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## **The Acquisition and Firm Growth: The perspective of Acquired Entrepreneurial Firms**

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### **Abstract**

This paper is to explore the effects of acquisition on the firm growth of acquired entrepreneurial firms which is overlooked by the extant empirical literature. Depending on a comprehensive dataset, the paper identifies the acquisitions of small entrepreneurial firms by large business groups during 2002 to 2004 in the high technology and knowledge intensive sectors in Sweden. By comparing the firm growth between acquired and non-acquired firms and before and after acquisition within acquired firms, it is found that acquisition is a selection process that the fast-growing entrepreneurial firms are more likely to be acquired. But the post-acquisition effects on growth is not positive. By comparing with the results from the previous study, it is inferred that in the sample of acquisitions of this paper, the negative impact is not mainly from the failures of post-integration process but more likely to connect to the development stages of acquired entrepreneurial firms when they are acquired. If the entrepreneurial firms are acquired during the stages with relatively mature innovations, it seems that acquiring groups would prefer to keep them independently within the group and increase investments to further improve and extend the innovations due to their high market potentials. Thus the growth of acquired firms would increase after acquisition. But if the entrepreneurial firms are acquired during the stages of early development of innovations, it seems that acquiring groups would be less possible to keep them as separate business units but would integrate them gradually by mergers or downsizing which entails the negative growth of acquired firms after acquisition. But these explanations need to be tested in future research.

# The Acquisition and Firm Growth: The perspective of Acquired Entrepreneurial Firms<sup>1</sup>

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## Abstract

This paper is to explore the effects of acquisition on the firm growth of acquired entrepreneurial firms which is overlooked by the extant empirical literature. Depending on a comprehensive dataset, the paper identifies the acquisitions of small entrepreneurial firms by large business groups during 2002 to 2004 in the high technology and knowledge intensive sectors in Sweden. By comparing the firm growth between acquired and non-acquired firms and before and after acquisition within acquired firms, it is found that acquisition is a selection process that the fast-growing entrepreneurial firms are more likely to be acquired. But the post-acquisition effects on growth is not positive. By comparing with the results from the previous study, it is inferred that in the sample of acquisitions of this paper, the negative impact is not mainly from the failures of post-integration process but more likely to connect to the development stages of acquired entrepreneurial firms when they are acquired. If the entrepreneurial firms are acquired during the stages with relatively mature innovations, it seems that acquiring groups would prefer to keep them independently within the group and increase investments to further improve and extend the innovations due to their high market potentials. Thus the growth of acquired firms would increase after acquisition. But if the entrepreneurial firms are acquired during the stages of early development of innovations, it seems that acquiring groups would be less possible to keep them as separate business units but would integrate them gradually by mergers or downsizing which entails the negative growth of acquired firms after acquisition. But these explanations need to be tested in future research.

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<sup>1</sup> The first draft, please do not quote.

Keywords: acquisitions, firm growth, acquired entrepreneurial firms, business groups, the high technology and intensive sectors, Sweden

## 1 Introduction

Mergers and acquisitions (M&A) is regarded as a process of resources reallocation in response to major technological change (Jovanovic and Rousseau 2008). Drawing on the knowledge-based view and the resource-based theory, knowledge especially technology knowledge is the most crucial resource building on an organization's distinct competitiveness (Kogut and Zander 1992). The competitiveness determines whether a firm will success in the selection process of industrial evolution (Nelson and Winter 1982). In this context, since 1970s, the beginning of Information Age, technology sourcing has become one of the most importance motives behind the majority of M&A transactions from the perspective of acquiring firms, especially in high technology industries (Blonigen and Taylor 2000; Ruckman 2004; Desyllas and Hughes 2008). This wave of M&As has resurged the research on post-M&A performance of concerned firms. For example, the finance literature focuses on the effects of M&A on subsequent market valuations or operating performance of acquiring or acquired firms (Kohers and Kohers 2000; Kohers and Kohers 2001; Benou and Madura 2005; Powell and Stark 2005; Ragozzino 2006; Feys and Manigart 2010). Another strand of studies on technology management recently show their interest in the effects of M&As on subsequent innovation of acquiring firms to explore how M&As affect firms' innovation process: such as input, output or technology sourcing strategies (Hitt, Hoskisson et al. 1991; Hitt, Hoskisson et al. 1996; Ahuja and Katila 2001; Hagedoorn and Duysters 2002; Cassiman, Colombo et al. 2005; Cefis 2010). However, these studies show that the results are not always satisfactory, unless acquiring and acquired firms can complement in resources by displaying their relatedness in knowledge base or technology, management, culture and strategy which facilitates to promote the post-M&A integration and assimilation processes (Ahuja and Katila 2001; Hagedoorn and Duysters 2002; Ranft and Lord 2002; Cassiman, Colombo et al. 2005; Cloudt, Hagedoorn et al. 2006).

By examining the extant studies on M&As, most of them focus on acquiring firms which are usually large publicly traded firms but overlook the characteristics and post-M&A performance of acquired firms, especially small entrepreneurial firms. Actually M&As motivated by technology sourcing are more likely to target small private firms and former subsidiaries instead of public targets (Desyllas and Hughes 2008). Benou and Madura (2005) find that the private high-tech targets can bring acquiring firms positive market valuations however the public targets are revealed to be detrimental to the market valuations of the bidders. Small entrepreneurial firms and large incumbent firms have their respective advantages in different stages of innovation due to their respective organizational properties (Yli-Renko, Autio et al. 2002). Small entrepreneurial firms tend to produce break-through innovations while large incumbent firms are better at rationalizing and improving these innovations by their routinized procedures (Baumol 2002). Small entrepreneurial firms and large incumbent firms are more complementary in resources and knowledge. M&A is one of the most efficient market forms in the “technology market” due to its comparatively low transaction costs than other alternative choices (Williamson 1979; Williamson 1981; Desyllas and Hughes 2008) to combine the advantages of small entrepreneurial and large incumbent firms. However, there has been limited research to explore M&A from the perspective of small entrepreneurial targets, especially when it comes to the acquisitions involving the interaction between small entrepreneurial firms and large incumbent groups. If it is assumed that acquisition is a selection outcome for entrepreneurial firms, it would be interesting to explore the pre-acquisition characteristics and the post-acquisition effects of acquired entrepreneurial firms. Only a few studies are exceptions but displays inconclusive results. Granstrand and Sjölander (1990) initiate a pilot case study to disentangle the process how large groups acquire and exploit technology through acquiring small technology-based firms. Bases on three samples of Swedish technology-based entrepreneurial firms established during 1945 to 1980, they discover that the acquisition has positively causal effect on subsequent growth of small technology-based firms. However, in another study based on a sample of entrepreneurial targets in the Flanders region of Belgium, Feys and Manigart (2010) find that cross-border acquisitions will improve the post-performance of entrepreneurial targets but entrepreneurial firms which are acquired by domestic bidders perform worse both before and after acquisition by comparing with a sample of independent counterparts.

Although these two studies reveal some pilot findings from the perspective of entrepreneurial targets, there are still some limitations. First, both of the studies are dependent on relative small samples of firms which entail some potential selection bias. Second, the recent trend on M&As studies tends to break down their research in order to eliminate the high heterogeneity of M&As activities. For example, some studies tend to focus on some specific industries, especially high-tech sectors or some specific countries to eliminate the industry or country effect. But in the two above-mentioned studies, they both use a pool of acquired entrepreneurial firms from different sectors but fail to control the difference of sector in their regression estimations. Third, the firm growth is a rather complex issue. As suggested by the organizational ecology approach, firm growth may involve quite many covariates, such like organization-specific, industry-specific and environment-specific factors (Hannan and Freeman 1977; Almus and Nerlinger 1999; Coad and Hözl 2010). But both of the studies much focus on the treatment variable – acquisition itself but pay less attention on the other covariates.

It is believed that the limitations of previous studies on acquired entrepreneurial firms are mainly due to the shortage of quality data as the process of M&As often imposes a situation that it is difficult to trace the post-M&A performance of acquired firms which usually lose their independent observations in the dataset after M&As. Relying on a unique comprehensive database, this paper is going to improve our understanding of the effects of M&As on the firm growth in the perspective of small entrepreneurial firms. Specifically, following the same logic of the study of Granstrand and Sjölander (1990), I plan to explore whether the firm growth is an effect or a cause of being acquired? A large amount of studies on entrepreneurship has paid attention on the impact either from the founders' individual traits, organizational characteristics or environmental conditions but the effects from acquisitions have not been much touched upon. The data of this paper identifies the complete population of independent entrepreneurial firms in the high technology and knowledge intensive sectors of Sweden established during 1997 and 2001 and follows each cohort until 2007. The data contains information of firm dynamics, business statistics and demographic statistics of employees from Statistics Sweden. The paper will contribute to the existing literature in the following three aspects: first, this paper focuses on the acquisitions of small entrepreneurial firms by large groups which more reflect the purpose of technology sourcing and diversifying. Second, this paper is to combine the acquisitions and the

firm growth to distinguish whether acquisition causes the growth of entrepreneurial firms or the growth promotes being acquired. Third, the data of this paper covers a long time span which allows examining the effects of M&As in the long run.

This paper is organized as follows: section 1 is introduction; section 2 provides theoretical framework and hypotheses; section 3 introduces data and method; section 4 displays analysis results and discussion; section 5 concludes the paper.

## 2 Theory and Hypotheses

### 2.1 The Post-Entry Evolution of Small Entrepreneurial Firms

Empirical evidence shows that new firms are fragile during their infancy: over 50% of new firms will exit within the first five years of entry while only around 20% will survive more than 10 years after entry (Dunne, Roberts et al. 1988; Geroski 1995). However, once they have survived in the first few years, small and young firms will experience higher growth rates than their larger and older counterparts, rejecting the Gibrat's law which proposes that firm growth follows a stochastic process, independent of firm size (Evans 1987; Hall 1987; Dunne and Hughes 1994; Lotti, Santarelli et al. 2003) at least in samples of small firms (Hart and Oulton 1996).

Substantive literature on organizational ecology and industrial organization reveals that firm size and age positively relate to firm survival and negatively relate to firm growth. In terms of firm survival, one argument is that new firms are subject to "liability of newness" which increases their likelihood of exit (Cefis and Marsili 2011). New firms, especially independent entrepreneurial new firms are facing more constraints in resources and knowledge than incumbent firms, such as financial constraints (Brito and Mello 1995) and asymmetric market information (Jovanovic 1982). In this context, entry size of a new firm actually is a reflection of its capacity of resources which predicts its survival ability. According to the "passive (Bayesian) - learning" model of Jovanovic (1982), firms with divergent capabilities gain the feedback from the market after entry, enabling them to position their capabilities and decide whether to stay, grow, shrink, or even exit. That is to say, as their ages grow, the selection process has already removed those firms with less efficiency. Age and size are not surprisingly to be found positively

affect survival probability of new firms (Pakes and Ericson 1998). In terms of firm growth, it is argued that new firms enter the market with a sub-optimal scale (Audretsch 1995). In order to compete with incumbent firms, they will experience rapid growth in order to smooth their average cost curve (Audretsch 1995). Recent studies reveal that the distribution of the growth rate of firms is highly skewed which means a few firms grow quickly while most others stagnate (Bottazzi and Secchi 2006). This distribution of growth rates is even more heavy-tailed for small firms (Coad and Hözl 2010). Generally speaking, the growth of small entrepreneurial firms is a rather complex process and hard to be predicted. It involves a large quantity of covariates: such as innovation, financial performance, productivity, founder's individual traits, firm-level factors, industry-level factors, environment conditions and etc. (Coad and Hözl 2010).

## 2.2 Acquisitions and Pre-Acquisition Firm Growth

There is limited research to link acquisitions and firm growth, especially in the perspective of small entrepreneurial firms. The first question concerning this topic would be whether acquisition itself is a selection outcome with bias towards the fast growing firms. If so, this blurs the effects of acquisitions on firm growth. Recent studies on entrepreneurship began to distinguish exit by sale from exit by termination (DeTienne 2010; Wennberg, Wiklund et al. 2010). Sale of firms is usually a more rewarding exit route other than termination of the business (liquidation or bankruptcy) as the retention of the business preserves the economic values of the firm (DeTienne 2010) and implies the future rewards. But the exit by sale is not necessarily implies better pre-sale performance. Entrepreneurs may choose to sell their businesses either for harvest or just for avoiding bankruptcy to keep as many as economic values (DeTienne 2010; Wennberg, Wiklund et al. 2010). Most venture capitalists invest in entrepreneurial firms especially the technology-based firms, treating them as experimental products, and will obtain high returns from their investment by selling these successful ventures to larger incumbent firms through the technology market (Cefis and Marsili 2011). But the success does not entail the firms with high growth will be more likely to be acquired, as many of the acquisitions are targeted on technology or innovative profiles of small entrepreneurial firms (Cefis and Marsili 2011).

Moreover, the sale or ownership change of entrepreneurial firms do not necessarily mean of entrepreneurial exit. Some entrepreneurs may not desire to cash in their investment or at least not

at the current moment. They prefer to retain their businesses for further development of their inventions or products. If small entrepreneurial firms plan to commercialize their products, they can either choose to compete with incumbent firms directly or choose to cooperate with incumbent firms such as being acquired to integrate into the existing value chain (Gans and Stern 2003). In this context, fast-growing firms or firms with high growth potential may tend to grow organically instead of being acquired. Two empirical studies show that there is no difference in growth between non-acquired counterparts and acquired firms when the acquired firms are not acquired (Granstrand and Sjölander 1990; Feys and Manigart 2010). Granstrand and Sjölander (1990) argue that large groups acquire small entrepreneurial firms more likely with the intention to sharing the complementary resource base instead of focusing on their pre-acquisition performance. Thus, the first hypothesis will be proposed at below:

Hypothesis 1: There is no significant difference in the firm growth between acquired entrepreneurial firms and non-acquired entrepreneurial firms during pre-acquisition period.

### 2.3 Acquisitions and Post-Acquisition Firm Growth: Positive Impact

The literature on organizational ecology and industrial organization suggests that small new firms will experience high growth in order to eliminate their cost disadvantages once they survive (Audretsch 1995). But this is conditional on that there are enough resources available in the environment. For small entrepreneurial firms, they are more likely to be constrained by resources and knowledge. Then joining in a business group would be a good strategy for small entrepreneurial firms to obtain external resources more efficiently to meet their objective of expansion. For example, knowledge from parent and sister organizations will facilitate them to fast position themselves in the market. Moreover, entrepreneurial firms can also actively participate in innovation relying on the external resources and knowledge to improve their capabilities, enhancing subsequent survival and growth as suggested in the “active-learning” model (Ericson and Pakes 1995).

More specifically, drawing on the knowledge-based view and the resource-based theory, knowledge is the most crucial resource building on an organization’s distinct competitiveness (Kogut and Zander 1992). Innovation is a dynamic process of development or new combination

of current knowledge (Cohen and Levinthal 1990) which requires constant exchange of knowledge resources through interactive learning with the external environment (Fagerberg 2005). In the high-tech sectors with rapid technological change and the complexity of knowledge, entrepreneurial firms particularly depend on external knowledge acquisition to foster their own competitiveness to offset their “liability of newness” (Yli-Renko, Autio et al. 2001; Cefis and Marsili 2011). Acquisitions can be regarded as a combination of knowledge base between acquiring and acquired firms (Ahuja and Katila 2001). Thus, entrepreneurial firms can be motivated by technology considerations to join in a business group, with the purpose of gaining a broader and deeper range of knowledge base for improving their innovation capacities. In the technology sourcing acquisitions, enhanced knowledge creation and exploration capabilities from the effects of economies of scale and scope of knowledge production will lead to a higher level of innovation output of target firms (Henderson and Cockburn 1996; Ahuja and Katila 2001). If we assume that innovation capacity stands for a competitive advantage of a firm, it is reasonable to expect that acquisition is positively related to firm growth especially the long-term growth of the target firms.

Besides technology sourcing, entrepreneurial firms are also motivated to depend on large business groups by non-technological considerations, for example with the purpose of obtaining certain complementary assets (Teece 1986) which are usually controlled by large incumbent firms, such as financial, managerial, marketing, distribution knowledge or resources (Granstrand and Sjölander 1990; Cefis and Marsili 2011) for market entry and related reasons (Chakrabarti, Hauschildt et al. 1994). In this sense, acquisition is more directly linked with improvement of market performance and growth. Granstrand and Sjölander (1990) find that the acquisition significantly improves the growth of acquired small technology-based firms. Thus, the second hypothesis will be proposed:

Hypothesis 2: Acquisition will affect the post-acquisition growth of acquired entrepreneurial firms positively.

#### 2.4 Acquisitions and Post-Acquisition Firm Growth: Negative Impact

Quite much work has been done to explore the effects of M&A on subsequent market valuations or operating performance (such as cash flows) of acquiring or acquired 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 acquiring firms (Hitt, Hoskisson et al. 1991; Hitt, Hoskisson et al. 1996; Ahuja and Katila 2001; Hagedoorn and Duysters 2002; Cassiman, Colombo et al. 2005; Cefis 2010). However, the results are not always satisfactory unless acquiring and acquired firms can complement in resources by displaying their relatedness in knowledge base or technology, management, culture and strategy which facilitates to promote the post-M&A integration and assimilation processes (Ahuja and Katila 2001; Hagedoorn and Duysters 2002; Ranft and Lord 2002; Cassiman, Colombo et al. 2005; Cloudt, Hagedoorn et al. 2006). Otherwise, the negative impacts such as increasing management controls, conflicts in culture and bureaucracy in the post-acquisition integration process will surpass the positive effects of M&As (Hitt, Hoskisson et al. 1990; Hitt, Hoskisson et al. 1996; Feys and Manigart 2010).

The innovation management literature reveals the negative impact of acquisitions from the following four aspects. First, because there are limited resources in a firm, the investment of acquisitions and the associated transaction costs (Ahuja and Katila 2001) such as integration will divert the focus towards current production or efficiency which inevitably weakens the input of productivity-enhancing activities (Aghion and Howitt 1992) – such as R&D input and hence lowering the long-term innovation output and growth (Harrison, Hitt et al. 1991). Second, the trade-off can also be reflected in the management attention. Acquisitions occupying much managerial energy will distract commitment of R&D by discouraging “championing culture” (Hitt, Hoskisson et al. 1991). Third, investment in acquisitions probably brings a large amount of debt to acquiring firms. The financial pressure will make acquiring firms particularly focus on financial controls but avoid risky productivity-enhancing projects such as R&D (Hitt, Hoskisson et al. 1990; Hitt, Hoskisson et al. 1996). Finally, the counter effects of non-technological acquisitions on internal R&D and innovation will make acquiring firms more depend on external technology acquisitions in the future through the self-reinforcing feedback loop (Hitt, Hoskisson et al. 1996). Similarly, the acquired firms may also suffer the above-mentioned counter effects because M&As make them one of the subsidiary or part of the acquiring groups. In addition,

acquired firms could be acquired solely due to their technology. In this context, acquiring firms are less motivated to further develop the innovation capacities and sales potential of acquired firms (Feys and Manigart 2010) but just focus on obtaining the acquired firms' technology or complementary assets. Based on the discussion above, the third hypothesis of this paper will be proposed as follows:

Hypothesis 3: Acquisition will affect the post-acquisition growth of acquired entrepreneurial firms negatively.

### 3. Data and Methods

#### 3.1 Data<sup>2</sup> and Description of the Sample

The main dataset in this paper is constructed by merging several databases from Statistics Sweden. The matched employer-employee database consists of annual dynamic information of all Swedish firms and their correspondent employees since 1987. By tracing the flows of employees among workplaces from each pair of years, firms/workplaces are identified as surviving, new or exit in each specific year. The same strategy can be found in studies of Eriksson and Kuhn (2006) and Andersson and Klepper (2012). In brief, a new firm is identified with a dummy variable of "new" combining the presence of a new organization number. The presence of a new organization number excludes firms with high turnover of employees which could otherwise errorously be identified as new firms based on the method of tracing employment flows. Furthermore, new firms with more than 10 employees are excluded as they are regarded as devestitures (Eriksson and Moritz Kuhn 2006) instead of "genuine" entrepreneurship. As independent entrepreneurial firms, new firms should not belong to any business group when they are founded. By linking the dataset of business group, non-independent new firms when they are founded are also excluded. For the demographic statistics of employees, the population register is merged by the personal identifiers. In order to obtain the accounting data, I also link the data to the business statistics where the whole population of firms is only available from 1997. To avoid truncation problems, I identify all the independent entrepreneurial firms born during 1997 and 2001 and follow them until 2007. By doing this, the data is long enough to detect the effects of

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<sup>2</sup> The author is grateful to Martin Andersson for his generous help in the definition of entry and exit of new firms and the definition of mergers and acquisitions.

M&As on the firm growth. Besides, I add CPI index each year to deflate the accounting data. The CPI<sup>3</sup> is from International Monetary Fund, World Economic Outlook Database (October 2012). In order to eliminate the heterogeneity in M&As among sectors, I focus on entrepreneurial firms of high technology and knowledge intensive sectors<sup>4</sup>, including high technology manufacturing industries, medium high technology manufacturing industries and knowledge intensive service sectors. Up to now, the sample consists of 67,314 independent entrepreneurial firms entering in the high technology and knowledge intensive sectors of Sweden during 1997 and 2001.

This paper is interested in the interaction of independent entrepreneurial firms and large groups as discussed before. Then it is reasonable to proxy the M&A as an event of joining a business group for the first time since the new firms have been established<sup>5</sup>. By following the 67,314 independent firms until 2007, two types of M&As have been identified. In the first type defined as acquisition, independent entrepreneurial firms are found to experience an event of joining in a business group for the first time. In the second type defined as merger, independent entrepreneurial firms are found to experience an event of exiting by merger according to the flows of employment. And the acquiring firm belongs to a business group. Totally, 3,031 firms have experienced an event of M&As until 2007, accounting for 4.5% of all independent firms in the sample, see Table 1. As this paper is to explore the effects of acquisitions on acquired firms which need independent observations after M&As in the data, only the first type of M&As will be considered. The independent entrepreneurial firms which has experienced an event of merger will be excluded from the sample. As shown in Table 1, only 0.67% independent entrepreneurial firms have experienced merger until 2007.

**Table 1 Mergers and Acquisitions Until 2007 by Birth Cohort**

Birth Cohort	Number of Firms	Being Acquired (%)	Being Merged (%)	Number of Acquisitions	Number of Firms Excluding Firms Being Merged
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<sup>3</sup> Base year: 2005=100.

<sup>4</sup> The definition is according to the OECD classification, NACE Version 1.1. See: [http://epp.eurostat.ec.europa.eu/cache/ITY\\_SDDS/Annexes/hrst\\_st\\_esms\\_an9.pdf](http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/hrst_st_esms_an9.pdf)

<sup>5</sup> As the data shows that some entrepreneurial firms may join in a business group but later be divested. And they could also join in another business group again.

1997	13594	4.22	0.68	573	13502
1998	13531	4.15	0.96	562	13401
1999	12401	3	0.57	372	12330
2000	14231	4.17	0.7	594	14131
2001	13557	3.53	0.44	478	13468
Total	67314	3.83	0.67	2579	66832

Data Source: Statistics Sweden

In order to compare the firm growth before and after acquisition, I define the firms which have experienced acquisitions during 2002 to 2004 as acquired firms. By doing this, the acquired firms can be traced at least three year after acquisitions if they can survive until then. Because the previous literature reveals that the post-M&As integration usually takes 3 to 5 years (Cefis, Marsili et al. 2009). The firms which have experienced acquisitions until 2007 but the acquisition years are not during 2002 and 2004 will be excluded from the sample. The firms which have not experienced acquisitions until 2007 is defined as non-acquired firms. The final sample consists of 65,118 independent entrepreneurial firms entering from 1997 to 2001 in high technology and knowledge intensive sectors of Sweden. Among them, 835 firms have joined in a business group during 2002 to 2004. The industry distribution is shown in Table 2. It is noted that over 95% acquired firms are in knowledge intensive service sectors.

**Table 2 Acquired Firms by Industry: 2002-2004<sup>6</sup>**

Sector	Number	Share (%)
Manufacturing Sector		
Chemicals and chemical products	2	0.24
Machinery and equipment	20	2.4
Electrical machinery and apparatus	2	0.24
Radio, television and communication equipment and apparatus	3	0.36
Medical, precision and optical	11	1.32

<sup>6</sup> According to NACE Version 1.1.

instruments, watches and clocks

Motor vehicles, trailers and semi-trailers	2	0.24
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Sub Total	40	4.8
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Service Sector

Water transport	2	0.24
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Post and telecommunications	5	0.6
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Financial intermediation, except insurance and pension funding	11	1.32
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Insurance and pension funding, except compulsory social security	3	0.36
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Activities auxiliary to financial intermediation	28	3.35
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Real estate activities	91	10.9
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Renting of machinery and equipment without operator and of personal and household goods	24	2.87
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Computer and related activities	164	19.64
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Research and development	19	2.28
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Other business activities	448	53.65
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Sub Total	795	95.21
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Total	835	100
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Data Source: Statistics Sweden

### 3.2 Methods

This paper adopt the growth of employment and net turnover to indicate firm growth. The value of net turnover is in Swedish kronor and has been deflated by CPI index with base year 2005 equaling to 100. I calculate the annual average growth rate for both acquired and non-acquired firms during the whole period, see Equation (1). I also calculate the annual average growth rate during pre-acquisition and post-acquisition period respectively, with the details shown in Equation (2) and (3). By doing this, a cross-section data has been constructed and will be used to

compare the firm growth between acquired and non-acquired firms based on the t-tests of the difference in mean values of the two samples.

$$average\_growth = [\ln(Size_{end\ observation\_year} - Size_{born\_year})/age] \quad (1)$$

$$average\_growth_{before\_Ac} = [\ln(Size_{2001} - Size_{born\_year})/age_{2001}] \quad (2)$$

$$average\_growth_{after\_Ac} = [\ln(Size_{2007} - Size_{2005})/2] \quad (3)$$

For acquired firms, a panel data has been constructed to detect whether the action of acquisition will affect the post-acquisition growth by comparing with the pre-acquisition growth within each acquired firm. The model specification is shown in Equation (4). The growth is the growth rate of each year in the logarithmic form.  $\alpha_i$  are the individual firm effects which are unobserved and assumed to be constant over time.  $x'_{it}$  is set of control variables.  $Ac_{it}$  is the independent variable to indicate whether the acquisition has been done or not.  $\mu_{it}$  is idiosyncratic errors. The choice of estimation method is depended on how the individual effects are treated (Wooldridge 2010). The random effect model is conditional on  $Cov(x_{it}, \alpha_i) = 0$  which assumed that the individual effects are not correlated with independent variables (Wooldridge 2010). Otherwise, the fixed effect model is more appropriate if it is assumed that the individual effects are correlated with independent variables. In the case of this paper, it is more reasonable to assume that there is correlation between the individual firm effects and independent variables. Then the fixed effect model will be adopted. Moreover, the literature shows that the annual growth rate is autocorrelated (Chesher 1979; Coad and Hözl 2010) and then the fixed effect model also needs to adjust the cluster robust standard errors to eliminate the impact of serial correlation (Falck 2008).

$$Growth_{it} = \alpha_i + \beta x'_{it} + \gamma Ac_{it} + \mu_{it} \quad (4)$$

### 3.3 Independent Variables

Acquisition: it is a dummy variable to indicate whether the acquisition has been done or not each year. If the acquisition has been done, it equals to 1 and otherwise 0.

Current Firm Size: in the logarithmic form.

Age

Industry Growth: The logarithmic difference of industry employment in two consecutive years on two-digit NACE code level (Version 1.1).

High technology manufacturing: Dummy variable of firms in high technology manufacturing industries.

Medium high technology manufacturing: Dummy variable of firms in medium high technology manufacturing industries.

KIS: Dummy variable of firms in knowledge intensive service sectors, the reference group.

#### 4 Results

By comparing the mean values of the annual average growth rate between acquired and non-acquired firms during the whole period, Table 3 shows that acquired firms grows slightly faster than non-acquired firms in terms of employment. But the difference is only at 10% significance level. In terms of net turnover, acquired firms are found to grow significantly faster than non-acquired firms. But it is not clear whether the faster growth of acquired firms is due to selection bias that the fast-growing firms will be more likely to be acquired or the effects from acquisition. In order to detect this problem, the comparison on firm growth before acquisition is needed. In Table 4, it is found that there is significant difference between growth both in terms of employment and net turnover between acquired and non-acquired firms in the period before acquisition. Especially, acquired firms show much higher growth in employment than non-acquired firms. But there is no significant difference on firm growth between acquired and non-acquired firms in the period after acquisition, see Table 5. From the results, it is clear that the acquisition is a selection process that the fast-growing entrepreneurial firms are more likely to be acquired by large business groups. The results do not support the first hypothesis of the paper and

are not consistent with the two previous studies by Granstrand and Sjölander (1990) and Feys and Manigart (2010). It is believed that the inconsistent results are mainly due to the differences in samples. In the study of Granstrand and Sjölander (1990), their samples have a bias towards to some relatively mature and successful technology-based firm which have survived for at least 8 years and are either based on some great, patented innovations, or still keep independent and with at least 20 employees until 1980, or are spin-offs from the university. For those firms, their initial objective could be to develop their business organically due to the high prospects of their inventions and products. But in the later stages, some of these firms are facing some constraints, especially financial resources (Falck 2008) and have to rely on external support by joining in business groups. The probability of being acquired would much depend on the commercialization environment (Gans and Stern 2003) but less relate to the pre-acquisition performance of growth because their innovative profiles have been already recognized by the market. In the study of Feys and Manigart (2010), their sample of firms covers a large range of sectors, from agriculture to service and the firms in high technology and knowledge-intensive sectors only account for less than half of the whole sample. In this case, acquisition would more reflect the motivations of market expansion locally or cross border, gaining operation synergies and etc. (Bower 2001). Thus, the entrepreneurial firms with lower operation performance would be more economy for the bidders. The data in this paper relies on a sample young small entrepreneurial firms in high-technology and knowledge intensive sectors. The average age of acquired firms when they are acquired is around 3-year old. For these young entrepreneurial firms, they have not enough time to develop their first generation of products which usually needs about 10 years (Granstrand and Sjölander 1990) and then their innovative profiles would have not been established and recognized. Then the pre-acquisition growth could be the main indicator for the large groups to assess their values and potentials.

**Table 3 The Annual Average Firm Growth between Non-Acquired and Acquired Firms: Whole Period<sup>7</sup>**

Growth Indicator	Non-Acquired Firms			Acquired Firms			T-test
	Observations	Mean	Std Dev.	Observations	Mean	Std Dev.	Pr( T > t )

<sup>7</sup> The reduced observations are either due to that some firms do not survive long enough or due to the missing accounting data.

<b>Annual Average Growth of Employment</b>	39040	0.026	0.24	835	0.041	0.228	0.0660
<b>Annual Average Growth of Net Turnover</b>	30520	0.045	0.613	661	0.122	0.511	0.0014

Data Source: Statistics Sweden and IMF

**Table 4 The Annual Average Firm Growth between Non-Acquired and Acquired Firms before Acquisition<sup>8</sup>**

<b>Growth Indicator</b>	<b>Non-Acquired Firms</b>			<b>Acquired Firms</b>			<b>T-test</b>
	Observations	Mean	Std Dev.	Observations	Mean	Std Dev.	Pr( T > t )
<b>Annual Average Growth of Employment</b>	21920	0.033	0.237	517	0.129	0.354	0.0000
<b>Annual Average Growth of Net Turnover</b>	18060	0.13	0.664	424	0.246	0.745	0.0000

Data Source: Statistics Sweden and IMF

**Table 5 The Annual Average Firm Growth between Non-Acquired and Acquired Firms after Acquisition**

<b>Growth</b>	<b>Non-Acquired Firms</b>	<b>Acquired Firms</b>	<b>T-test</b>
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<sup>8</sup> The reduced observations are either due to that some firms do not survive long enough or due to the missing accounting data.

Indicator							Pr( T > t )
	Observations	Mean	Std Dev.	Observations	Mean	Std Dev.	
<b>Annual Average Growth of Employment</b>	10674	0.008	0.147	347	0.002	0.207	0.4741
<b>Annual Average Growth of Net Turnover</b>	9809	0.029	0.41	342	0.037	0.332	0.7416

Data Source: Statistics Sweden and IMF

In terms of firm growth in the period after acquisition, the statistics in Table 5 show that the employment of acquired firms grows slower than that of non-acquired firms while the growth of net turnover of acquired firms is slightly higher than that of non-acquired firms, but both of them are not significant. A closer examination based on a panel data of acquired firms are employed to detect the acquisition effects on the firm growth. The descriptive statistics are provided in Table 6 by distinguishing the samples of before and after being acquired. The annual growth rates both in terms of employment and net turnover are lower after being acquired than that of before being acquired. The standard deviations also drop after being acquired.

**Table 6 Descriptive Statistics of Acquired Entrepreneurial Firms Before and After Being Acquired**

Variables		Before Being Acquired		After Being Acquired	
		Mean	Std Dec.	Mean	Std Dec.
Employment Growth (Log)	Overall	0.09	0.41	0.01	0.37
	Between		0.30		0.25
	Within		0.33		0.31
Net Turnover Growth 8Log)	Overall	0.20	0.92	0.02	0.63
	Between		0.77		0.51

	Within		0.70		0.52
	Overall	0.63	0.73	0.85	0.89
Size (Log)	Between		0.67		0.84
	Within		0.30		0.25
	Overall	1.49	1.49	5.46	2.03
Age	Between		0.86		1.80
	Within		1.22		1.12
	Overall	0.05	0.07	0.03	0.04
Industry Growth (Log)	Between		0.04		0.03
	Within		0.05		0.03

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Data Source: Statistics Sweden and IMF

The estimation results based on pooled OLS and the fixed effect model are reported on Table 7. The results of pooled OLS show the significantly negative impact of acquisition on the firm growth both in employment and net turnover across the acquired firms. The fixed effect model displays a non-significantly impact of acquisition on the employment growth. However, the growth of net turnover is found to negatively affected by acquisition but only at 10% significance level. Current size is found to be positively related to the firm growth. But the age is negatively related to firm growth which is consistent with the previous literature. Industry growth is also not surprisingly to be found to promote firm growth which proves the positive industry-life-cycle effects. But the dummy variables of high technology and medium high technology manufacturing do not display any significant coefficients. The results rejects the second hypothesis but support the third hypothesis that the acquisition is harmful to the firm growth of acquired entrepreneurial firms. The results are inconsistent with the findings of Granstrand and Sjölander (1990). It seems that in the sample of acquisitions of this paper, the negative impact from acquisitions is not mainly from the failures of post-integration process as suggested in Section 2.4. The explanation could be due to the sample differences again. For the small technology-based firms in the study of Granstrand and Sjölander (1990), their innovations are relatively mature when they are

acquired<sup>9</sup>. In this case, the main motivation of acquired firms to join in business groups is that they need the ample resources and knowledge of acquiring firms to improve and extend their innovations for market entry. In the aspect of acquiring groups, they also would prefer to keep these acquired firms with mature innovations as separate business units within the group due to their high market potentials. The acquisition in this case combines the respective advantages on innovation of small entrepreneurial firms and large incumbent firms and would increase the firm growth of acquired firms after acquisition. But in this paper that small entrepreneurial firms are acquired at early state of their development, acquiring firms are more motivated by technology sourcing or diversifying, such as to obtain intellectual property rights, tacit knowledge, or human assets and so on. After acquisition, acquiring groups would further develop the acquired technology themselves or recombine the acquired knowledge with their own innovations. Moreover, acquiring groups would be less possible to keep them as separate business units but would integrate them gradually by mergers or downsizing which entails the negative growth of acquired firms after acquisition. The data of this paper shows that around 6.11% of these acquired entrepreneurial firms which are acquired during 2002 to 2004 have ended up to being merged by the parent or sister companies until 2007 instead of to stay as independent business units within the business group.

**Table 7 Estimation Results: The Effect of Acquisition on Firm Growth**

Variabels	Pooled OLS	Pooled OLS	Fixed Effect	Fixed Effect
	g_employment	g_NetTurn	g_employment	g_NetTurn
After Acquisition	-0.0576*** (0.0170)	-0.152*** (0.0367)	0.00930 (0.0251)	-0.0994* (0.0591)
Current Size	0.154*** (0.00747)	0.109*** (0.0161)	0.614*** (0.0304)	0.141*** (0.0383)
Age	-0.0131*** (0.00357)	-0.0147* (0.00773)	-0.0402*** (0.00542)	-0.0276** (0.0140)

<sup>9</sup> Around 26% of small technology-firms were acquired during 10-32 years of entry, see Granstrand and Sjölander (1990).

Industry Growth	0.395*** (0.112)	0.670*** (0.257)	0.360*** (0.124)	0.614** (0.308)
High Technology Manufacturing	0.00478 (0.0499)	0.0487 (0.109)	0.127 (0.0923)	0.464 (1.610)
Medium high technology Manufacturing	-0.0368 (0.0367)	0.0763 (0.0766)	0.109 (0.0687)	-0.411*** (0.0189)
Constant	-0.00293 (0.0135)	0.139*** (0.0296)	-0.294*** (0.0270)	0.147*** (0.0507)
Observations	3,580	3,202	3,580	3,202
R-squared	0.119	0.031	0.292	0.022
Number of FAD_F_Id			764	719

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Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Data Source: Statistics Sweden and IMF

## 5 Conclusions

This paper explores the effects of acquisition on the firm growth of acquired entrepreneurial firms which is overlooked by extant empirical literature. Through following the independent entrepreneurial firms entering during 1997 and 2001 in the high technology and knowledge intensive sectors in Sweden until 2007, I distinguish the firms which were acquired during 2002 to 2004 and firms which were not acquired until 2007, and define them as acquired firms and non-acquired firms respectively. In order to detect whether acquisition is a factor which affects the firm growth, I use the cross-section data to compare the growth between acquired and non-acquired firms in the period before and after acquisition respectively. The results of t-tests in the period before acquisition show that acquisition is a selection process that the fast growing entrepreneurial firms are more likely to be targeted by large groups. But there is no significant difference in the firm growth between acquired and non-acquired firms after the period of

acquisition. Furthermore, the estimation results of the panel data of acquired firms reveals that acquisition is harmful to the post-acquisition growth for the acquired firm. The data shows that large groups acquire the fast-growing entrepreneurial firms but fails to bring them the prospects of growing. By comparing the findings with the results from the previous study by Granstrand and Sjölander (1990), it seems that in the sample of acquisitions of this paper, the negative impact from acquisition is not mainly from the failures of post-integration process but is more likely to connect to the development stages of acquired entrepreneurial firms when they are acquired. If the entrepreneurial firms are acquired during the stages with relatively mature innovations, it seems that acquiring groups would prefer to keep them independently within the group and increase investments to further improve and extend the innovations due to their high market potentials. Thus the growth of acquired firms would increase after acquisition. But if the entrepreneurial firms are acquired during the stages of early development of innovations, acquiring groups would be less possible to keep them as separate business units but would integrate them gradually by mergers or downsizing which entails the negative growth of acquired firms after acquisition. However, the findings of this paper imply that the age of acquired firms when acquired is need to include in future research to further test the explanations proposed above.

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