets.

Keywords: acquisitions, post-acquisition restructuring process, acquired entrepreneurial firms, business groups, discrete-time duration models, Sweden

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¹ The first draft, please do not cite or circulate without permission from the author. The new version will be updated before Jan.1, 2014.

1 Introduction

Technology-related mergers and acquisitions (M&A) have been highlighted in terms of their increasing importance in the recent waves of M&A since 1990s (Sleuwaegen and Valentini 2006). Large firms adopt M&A as one important strategy for technology sourcing externally to complement in-house R&D (Blonigen and Taylor 2000; Cassiman and Veugelers 2006; Desyllas and Hughes 2008) or diversify their technology capabilities (Granstrand et al. 1992), particularly from high technology industries (Chakrabarti et al. 1994), and are more likely to create positive consequences when targeting small private firms (Benou and Madura 2005) or new technology-based firms (NTBFs) (Granstrand and Sjölander 1990; Lindholm 1996). However, the current academic debate on M&A literature still concentrates on transactions between large publicly traded firms, and pays much attention to the perspective of acquiring firms – their motives, post-acquisition integration process and consequences (Hitt et al. 1990; Harrison et al. 1991; Hitt et al. 1991; Hitt et al. 1996; Blonigen and Taylor 2000; Kohers and Kohers 2000; Ranft and Lord 2000; Kohers and Kohers 2001; Ranft and Lord 2002; Cassiman et al. 2005; Desyllas and Hughes 2008). In contrast, there are limited studies focusing on the other side of M&A, say, the acquired firms, especially when targets are entrepreneurial firms. New firms, especially NTBFs have widely been recognized in terms of their role in promoting technology transfer and industrial dynamics (Autio 1994; Rickne and Jacobsson 1999). A recent study by Andersson and Xiao (2013) reveals a possible hierarchic system in market selection for start-ups with respect to their technology profiles: ‘best’ firms being acquired; ‘good’ firms continuing; and ‘bad’ firms closing down. It implies that, acquired new firms - as a highly selected group of start-ups, embedded with the best “quality” of technology properties, are supposed to be central to the process of technology transfer and diffusion, and deserving a follow-up study to discern how they interact with both acquired firms and external environment in post-acquisition restructuring process.

Furthermore, compared to a vast literature in post-acquisition performance, there are limited studies exploring the patterns of post-acquisition restructuring, which clusters in a period shortly after acquisition with extensive restructuring activities observed (Maksimovic et al. 2011). The management literature stresses the importance of post-acquisition integration process in deciding the success of an acquisition, during which a large amount of managerial efforts are required to combine and integrate acquirers and targets (Hitt et al. 1991; Hitt et al. 1996; Ahuja and Katila 2001). But post-acquisition restructuring is a wider concept than post-

acquisition integration. Literature reveals that M&A are multifaceted activities with heterogeneous motives and agents involved (Trautwein 1990). Literature also tells us that M&A transactions suffer from information asymmetries between acquirers and targets, which may create “bad” matches of acquisition partners (Lichtenberg et al. 1987). During the period shortly after acquisition, acquirers face decisions on how to restructure acquired firms according to their motives, the full information revealed from targets, integration strategies and outcomes: to retain, sell, or even close down acquired firms. It is only meaningful to argue the “real” effect from an acquisition after post-acquisition restructuring process when noisy observations have been eliminated massively. Thus, knowing the length and characteristics of restructuring process is crucial to evaluate the success of an acquisition.

By combining the two negligent perspectives in the existing literature mentioned above, the main aim of this paper is to explore the patterns of post-acquisition restructuring from the perspective of acquired firms. More specifically, this paper is to answer when and who, survived from post-acquisition restructuring process. The focus on survival has two considerations. First, survival signals an “incubating” motive of acquirers. Large firms acquire new firms for various reasons and acquired firms are not necessarily kept as separate business units after acquisitions. But if acquired firms do survive from the post-acquisition restructuring process, which implies that acquirers may intend to nourish acquired firms with their ample resources and knowledge (e.g. financial resources, complementary assets, etc.) to extend innovations, products or business models of acquired firms. In this context, acquisition is a coordination mechanism to combine a division of labor in terms of innovation between small and large firms and synergy gains could be expected from a possible “David – Goliath Symbiosis” (Granstrand and Sjölander 1990; Lindholm 1996; Baumol 2002). Second, Organizational Ecologists propose the “liability of newness” (Freeman et al. 1983) to emphasize the age dependence of firm exit rate. It implies that even for entrepreneurial firms acquired with an “incubating” motive, their primary objective could still be to survive before their other prospects emerge.

The comprehensive micro-level data used in this paper observe the entire sample of entrepreneurial firms in Sweden from 1991 to 2002 in manufacturing and some selected service sectors. Each firm is followed from entry until 2009, which means there is no left truncation problem in the dataset. The longitudinal nature of the data allows not only identifying the events of acquisition but also following acquired firms over time to detect their

post-acquisition dynamics. This paper applies discrete-time duration model to consider the duration dependence both after entry and after acquisition, which leads to two empirical strategies to address the research questions. To answer “when”, this paper compares the post-acquisition survival probabilities between acquired firms and non-acquired firms to estimate the length of post-acquisition restructuring process. To answer “who”, this paper focuses on the sample of acquired firms and disentanglers, who, in terms of characteristics of targets and acquirers, survived from post-acquisition restructuring process.

The results reveal that post-acquisition restructuring process takes about 4-6 years after acquisitions. During the process, acquired firms will exert a higher transition rate than “similar” non-acquired firms after controlling for a rich set of covariates. But after this process, acquired firms will exhibit a higher survival probability than non-acquired firms. Moreover, firm heterogeneity both from acquirers and targets is found to contribute variations in terms of post-acquisition survival performance.

The contribution of the paper is as follows. First, this paper improves our understanding of the post-acquisition restructuring process of entrepreneurial targets acquired by incumbent business groups, which is a missing perspective both in the M&A literature and entrepreneurship literature. Second, this paper makes use of information both from acquirers and targets to explore how firm heterogeneity affects the post-acquisition survival performance. The rest of this paper is organized as follows: section 2 provides theoretical and empirical backgrounds; section 3 introduces the data and describes summary statistics; empirical strategies and results are displayed in section 4 and 5 separately; section 6 discusses and concludes the paper.

2 Theoretical and Empirical Backgrounds

2.1 Acquisition Motives

Literature in industrial organization and financial economics has a long tradition to explore why some firms acquire other firms². The main motives include achieving market power when firms use M&A to eliminate competitors, increase entry barriers (Stigler 1950) or access new geographic markets (Shimizu et al. 2004); creating efficiency gains when firms use M&A to create financial, operational, managerial or technological synergies (Ansoff 1965;

² An extensive summary of acquisition motives can refer to Trautwein (1990).

Williamson 1998; Cassiman et al. 2005); building empire when managers use M&A to maximize firms size and thereby increase their own power or benefits (Mueller 1969; Jensen 1986); hubris when managers overestimate values of target firms (Roll 1986; Black 1989); technology or knowledge sourcing when target firms contributes technology or knowledge through acquisition (Blonigen and Taylor 2000; Ranft and Lord 2000), and so on.

Technology or knowledge – related acquisitions are found to be one the most important subset of M&A, especially when target are entrepreneurial firms. The empirical studies show that M&A motivated by technology sourcing are more likely to target small private firms or former subsidiaries instead of public targets (Desyllas and Hughes 2008); and that entrepreneurial firms with the strongest technology properties are more likely to be acquired shortly after foundation (Andersson and Xiao 2013). Under the framework of technology or knowledge-related acquisitions, this paper discusses three specific motives when it comes to acquisition of entrepreneurial firms by business groups.

- “Picking cherries”:

Business groups could use acquisitions to acquire some specific resources, such as intellectual property rights, technological know-how, tacit knowledge, or human capital, with the intention to develop acquired technology themselves or recombine acquired knowledge or assets with their own innovations. In this context, acquired entrepreneurial firms will face a divesting, downsizing, or even closing down after acquirers picked the best valuable technology assets from acquired firms.

- “Incubating”:

Business groups could be motivated by acquiring entrepreneurial firms with the intention to further improve and extend innovations, products or business models of acquired firms. In this context, acquired firms could gain support from acquirers, solving the mismatch between their “good ideas” and a lack of available resources through acquisitions and are supposed to exert a higher post-acquisition survival prospect.

- “Pre-empting”:

Business groups could use acquisitions in the technology markets to pre-empt potential entries (Gilbert and Newbery 1982; Reinganum 1983; Grimpe and Hussinger 2008). Under this offensive motive, acquired firms could encounter a very negative consequence shortly after acquisitions, such as with most of their employees laid off.

2.2 Information Asymmetry

Hidden information is a traditional factor to affect acquisition activities, especially when targets are small, young, and private firms (Shen and Reuer 2005). The “matching” theory proposed by Lichtenberg et al. (1987) argues that some firms suffer from the incompatibility between their “talents” and management competence and M&As provides them a new matching opportunity to correct efficiency lapses. The main driving force of M&A under this framework is a comparative advantage of buyers or comparative disadvantage of sellers. There are heterogeneous buyers and seller in the market, but buyers would only be interested in maintaining and managing targets which they believe they have the abilities to improve or which they believe have the potential to be improved after acquisitions. However, acquisition is highlighted as an “experience good” due to information asymmetries before acquisition, which means that buyers need a “trial time” after acquisitions to evaluate the quality of match when the full information of target reveals. Thus, “matching” theory implies two important factors related to post-acquisition restructuring: (1) the length of the match; (2) the quality of match.

2.3 Post-Acquisition Integration

Quite a number of work has been done to explore the effects of acquisitions on subsequent market valuations or operating performance (such as cash flows) of involved firms (Kohers and Kohers 2000; Kohers and Kohers 2001; Benou and Madura 2005; Powell and Stark 2005; Ragozzino 2006; Feys and Manigart 2010) or innovation performance of combined firms (Hitt et al. 1991; Hitt et al. 1996; Ahuja and Katila 2001; Hagedoorn and Duysters 2002; Cassiman et al. 2005; Cefis 2010). However, the results shows that most of acquisitions fail with the exception that acquiring and acquired firms can complement in resources by displaying their relatedness in knowledge base or technology, management, culture and strategy which will facilitate to promote post-acquisition integration and assimilation processes (Ahuja and Katila 2001; Hagedoorn and Duysters 2002; Ranft and Lord 2002; Cassiman et al. 2005; Cloudt et al. 2006). Otherwise, the negative impacts such as disruption in organization routines, increasing management controls, conflicts in culture and bureaucracy from post-acquisition integration process will prevail (Hitt et al. 1990; Hitt et al. 1996; Ahuja and Katila 2001; Feys and Manigart 2010).

2.4 Characteristics of Acquirers and Targets

Frequent Acquirers

Frequent acquirers could be more likely to hold “empire building” motive for acquisitions (Maksimovic et al. 2011). In this situation, managers may concern more the quantity of acquisitions to maximize their own power and benefits but do less due diligence in the selections process and pay less attention to post-acquisition integration. In this context, a higher transition rate could be expected for firms acquired by frequent acquirers. On the other hand, some acquirers acquire often because they use M&A as effective strategies to expand operations or knowledge sourcing. In this situation, acquirers could accumulate experience in acquisition activities which will improve their successful rate in selection and post-acquisition integration. In this context, firms acquired by frequent acquirers are expected to have a lower transition rate.

Acquirers from Multinational Enterprises (MNEs)

Literature in international trade and investment reveals that MNEs are characterized to be more productive, more R&D and knowledge intensive, more focused on technologically cutting-edge products, more involved in product differentiation strategies, have more intangible assets, and etc. which advantages allow them to cover transaction costs arising during the process of internationalization, particularly when they are engaged in foreign direct investment (FDI) (see, e.g., Markusen 1995; Markusen 1998; Bernard and Jensen 1999; Helpman et al. 2004). Foreign market access has been a common motive identified for foreign acquisitions. There is a large literature to explain why MNEs may choose foreign acquisitions to access foreign markets over other alternative entry modes (see Shimizu et al. 2004 for a survey). Recently, Nocke and Yeaple (2007) propose that MNEs may use foreign acquisitions to combine their internationally mobile capabilities (“intangible technological advantages”) with non-mobile capabilities (country-specific capabilities) of targets for synergies. The recent trends in M&A also indicate that technology or knowledge sourcing is another important motive for acquisitions by MNEs.

Andersson and Xiao (2013) indicates two layers of hierarchies in market selection for start-ups based on the whole population of new firms in Sweden. They find that, in the first layer, start-ups with the best technology properties are acquired than survive or exit; in the second layer, within the acquired firms, MNEs are more likely to pick start-ups with better technology properties and efficiency than domestic enterprises. But when comparing between two different types of MNEs, their findings show that Swedish MNEs are more likely to pick start-ups with the best technology properties while foreign MNEs are more likely to target the most efficient start-ups in terms of labor productivity. It seems that technology or knowledge sourcing is a primary motive for both Swedish MNEs and foreign MNEs when they target entrepreneurial firms in Sweden. But compared to Swedish MNEs, foreign MNEs concern more the efficiency of acquired firms. This may indicate that besides technology or knowledge sourcing, foreign MNEs also tend to hold motives for foreign markets accessing or gaining some country specific capabilities through targets. They consider the efficiency of acquired firms as they tend to make acquired firms as their agencies in Sweden. Thus, it is expected that firms acquired by foreign MNEs may indicate a higher post-acquisition survival than firms acquired by Swedish MNEs. Moreover, some studies emphasize that MNEs are more efficient to redeploy production or employment due to their global organization of production (Bernard and Sjöholm 2003; Bandick and Görg 2010). In this context, firms acquired by MNEs may have lower probability to survive from post-acquisition restructuring process than firms acquired by domestic enterprises.

Foreign MNEs may suffer severer information asymmetries abroad due to economic, institutional and cultural differences (Zaheer 1995; Barkema et al. 1996; Shimizu et al. 2004). Thus, foreign MNEs could be more cautious on due diligence when selecting target firms. Thereby, foreign MNEs may need some indicators (e.g. labor productivity) to signal the quality of targets, lowering the potential risks of adverse selection. But foreign acquisitions still entail a higher risk and uncertainty, which could be reflected in a higher rate of “bad” matches of acquisition partners or a more challenging post-integration integration and learning process (Shimizu et al. 2004). In this context, firms acquired by foreign MNEs may exert a higher transition rate than firms acquired by both Swedish MNEs and domestic enterprises during post-acquisition restructuring process.

Targets in Knowledge Intensive Business Services Sectors (KIBS)

KIBS not only represent a growing phenomenon in knowledge-based economies (Peneder et al. 2003), but also are highlighted as their pivotal role in innovation (Miles et al. 1995; Den Hertog 2000; Muller and Zenker 2001). Knowledge acquisition is identified as one of the most important strategy for acquirers to expand new products or source new expertise when they target firms in KIBS (Ojanen et al. 2008). However, Coff (1999) points out that in knowledge-intensive sectors, knowledge are usually embedded with humans, thereby knowledge-based assets are more difficult to observe and evaluate. This intensified situation in information asymmetries raises higher risk and uncertainty in acquisition transactions in KIBS, especially when associated with high-tech projects, which again challenges the selection and post-integration for acquisitions in KIBS, especially high-tech KIBS. Thus, the failure rate of acquired firms in KIBS, especially high-tech KIBS is expected to be higher than firms in less-knowledge-intensive service sectors.

2.5 Empirical Evidence

Empirical evidence in the topic of post-acquisition survival of acquired firms is limited. Particularly, most studies pay less attention on the temporal dimension of post-acquisition survival performance. The existing empirical studies either fail to consider the impact of duration after acquisition in their empirical designs, or do not reveal enough information about the duration effect in their analysis even if they include it in their empirical specifications. As discussed above, the “real” effects of an acquisition only emerge after post-acquisition restructuring when noisy observations have been eliminated massively. One exception is the study by Maksimovic et al. (2011), which reports there are extensive restructuring activities within 3 years after acquisition, during which about a half of acquired plants are divested or closed down.

Furthermore, the empirical findings on post-acquisition survival of acquired firms are also ambiguous. McGuckin and Nguyen (2001) find that acquired plants have a higher survival probability than non-acquired firms based on the data from US manufacturing industries from 1977 to 1987. When it comes to the impact of foreign acquisition, most studies exhibit a negative impact. For example, Bernard and Sjöholm (1985) find that foreign plants are more

likely to exit than domestic counterparts, based on Indonesian manufacturing data from 1975 to 1989. Van Beveren (2007) finds that foreign multinationals are more likely to shut down plants, depending on the data from all sectors of Belgium from 1996 to 2001. Girma and Görg (2003) use plant-level data of UK electronics and food industries from 1980 to 2003, finding that foreign acquisition reduces lifetime of acquired plants in the both sectors. However, when Bandick and Görg (2010) decompose the effect of foreign acquisition according to the information of target plants before acquisition, they find that only plants which were exporters benefit from foreign acquisition in terms of post-acquisition survival, based on the data from Swedish manufacturing industries from 1993 to 2002. When it comes to frequent acquirers, Maksimovic (2011) finds that plants are acquired in third or later deals are more likely to be closed or sell, based on the information of U.S. targets in manufacturing sectors from 1981 to 2000.

3 Data and Descriptive Statistics

Data

The unique dataset of this paper is constructed by linking a number of databases, including matched employer-employee, business group, population register, business statistics and Swedish inventors. The database of Swedish inventors is newly developed by researchers at CIRCLE (Ejeremo 2011; Ejeremo and Jung 2013). All the other databases originate from Statistics Sweden. Following the studies by Eriksson and Kuhn (2006) and Andersson and Klepper (2013), we use the method of tracing employment flows at each pair of years and identify the entire sample of entrepreneurial firms in Sweden entering from 1991 to 2002 in manufacturing and some selected service sectors; and we also divide new firms into five categories according to background information on their initial employees and the flows of employees relative to the preceding year: pulled spin-offs, pushed spin-offs, other new firms, unemployed firms and self-employed firms. Spin-offs are firms with over 50% employees coming from the same parent firm. A spin-off is defined as a pushed spin-off if its parent firm exited the same year when the spin-off entered; otherwise it is defined as a pulled spin-off. Other new firms are these with employees from different previous firms but no single previous firm dominating the source of employees. Unemployed firms refer to firms started by people who were unemployed in the preceding year. Self-employed firms are firms initiated with only one individual. Business statistics are only available from 1997 for the

whole population of firms. Besides, (consumer price index) was added each year to deflate the business statistics.³

An acquisition is identified when a firm joins a business group. This paper follows entrepreneurial firms from entry either until the occurrence of event of transition or until 2009. The event of transition based on the whole sample of firms is identified when firms either lose the observation as independent organizational units or close down⁴. The event of transition based on the sample of acquired firms also includes the situation when acquired firms divest from their acquiring firms after acquisitions. Firms acquired in 2009 dropped automatically as acquired firms need to be observed at least one year after acquisitions. This paper focuses on entrepreneurial firms in manufacturing sectors (NACE⁵ code 15-36), knowledge-intensive business service sectors - KIBS (NACE code 72-74⁶), and less-knowledge-intensive service sectors LKIS (NACE code 50-52, 55). The definition of KIBS refers to Miles (2005). The focus of the three sectors is that the share of acquisitions in the three sectors account for over 83% of all acquisitions in manufacturing and private service sectors. Also, the focus on the three sectors could partly reduce the heterogeneity of M&A cross industries.

Summary Statistics

Table 1 gives the description of main variables and their summary statistics for the whole sample. All the variables are given as values of entry. Two facts should be noted from Table 1. First, about 3% of entrepreneurial firms are acquired by business groups until 2009 in the above-mentioned sectors, with about 2.7% acquired by domestic enterprises, 0.4% acquired by foreign MNEs and 0.3% acquired by Swedish MNEs. Second, about 34% of entrepreneurial firms enter in KIBS sectors from 1991 to 2002. In contrast, only 13% of entrepreneurial firms enter in manufacturing firms during the same period.

³ From Statistics Sweden, with base year 1980 equaling 100.

⁴ Divestiture is not identified as the transition event for the whole sample of entrepreneurial firms as it does not apply to non-acquired firms. Instead, if acquired firms are observed divesting from their acquiring firms, the corresponding observations are coded as missing values.

⁵ NACE version 1.1.

⁶ Some subsectors under NACE division 74 are excluded according to the definition of Miles (2005).

Table 1 Main Variables' Description and Summary Statistics

Variable	Description	Mean	Std. Dev.
		The Whole Sample (264,002 firms)	
Foreign MNEs	Dummy variable of firms acquired by domestic enterprises	0.004	0.060
Swedish MNEs	Dummy variable of firms acquired by Swedish MNEs	0.003	0.051
Domestic enterprises	Dummy variable of firms acquired by foreign MNEs	0.027	0.162
Share of tertiary education or above	Share of employees with tertiary or above education	0.134	0.329
Share of S&E	Share of employees with tertiary or above education in the field of science and engineering	0.037	0.181
Inventor	Dummy variable for firms with inventors	0.004	0.060
Entry Size	Number of employees in logarithm	0.237	0.471
Pulled spin-offs	Dummy variable for pulled spin-offs	0.007	0.085
Pushed spin-offs	Dummy variable for pushed spin-offs	0.013	0.115
Other new firms	Dummy variable for other new firms	0.170	0.376
Unemployed firms	Dummy variable for unemployed firms	0.046	0.209
Self-employed firms	Dummy variable for self-employed firms (reference group)	0.763	0.425
Manu	Dummy variable for firms in manufacturing sectors	0.133	0.340
KIBS	Dummy variable for firms in knowledge-intensive business service sectors	0.345	0.475
LKIS	Dummy variable for firms in less knowledge-intensive service sectors	0.522	0.500
Stockholm	Dummy variable of firms located in Stockholm region	0.320	0.466
Gothenburg	Dummy variable of firms located in Gothenburg region	0.120	0.325
Malmo	Dummy variable of firms located in Malmo region	0.114	0.317
Other regions	Dummy variable of firms located in other regions (reference group)	0.447	0.497

Note: All the variables are coded at entry year.

Figure 1 displays the top ten sectors in terms of the share of acquired firms of all acquired firms in manufacturing, KIBS and LKIS sectors⁷. The lion's share goes for the sector "Other business activities" (NACE code 74). Figure 2 depicts the distribution of acquisition age (the age when a firm is acquired) of acquired firms. Over 30% of acquired firms are acquired in first year following entry and then the share declines with acquisition age.

⁷ According to NACE (version 1.1) codes. For the list of sector classification, please refer to http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/hrst_st_esms_an9.pdf.

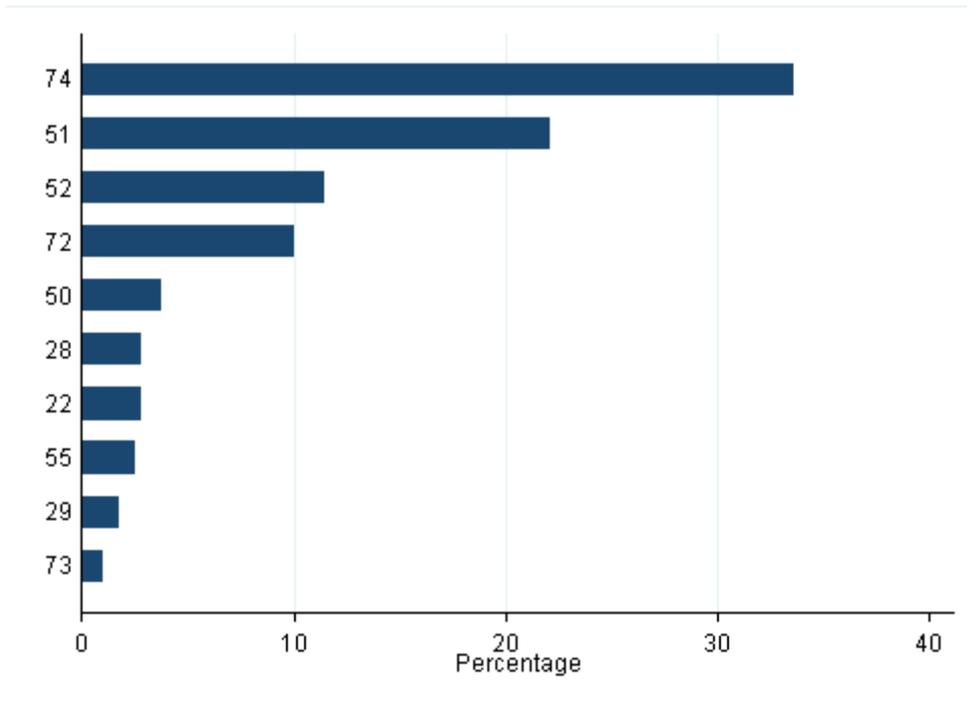


Figure 1 Sector Distribution of Acquired Firms – the Top Ten Sectors

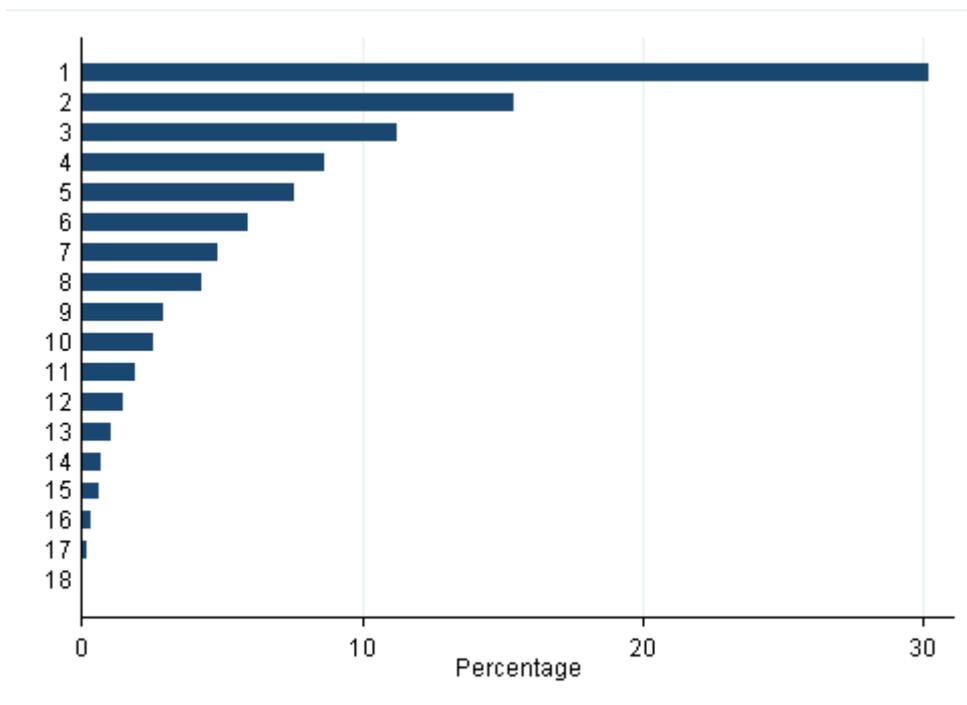


Figure 2 Age Distribution of Acquisitions

4 Empirical Strategies

This paper applies discrete-time duration models to explore the survival performance of entrepreneurial firms for three reasons. First, discrete-time models are more appropriate to tackle the data which are recoded in discrete unit (Allison 1982). Second, duration models consider incomplete information of the event occurrence which means that they consider that not all events could be observed to occur in a given observation period (Singer and Willett 1993). Third, duration models consider duration dependence, which means that time elapsed potentially affects the probability of staying in a particular state (Singer and Willett 1993).

Equation (1) defines the discrete-time hazard function,

$$\mathbf{h}(t) = \Pr[\mathbf{T} = t | \mathbf{T} \geq t] \quad (1)$$

The hazard rate at time t is the probability that a subject will experience an event in a given time interval if it is still at risk at the beginning of that time interval (Singer and Willett 2003). Following Singer and Willett (2003), this paper adopts the proportional hazard odds model to link the hazard function and covariates, see Equation (2).

$$\frac{\mathbf{h}(t|\mathbf{X}_t)}{1-\mathbf{h}(t|\mathbf{X}_t)} = \frac{\mathbf{h}_0(t)}{1-\mathbf{h}_0(t)} \cdot \exp(\boldsymbol{\beta}'\mathbf{X}_t) \quad (2)$$

where \mathbf{X}_t is a vector of covariates and $\mathbf{h}_0(t)$ is the baseline hazard rate – referring to the hazard rate depending only on time that all covariates equal zero. This model does not need to impose any priori assumption about the shape of baseline hazard. Instead, it could use duration dummies to let the baseline hazard rate vary at each duration time. Equation (3) displays the model after a logarithmic transformation when the hazard odds and the covariates are linked by a linear form.

$$\ln\left(\frac{\mathbf{h}_t}{1-\mathbf{h}_t}\right) = \boldsymbol{\alpha}_i' \mathbf{D}_i + \boldsymbol{\beta}'\mathbf{X}_t \quad (3)$$

where \mathbf{D}_i refers to a vector of dummies for duration time and $\boldsymbol{\alpha}_i$ is a vector of parameters of the baseline logit hazard function at each duration. The logit model is estimated by maximum likelihood method.

Discrete-time duration models consider the duration effect both after entry and after acquisitions, which leads to two strategies to explore the research questions in this paper. The

first strategy is to observe all firms from the first year after entry either until the occurrence of event or until 2009 and uses a time-varying variable to indicate the status of acquisitions; and then compare the post-acquisition survival probabilities between acquired firms and non-acquired firms to roughly estimate the length of post-acquisition restructuring process. The second strategy is to observe only acquired firms from the first year after acquisitions either until the occurrence of event or until 2009 and explores which heterogeneity from acquirers or targets contributes to survive from post-acquisition restructuring process.

5 Results

5.1 Acquired firms vs. non-acquired firms

Table 2 looks at the estimation results based on the whole sample of firms. Specification A includes a time-varying variable with a one-year lag to indicate the status of acquisitions, covariates and duration dummies. The coefficient of the status of acquisitions one year before acquisitions is positive and statistically significant, indicating that acquired firms have a higher transition probability (or a lower survival probability) than non-acquired firms. However, Specification A compounds the duration effect after acquisitions for observations of acquired firms. In order to solve this problem, this paper uses dummy variables to divide observations of acquired firms according to their durations after acquisitions in year $t-1$. Figure 3 displays the coefficients for each dummy⁸, showing that the sign of coefficient switches to be negative first at the 5th year after acquisitions and then switches back to be positive at 6th year after acquisitions, but from the 7th year after acquisition, the sign of coefficient keeps negative stably. Figure 3 indicates that acquired firms have a lower survival likelihood within 4-6 years following acquisitions compared to non-acquired firms, but afterwards they exhibit a higher survival probability. Accordingly, Specification B groups the observations of acquired firms into two categories: observations of acquired firms within 6 years following acquisitions and that of acquired firms from the 7th year after acquisitions and onwards. As expected, compared to non-acquired firms, acquired firms exhibit a significantly lower survival probability within 6 years following acquisitions but from the 7th year after acquisitions and onwards acquired firms

⁸ Figure 3 only displays 12 dummies as from the 13th dummy there are not enough observations which makes the coefficients unreliable.

Table 2 Estimation Results -All Firms

Variables	A	B
Status of Being Acquired (L1)	0.194*** (0.0172)	
Share of tertiary education or above	-0.110*** (0.00869)	-0.110*** (0.00869)
Share of scientists and engineers	-0.0704*** (0.0152)	-0.0707*** (0.0152)
Inventor	-0.0448 (0.0411)	-0.0444 (0.0411)
Entry Size	0.656*** (0.0139)	0.656*** (0.0139)
Pulled spin-offs	-1.221*** (0.0359)	-1.221*** (0.0359)
Pushed spin-offs	-1.104*** (0.0295)	-1.103*** (0.0295)
Other new firms	-0.698*** (0.0150)	-0.698*** (0.0150)
Unemployed firms	-0.554*** (0.0160)	-0.554*** (0.0160)
Stockholm (L1)	0.0335*** (0.00585)	0.0335*** (0.00585)
Gothenburg (L1)	0.0172** (0.00800)	0.0173** (0.00800)
Malmö (L1)	-0.00211 (0.00814)	-0.00201 (0.00814)
1-6 year after acquisition		0.226*** (0.0178)
7+ year after acquisition		-0.199*** (0.0656)
Constant	-0.474*** (0.0888)	-0.475*** (0.0888)
Baseline hazard	Yes	Yes
Sector Dummies	Yes	Yes
Year Dummies	Yes	Yes
Obs	1,036,140	1,036,140
Log-likelihood	-515738.32	-515716.59
LR Chi square	72361.89	72405.36
Prob > chi2	0.0000	0.0000

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Estimated logit baseline hazard, sector and year dummies are not reported due to space limitation.

All variables marked with (L1) are coded according to values with a one-year lag.

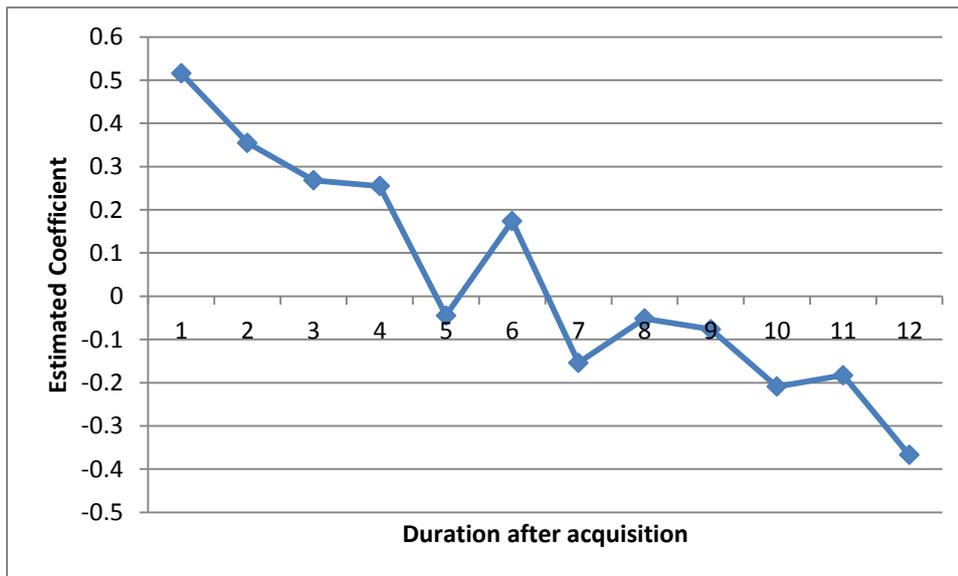


Figure 3 Coefficient of Being Acquired Against Duration after Acquisition

show a significantly higher survival probability. If we assume that if control variables make acquired firms and non-acquired firms as similar as possible except for the acquisition status, the findings may indicate that the post-acquisition restructuring process takes about 4-6 years after acquisitions.

5.2 Heterogeneity within acquired firms

Table 3 reports the estimation results for acquired firms. The results from specification A indicates that compared to purely domestic enterprises, firms acquired by both Swedish MNEs and foreign MNEs have a significant higher transition probability. However, the coefficient of foreign MNEs is only significant at 10% significance level. Moreover, the magnitude of firms acquired by Swedish MNEs is higher than that of firms acquired by foreign MNEs. The coefficient of acquisition age is negative and significant, indicating that firms acquired at older ages have a higher survival probability than firms acquired at younger ages. But the variables of technological profiles are found not to play significant effect in explaining the variations of post-acquisition survival performance of acquired firms. Firm size

Table 3 Estimation Results -Acquired Firms

Variables	A	B	C
Swedish MNEs	0.289*** (0.0535)	0.284*** (0.0536)	0.231*** (0.0545)
Foreign MNEs	0.0861* (0.0469)	0.0817* (0.0469)	0.0983** (0.0470)
Acquisition age	-0.0483*** (0.00613)	-0.0466*** (0.00614)	-0.0448*** (0.00615)
Share of tertiary education or above (Ac_L1)	-0.0757 (0.0486)	-0.0592 (0.0488)	-0.0516 (0.0489)
Share of scientists and engineers (Ac_L1)	-0.0218 (0.0752)	-0.0689 (0.0763)	-0.0594 (0.0764)
Inventor	-0.0846 (0.124)	-0.0941 (0.124)	-0.0849 (0.124)
Size (Ac_L1)	-0.0756*** (0.0242)	-0.0811*** (0.0242)	-0.0840*** (0.0242)
Pulled spin-offs	-0.104 (0.0821)	-0.104 (0.0822)	-0.101 (0.0822)
Pushed spin-offs	-0.181*** (0.0702)	-0.184*** (0.0703)	-0.184*** (0.0703)
Other new firms	0.0937** (0.0369)	0.0895** (0.0369)	0.0880** (0.0369)
Unemployed firms	0.0753 (0.0688)	0.0747 (0.0688)	0.0600 (0.0689)
Manu (Ac_L1)	-0.0316 (0.0452)	-0.0306 (0.0452)	-0.0203 (0.0452)
KIBS (Ac_L1)	0.0892*** (0.0339)		
KIBS-high-tech (Ac_L1)		0.241*** (0.0513)	0.232*** (0.0514)
KIBS-other (Ac_L1)		0.0431 (0.0360)	0.0429 (0.0360)
Stockholm (L1)	0.0384 (0.0343)	0.0308 (0.0343)	0.0318 (0.0344)
Gothenburg (L1)	-0.0665 (0.0452)	-0.0691 (0.0452)	-0.0715 (0.0452)
Malmo (L1)	-0.114** (0.0489)	-0.117** (0.0489)	-0.104** (0.0490)
Number of firms acquired in logarithm			0.304*** (0.0513)
Duration (1-6 year)	0.728*** (0.0585)	0.716*** (0.0586)	0.717*** (0.0587)
Constant	-1.245*** (0.199)	-1.218*** (0.200)	-1.246*** (0.200)
Year Dummies	Yes	Yes	Yes
Obs	25 996	25 996	25 996
Log-likelihood	-14732.074	-14724.546	-14707.369
LR Chi square	800.95	816.01	850.36
Prob > chi2	0.0000	0.0000	0.0000

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Estimated year dummies are not reported due to space limitation.

All variables marked with (Ac_L1) are coded according to values one year before acquisitions.

has a significantly positive effect on a higher survival probability for acquired firms. In terms of firm type, pushed spin-offs are found to have a higher survival probability while other new firms are found to have a lower survival probability compared to the reference group – self-employed firms. The coefficients of pulled spin-offs and unemployed firms are not statistically significant. The coefficient of firms in manufacturing sectors is not statistically significant. However, firms in KIBS sectors exhibit a lower survival probability than firms in LKIBS sectors. The coefficients of location dummies are not statistically significant. Specification B further divides KIBS sectors into high-tech KIBS sectors and other KIBS sectors according to the OECD classification (Eurostat 2011). Interestingly, the findings show that the negative effect of KIBS sectors on survival probabilities is mainly from high-tech KIBS sectors. The results for all the other variables do not have big variations. Specification C further controls for the number of firms acquired by acquirers to indicate frequent acquirers. The results show that firms acquired by frequent acquirers have a significantly lower survival probability. But when controlling for the number of firms acquired by acquirers, the coefficient of foreign MNEs is significant at 5% significance level.

6 Discussions and Conclusions

In terms “when” question, this paper indeed finds a temporal boundary for post-acquisition restructuring process, which lasts for roughly 4-6 years after acquisitions. During the process, acquired firms are found to have a higher transition rate than “similar” non-acquired firms, indicating a possible disruption of operation or a harsher selection for acquired firms.

In terms “who” question, several interesting findings emerge. First, firms acquired by MNEs especially Swedish MNEs have a much lower survival probability than firms acquired by purely domestic enterprises. If we recall that Swedish MNEs pick firms with the best technology profiles while foreign MNEs target the most efficient firms in the selection process (Andersson and Xiao 2013), it is reasonable to speculate that Swedish MNEs are more likely to hold a “picking cherries” or “pre-empting” motive while foreign MNEs tend to suffer more from the challenges from post-acquisition integration. Second, firms acquired by frequent acquirers exert a higher transition rate, indicating that frequent acquirers are more likely to hold a “building empire” motive or suffer from the “hubris” of their managers. Third,

firms in high-tech KIBS sectors are found to have a lower survival probability than firms in LKIS sectors. This may imply that acquirers when targeting high-tech KIBS sectors tend to target their human resources.

The findings of this paper indicate that if scholars want to argue the “real” effect of an acquisition, they should consider the potential disturbance from post-acquisition restructuring process, when acquired firms’ operation is temporally disrupted and they may face a very active selection from acquirers. Another attention should be paid to firms acquired by Swedish MNEs who pick firms with the best technology properties but seem not intend to “incubate” them afterwards. It is possible that Swedish MNEs use acquisitions to pre-empt potential entries in technology markets. Another explanation is that Swedish MNEs may use acquisitions to pick some critical resources which are usually difficult to obtain from factor markets.

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