

## **A Comparison of Full and Partial Private Equity Exits in the Nordic Region**

Does information asymmetry affect the extent of exit?

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### **Abstract**

When exiting their investments, PE firms can either make a full or partial exit. The former implies disposing of the whole stake in the investment while the latter means that a part of the stake is retained. This thesis investigates whether the degree of information asymmetry between the selling PE firm and the buyer affects the likelihood of a partial exit. Using a logistic regression model we analyze a sample consisting of 138 transactions taking place in the Nordic region in the period of 2002-2012. We find support for our hypothesis that a higher degree of information asymmetry between the selling PE firm and the buyer increases the likelihood of a partial exit in order to signal the investment's quality. Moreover, we are able to show significant results for several proxies hypothesized to be important factors in increasing, or diminishing, information asymmetry upon exit. However, we observe some differences among the included subsample estimates, indicating that the fit of the model varies between different time-periods, investment development stages, and countries.

**Keywords:** Private Equity, Private Equity Exit, Partial Exit, Information Asymmetry

**Tutor:** Tomas Hjelström

**Acknowledgements:** We would like to thank our tutor Tomas Hjelström for his insightful and constructive remarks.

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# 1 Introduction

## 1.1 Background

Over the last decades the Private Equity (PE) industry has seen considerable growth in the Nordic region where PE investments have increased from €0.19 billion in 1990 to a high of over €5.4 billion in 2007 (EVCA<sup>1</sup> Yearbook 2014). Even after suffering from a downturn during the years of the financial crisis, PE firms today constitute one of the most important investor groups in the region (Spliid, 2013).

In this thesis we adopt a broad definition of PE to include the financing of all enterprises not quoted on a stock market, ranging from early stage firms seeking seed and growth capital to late stage buyout firms in need of restructuring. The type of company typically financed by a PE investor is often associated with a high level of risk, discouraging other types of investors such as banks from providing financing (Lerner, Leamon, and Hardyman, 2012). A large part of the company's elevated risk profile originates from the informational gaps (agency problems) that exist between the managers and the owners of the company (Lerner et al., 2012; Jensen and Meckling, 1976). The agency problems allow the managers to behave opportunistically when the financing needed has been secured as they exert a more direct control of the firm's funds compared to the investors (Jensen and Meckling, 1976). It has been argued that PE-firms have the adequate skills to mitigate agency problems by committing to a thorough due diligence process before investing and supervising the portfolio companies closely (Sahlman, 1990; Kaplan and Strömberg, 2001). This gives certain companies an opportunity to raise capital from the PE market that they would not be able obtain from other sources.

The PE investment process can be seen as a cycle, starting with raising the necessary funds and ending with exiting the investment (Gompers and Lerner, 2004). As the typical PE investment does not pay any dividends the returns are rather generated from the capital gains upon exit (Cumming, Fleming and Schwienbacher, 2006; Cohn, Mills, and Towery, 2014). The exit process is therefore of high importance to the PE-firm since a successful exit ensures attractive returns for the fund's investors and helps the PE-firm to effectively raise new capital in the future (Black and Gilson, 1998).

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<sup>1</sup> European Private Equity and Venture Capital Association

## 1.2 Purpose

As in all transactions where the seller has more information than the buyer regarding the object to be sold, PE firms have to handle the so called “lemons” problem (Akerlof, 1970) when exiting an investment. This “lemons” problem is determined by the degree of information asymmetry between the two parties which is negatively correlated with the buyer’s willingness to pay (Ibid.). When the PE firm is able to reduce the information asymmetries faced by the new owners of the firm, the result will therefore more likely be a successful exit outcome (Cumming and Johan, 2008). One way of mitigating the information asymmetry is through signaling the quality of the portfolio firm, for example by retaining an equity stake (Leland and Pyle, 1977; Cumming and MacIntosh, 2003).

The majority of previous research on PE investments has been carried out on American data and analyzes the investment and value-adding phases of the PE-investment cycle (Félix, Pires, and Gulamhussen, 2012). Few articles have regarded the exit decision and of the existing studies of PE exits, most focus exclusively on the process of IPOs (Ibid.). Our work is related with the studies analyzing the impact of information asymmetry on the exit decision. More specifically, we look upon how the degree of information asymmetry between the PE firm and the buyer affects the extent of the exit. The proportion of PE investments that is partially exited has increased substantially during the last years, from below 20% of all exits in 2006 to 35% in 2013 (Preqin, 2013). However, no study focusing on partial exits has been carried out since Cumming and MacIntosh (2003) first discussed the exit strategy, with the exception of Félix, Esperança, Gulamhussen and Pires (2009) who considered partial exits in the Portuguese PE market. Therefore, by replicating parts of Cumming and MacIntosh’s (2003) study we examine a number of causal factors for information asymmetry and their impact on the likelihood of partially exiting the portfolio company in order to signal its quality. Thus, our research question is:

*Does a greater degree of information asymmetry between the selling PE firm and the buyer increase the likelihood of a partial exit to signal the portfolio firm’s quality?*

In contrast to Cumming and MacIntosh (2003), who studied a number of North American exits, we consider a sample of transactions taking place in the Nordic region. We also extend beyond Cumming MacIntosh’s (2003) study by including a number of additional variables related to information asymmetry between the selling PE firm and the buyer.

The paper will proceed as follows: section 2 presents the theoretical framework of the thesis and previous related research. Section 3 describes the development of our hypotheses. Section 4 presents the data collection and the descriptive statistics of the sample. Section 5 explains the research methodology used. Section 6 presents the results and analysis. Finally, conclusions are drawn in section 7.

## **2 Theory**

This section begins with providing the theoretical framework for the subject of the thesis, including the exit vehicles used by private equity firms and the underlying reasons for making a partial exit. Lastly, the research related to the subject performed to date, is presented.

### **2.1 Theoretical Framework**

#### **2.1.1 Private Equity Exit Vehicles**

Cumming and MacIntosh (2002a) present four types of exits that PE firms generally use to divest their portfolio companies to a new owner: initial public offering (IPO), acquisition exit, secondary sale and management buyback. In an IPO, the PE firm sells its shares in the portfolio company to participants of the public market and lists the company on a stock exchange. The PE firm will in most cases sell only a fraction of its shares at the date of the IPO (Bergström, Nilsson and Wahlberg, 2006; Megginson and Weiss, 1991). Lin and Smith (1998) found that on average, the PE firm holds 12.1% of the shares in the portfolio company immediately after the IPO. During the months or years following the IPO, most PE firms sell the remaining shares and after three years, the majority of all PE firms have completely disinvested the portfolio company (Ibid.). Megginson and Weiss (1991) found that even if most PE firms retain a stake in the portfolio company upon an IPO, a large number of PE firms give up the voting control of the firm.

Following the IPO, the PE firm sometimes enters a so called “lock-up” agreement with the IPO’s underwriter, constraining the PE firm from selling its shareholdings in the portfolio company within a certain period of time (Gompers and Lerner, 2004). The length of US lock-up periods is typically around 180 days following the IPO (Brav and Gompers, 2003); however evidence suggests that the Nordic average is higher (Beck-Friis and Geijer, 2010).

In the case of an acquisition exit, the entire portfolio company is purchased by a third party (Cumming and MacIntosh, 2002a). The acquirer can be either a financial or a strategic buyer. A financial buyer is a company that may have knowledge in a related industry but is not at the moment in the same line of business as the target company (Kearney, 2012). Predominantly, the buyer will look on the investment at a standalone basis with the objective of increasing revenue, earnings and free cash flow (Ibid.). There are two main categories of financial buyers; PE firms and financial institutions. Examples of financial institutions are banks, pension funds and asset managers. When an acquisition exit of a buyout investment is performed and the acquirer is another PE firm, the transaction is called a secondary buyout. This type of deal has become an increasingly common exit route for buyout investments and has constituted around 35% of the total buyout transaction volume during recent years (Wang, 2012).

A strategic buyer is a company that is already in the same line of business as the target company (Kearney, 2012). It could be a competitor, supplier or customer of the target and is frequently larger than the acquired firm (Cumming and MacIntosh, 2002a). A strategic buyer is often focused on improving its current business through operational synergies, gained by integrating the target into its own business (Rousseau, 2010). The underlying fundament for the synergies could be e.g. distribution networks, intellectual property or customer bases. In contrast to a financial buyer, a strategic acquirer is usually concerned about the long-term development of the target's business and does not intent to divest their investment in a relatively short period of time following the acquisition (Ibid.). Strategic buyers are usually valuing the target company higher than financial buyers, making it a preferred exit route to selling the company to a financial buyer (Gorbenko and Malenko, 2012; Daniels, 2004).

In an exit carried out as a secondary sale, the PE firm sells its shares in the target company to a third party, which again could be either a financial or a strategic buyer. The difference from an acquisition exit is that only the PE firm sells its shares while other shareholders retain their investments (Cumming and MacIntosh, 2002a). In the case of a financial buyer, the purchaser has a higher likelihood of being a financial institution compared to when divesting the investment through an acquisition exit. The reason for this is that financial institutions rarely seek to acquire controlling stakes in companies, as they do not aspire to take an as active ownership role as a PE firm would have done (Goergen and Renneboog, 1999). Strategic buyers are also rarer, compared to in an acquisition exit, when exiting through a secondary selling as transaction synergies for the buyer are less likely to be realized (Cumming and

MacIntosh, 2002a). The reason for this is that the purchaser will not be able to combine the targets assets with its own as if it owned the whole company. If the acquirer only owns a minority stake of the shares in the target company it will be difficult to obtain the board's permission to carry out a merger as regulations usually demand a qualified majority of the votes to be cast in favor of the merger. Even if a majority stake is bought there still might be other shareholders who oppose the merger through legal processes. Although a true merger is difficult to realize for a strategic buyer, a secondary selling could be a first step towards a full acquisition of the target company in the future. The stake obtained could also provide the buyer with a window into the target company's operations and technologies (Cumming and MacIntosh, 2002a).

In the case of a management buyback, the managers of the company acquire the company owned by the PE firm (Cumming and MacIntosh, 2002a). The managers have the choice of either acquiring the company by themselves or to seek backing by a PE firm. Fidrmuc, Palandri, Roosenboom and van Dijk (2013) show that when the managers face financial constraints, they are more likely to seek PE backing. The financial constraints could be caused by factors such as a high valuation of the target company, a large company size or a small managerial toehold (Ibid.).

### **2.1.2 Full and Partial Private Equity Exits**

When exiting an investment, a PE firm can do so either fully or partially. In the first case, the PE firm disposes all of its holding in the portfolio company that is to be exited while in the second case, only a part of the holding is disposed. Cumming and MacIntosh (2003) elaborate on the definitions of full and partial exits over the different exit vehicles described in the previous section.

A full exit for an IPO consists of the selling of the PE firm's entire holding within one year from the IPO date. A partial IPO exit involves the selling of only a part of the holding within that period. It would be incorrect to view all IPO exits as partial if the PE firm does not sell all of its holdings at the IPO date for a number of reasons. Firstly, as discussed above, the PE firms often enter so called "lock-up" agreements during the period following the IPO where it cannot sell off more than a pre-determined share of its holding (Gompers and Lerner, 2004). Secondly, in many cases the market for the portfolio firm's stock does not provide enough liquidity for the PE firm to sell off all of its holdings within a shorter period of time without the effect of serious price pressure (Ibid.).

As an acquisition exit per definition is a transaction where the entire firm is sold, it might not seem possible to observe a partial acquisition exit. However, the extent of an acquisition exit is decided by the terms of payment rather than the proportion of the stake being sold. A full acquisition exit consists of the selling of the entire portfolio company in return for cash. An acquisition exit where the PE firm receives either a part or the whole payment in shares of the acquirer firm is considered to be a partial exit. As long as the PE firm holds shares in the new owner company it will continue to be able to influence the portfolio company and is exposed to any future gains or losses of the investment.

In the case of a secondary selling or an MBO, a full exit consists of the PE firm disposing all of its holdings in the portfolio company. A partial exit would subsequently take place when only a part of the PE firms holding is sold to the buyer.

There are several aspects that make a partial exit appear as an unfavorable option compared to a full exit (Cumming and MacIntosh, 2003). The partial exit will lock down a part of the returns deriving from the realization value of the portfolio company, yet it will lower the potential future upside too as the equity stake is decreased. The exit will also reduce the PE firm's capability to control the portfolio company as a number of the voting rights are transferred to the new owner. However, the partial exit will not diminish the maintenance costs of the investment as such costs are relatively fixed (Cumming and MacIntosh, 2003). The PE firm is therefore sacrificing its economies of scale when reducing the size of its investment.

Even if there are several disadvantages of making a partial exit compared to a full exit there are situations where the use of a partial exit serves a valuable purpose for the PE firm. Cumming and MacIntosh (2003) present a theory of partial exits as a way to signal high quality of the portfolio company in order to mitigate information asymmetries between the PE firm and the buyer. By signaling the high quality of the portfolio company the PE firm can be able to sell the shares at a value closer to their true value. The concept of signaling is based on the assumption of that the seller knows the true value of the investment better than the buyer (Leland and Pyle, 1977). By retaining a stake in the portfolio company the seller signals that he expects future earnings to be high compared to the current value of the firm (Ibid.). A higher degree of information asymmetry between the selling PE firms and the buyer will augment the value of the signal, therefore increasing the probability of a partial exit (Cumming and MacIntosh, 2003).



## 2.2 Previous Literature

The starting-point for this thesis is the article by Cumming and MacIntosh (2003), which to our knowledge is the first to study the occurrence of partial PE exits. In the article the authors examine whether a higher degree of information asymmetry between the selling PE firm and the buyer increases the likelihood of a partial exit. They use a sample of American and Canadian PE firms to carry out their analysis and find evidence supporting their hypothesis. They also find that there are differences between the American and Canadian PE markets, decided by legal and institutional factors in the two countries. Félix et al. (2009) investigated the event of partial exits in the Portuguese PE market, confirming parts of Cumming and MacIntosh's (2003) results. In their article regarding PE returns and valuation disclosures in 39 different countries, Cumming and Walz (2010) determined the probability of either partially or fully exiting an investment in their sample selection process. However, as their research question laid elsewhere, they did not analyze the results further.

This study of partial exits is related to the research concerning issues that arise for PE firms in situations associated with asymmetric information. Jensen and Meckling (1976) introduced the concept of agency problems which occur when asymmetric information exists between the managers and the owners of a company. Sahlman (1990) found that to cope with the challenges of agency problems, PE firms financing earlier stage firms use the concept of staging, which means that they separate their investment into different rounds, each of which will only provide capital enough to reach the next stage of development for the company. Garvey (1992) found that for buyout investments, PE funds often take on high debt levels for the company in order to overcome agency problems. This has a similar effect to staging the investment since a high amount of debt decreases the discretionary cash flows of the company. Both early stage and buyout focused PE firms also use equity oriented compensation schemes to increase management's motivation to achieve success for the firm (Sahlman, 1990).

Besides reducing agency problems between the management of the portfolio companies and themselves, PE firms have a function of certifying the quality of the portfolio company towards third party buyers at the time of the PE firm's exit of its investments. In the case of IPOs, Barry et al. (1990) showed that PE firms who hold a high quality in their monitoring of their portfolio companies experience lower levels of under-pricing. Megginson and Weiss (1991) found that PE-backed companies had a lower total cost of going public compared to a

group of peers. Gompers and Lerner (2004) showed that the characteristics of the PE firm have an impact on the strength of certifying effect where independent PE firms have a stronger certifying effect than captive or government sponsored PE firms. One of the reasons for this is that independent PE firms have stronger compensatory incitements to maximize the value of the portfolio companies compared to captive or government sponsored PE firms.

Our work is also related to the research studying the different exit forms and the timing of the exit. Schwienbacher (2002) argued that the PE firm's characteristics and monitoring mechanisms have an impact on the exit forms used. He also presented evidence on that European PE firms' monitoring intensity differed from American PE firms' because of the lower level of capital market liquidity available in Europe. Cumming and MacIntosh (2002a) found that the exit vehicle used was influenced by the characteristics of the portfolio firm to be exited, where for example high quality firms had a higher likelihood of being exited through an IPO. Cumming, Fleming and Schwienbacher (2006) investigated the impact of legal factors on PE exits. Their results indicated that a legal environment of high quality increased the probability of an IPO exit. Cumming and Johan (2008) found that when the PE firm in the process of exiting an investment was able to mitigate information asymmetry faced by the new owners of the firm, the likelihood of a successful exit outcome increased. Schmidt, Steffen and Szabo (2010) considered the exit strategies of buyout investments in Europe and the United States, finding that the exit decision was driven by market sentiment.

Giot and Schwienbacher (2007) studied PE investments using a competing risk model, allowing them to take into account both the dimensions of investment duration and exit vehicle used. They found that PE-backed firms initially exhibit an increased likelihood of being exited through an IPO. However, after reaching a plateau, the investments not exited had a decreasing probability of being exited through an IPO as time passes; indicating that IPO candidates are picked early on after the investment has been made. The other exit vehicles reviewed did not show the same pattern as IPOs.

Cumming and MacIntosh (2001) provided a comparative framework of the PE firm's value adding ability to the investee firm relative to the cost of maintaining the investment and used this to analyze the optimal investment duration of PE investments. By comparing the fit of their theoretical model for data from both the U.S. and Canada, Cumming and MacIntosh (2002b) could present evidence supporting the view that institutional factors of a country have an impact on the investment duration. The analysis of investment durations was extended by

Cumming and Johan (2010) who applied Cumming and MacIntosh's (2001) framework on a larger sample of North American PE investments. They found that strong market conditions shortened the expected investment duration and confirmed Cumming and MacIntosh's (2002b) findings of institutional factors influencing the investment duration.

### **3 Hypothesis Development**

In this section we develop our hypotheses based on the theories and empirical findings of previous literature.

#### **3.1 Type of Exit Vehicle**

The different exit vehicles are characterized by infusing dissimilar degrees of information asymmetry between the PE firm and the third party buyers (Cumming and MacIntosh, 2002a). Therefore we hypothesize, in line with Cumming and MacIntosh (2003) that the exit vehicles where information asymmetry is more pronounced are expected to have a higher likelihood of being partially exited.

*H<sub>1</sub>: The exit vehicle used has an influence on the probability of a partial exit*

##### **3.1.1 Initial Public Offerings**

IPO is the exit vehicle associated with the highest degree of information asymmetry, as public buyers (usually individuals and institutional investors) are relatively unsophisticated compared to other types of buyers (Chemmanur and Fulghieri, 1994). In a management buyback, the management has a profound knowledge of the company's operations. In the case of an acquisition exit or secondary selling, the buyer often possesses expertise in the company's field of business. Besides lack of industry knowledge, public investors suffer from the so called free rider problem as their shareholding concentration in the exited company will be low. As a result of this, public investors are dependent on each other for accurately pricing the IPO, increasing the information asymmetry even further (Black, 1992).

Investment banks and other market professionals are often used to reduce the information asymmetries caused by the lack of sophistication of public buyers (Carter and Manaster, 1990). However, as most investment banks in the Nordic region tend to be non-specialized, they are unlikely to be able to overcome the information asymmetries more efficiently than

industry professionals. As a partial exit mitigates information asymmetry, we hypothesize in line with Cumming and MacIntosh (2003), that partial exits will be used more frequently in IPOs compared to acquisitions exits, secondary sales or MBOs.

*H<sub>1A</sub>: A partial exit will be used more often when the exit occurs through an IPO compared to other types of exits*

### **3.1.2 Acquisition Exits**

As mentioned in section 2, an acquisition exit implies that the whole portfolio company is sold to either a financial or strategic buyer. In the first case, the buyer is commonly another PE firm, motivated to pursue the acquisition because of a stronger expertise in the target firms market or technology compared to the seller (Wang, 2012; Cumming and MacIntosh, 2002a). This view has been backed by Sousa (2010) who suggests that different value creation strategies are used according to the financial buyer's unique skill set. In the case of a strategic acquirer, the buyer possesses profound knowledge of the portfolio company's industry as the acquirer is operating in the same, or a related, line of business (Rousseau, 2010).

In case of either a financial or a strategic buyer the level of information asymmetries are believed to be relatively low because of the purchasers' strong skill set. Cumming and MacIntosh (2002a) also suggest that an acquirer of the whole firm will have a strong bargaining power against the seller which enables for access to inside information about the target firm, further lowering the levels of information asymmetry. We therefore hypothesize in line with Cumming and MacIntosh (2003) that acquisition exits will see a lower level of partial exits than IPOs and secondary sellings.

*H<sub>1B</sub>: A partial exit will be used less often when the exit occurs through an acquisition exit compared to IPOs and secondary sellings*

### **3.1.3 Secondary Sellings**

For a secondary selling, the degree of information asymmetry is likely to be higher than when an acquisition exit is used because of several reasons. In a secondary selling, a financial buyer has a higher likelihood of being a financial institution compared to when an acquisition exit is used, as financial institutions rarely seek to acquire majority stakes in companies (Goergen and Renneboog, 1999). Financial institutions generally lack the same level of industry expertise as a PE firm possesses and therefore the information asymmetry is often relatively

high (Cumming and MacIntosh, 2003). Additionally, since transaction synergies are less likely to be realized, strategic buyers are not as common when exiting through a secondary selling (Ibid.). Even in the case of a strategic buyer, the purchaser will not have the same bargaining power as in the case of an acquisition, therefore gaining less access to insider information regarding the portfolio company (Cumming and MacIntosh, 2002a).

Because of the relatively high degree of information asymmetry characterizing secondary sellings we hypothesize, in line with Cumming and MacIntosh (2003), that secondary sellings will see a higher proportion of partial exits than acquisition exits and MBOs.

*H<sub>1C</sub>: A partial exit will be used more often when the exit occurs through a secondary selling compared to acquisition exits and MBOs*

### **3.1.4 Management Buybacks**

As the acquirer in an MBO is the management of the company, the buyer typically holds better knowledge of the firm than the seller (Fama and Jensen, 1983) thereby eliminating the need for a partial exit as a way of mitigating information asymmetry. Also, Fidrmuc et al. (2013) show that even when facing financial constraints, the management of the company is likely to seek financial backing from financiers such as banks or other PE firms to acquire the whole company. Therefore, we hypothesize that MBOs will see the smallest fraction of partial exits among the exit vehicles.

*H<sub>1D</sub>: A partial exit will be used the least when the exit occurs through a MBO compared to the other exit vehicles*

## **3.2 Development Stage**

Sahlman (1990) and MacDonald (1992) list the different stages of progress of a company, ranging from seed to buyout stage where each stage represents a new phase in the development of the company. Sahlman (1990) shows that the level of information asymmetry between company insiders and outsiders varies with the portfolio company's stage of development. In early stages the informational asymmetries are high since the company is characterized by uncertainty regarding the business' future profitability. In later stages the information asymmetry is lower as the company has matured and started to generate cash flows (Landström, 1992; Sahlman, 1990). Cumming and MacIntosh (2003) argue that for any given duration, earlier stage investments will therefore be characterized by a higher amount of

information asymmetry than later stage investments. We therefore hypothesize that there will be an decreasing probability of partial exits in the following order of development stages: seed, venture, small-cap buyout, mid-cap buyout and large-cap buyout.

*H<sub>2</sub>: Earlier stage investments increase the likelihood of a partial exit compared to later stage investments*

### **3.3 Investment Duration**

Cumming and MacIntosh (2002a) suggest that the longer the investment duration lasts the less information asymmetry between insiders and outsiders of the portfolio firm exists as PE investments are designed to mitigate these. This is in line with Megginson and Weiss (1991) who found that a longer PE investment duration leads to less underpricing of IPOs caused by information asymmetry. The value of a partial exit will therefore be higher for investments of shorter durations, increasing the likelihood of a partial exit.

Additionally, Gompers (1995) showed that in the case of earlier stage investments, PE firms periodically perform a revaluation of the portfolio company when approaching a new stage of development. If the revaluation shows a positive net present value, additional funding is provided to the portfolio company and if not, the investment is disposed of. The procedure allows PE firms to quickly abandon projects with dim prospects (Ibid.) which creates further uncertainty for the buyer regarding the portfolio company's quality in the case of a short investment duration, thus enhancing the need for a partial exit.

For the reasons stated in this section, we hypothesize in line with Cumming and MacIntosh (2003) that shorter investment duration will lead to a higher likelihood of a partial exit.

*H<sub>3</sub>: Shorter investment duration will lead to a higher likelihood of partial exit*

### **3.4 Capital Availability**

The managers of PE firms get part of their salary as a percentage of the total assets under management (Sahlman, 1990). As a result, they have strong incitements to increase the amount of funds under administration when fresh supplies of capital becomes available (Ibid.). However, as every PE manager only has the ability to actively monitor a limited number of portfolio companies (Gorman and Sahlman, 1989) the PE firm is constrained in its ability to deploy the raised capital into new investments. Successful PE investing demands

years of experience, therefore the supply of PE managers will be inelastic. As a result, increases in capital availability will shorten the investment duration as the PE firms would want to exit their old portfolio companies to be able to take on new larger investments (Cumming and MacIntosh, 2001). The premature exit of the portfolio companies would in turn increase the amount of information asymmetry between the PE firm and the buyer, making the signaling effect of a partial exit more valuable. Therefore we hypothesize, in line with Cumming and MacIntosh (2003), that an increase in capital available will lead to a higher likelihood of a partial exit.

*H<sub>4</sub>: An increase in capital available will lead to a higher likelihood of partial exits*

### **3.5 Growth Rate and the Market to Book Ratio**

The market to book ratio can be defined as:

$$\frac{M}{B} = \frac{ROE - g}{r - g}$$

Where:

M = Market value of equity

B = Book value of equity

g = Growth rate

r = Required rate of return on equity / discount rate

There are several reasons for a high market to book ratio of a company. The company could be of high quality, having a high return on equity and a low discount rate. It could also be that the firm is a high growth company, or both. The first reason would realistically lower the probability of a partial exit, provided that the buyer is aware of the firm's quality. However, the second reason amplifies the amount of uncertainty of the investment since high growth levels are unlikely to be sustained over a longer time period, thereby increasing the degree of information asymmetry and the value of a partial exit. In line with Cumming and MacIntosh (2003), we believe the second effect to be stronger thus leading to an increased likelihood of partial exits for investments with high market to book ratios. However, as the reason for making a partial exit is to achieve a higher exit value the variable might be submitted to endogeneity. Therefore, in the analysis we test for the possibility of endogeneity.

*H<sub>5</sub>: A higher market to book value will lead to a higher likelihood of a partial exit*

### 3.6 High-technology and Biotechnology Firms

A substantial part of all Nordic PE investments are made in high-technology firms (EVCA, 2014). These firms have a great proportion of intangible assets (Noe and Rebello, 1996) and a larger part of the companies' value can be derived from human capital, which in most cases is moveable (Hart & Moore, 1994). This causes problems for valuation purposes, especially for third party buyers (McCahery and Renneboog 2004). The same reasoning can be applied to biotech firms, whose operations mainly consist of R&D processes (Choi, Mao and Upadhyay, 2007). Aboody and Lev (2000) found that R&D is a major source of information asymmetry between the management and outsiders of the company. In line with these findings Gou, Lev and Zhou (2004) presented evidence on that the bid-ask spread, a measure of information asymmetry, was larger for public biotech companies than for other firms.

In addition to the characteristics of high-tech and biotech firms increasing information asymmetry, Cumming and MacIntosh (2003) argued that in the case of IPO exits, the problem of valuing a high-tech or biotech firm become enhanced. This is due to the low level of sophistication and free-riding problems that characterize IPO investors.

Because of the high degree of information asymmetry associated with high-tech and biotech companies, we hypothesize that these companies will be exited partially to a higher extent.

*H<sub>6</sub>: High-tech and biotech firms are more likely to be exited partially*

### 3.7 Syndication

A syndicate is a group of two or more PE firms that invest together in a portfolio firm and share the possible capital gains (Lerner, 1994). There are several rationales behind syndicating a PE investment, e.g. portfolio diversification (Cumming, 2006) or access to larger deal sizes (Manigart, Lockett, Meuleman, Wright, Landström, Bruining, Desbrières and Hommel, 2006). Additionally, syndication enhances the due diligence process of the investee firm and increases the value added to the portfolio firm as multiple PE firms participate in the process of developing the company (Chahine, Filatotchev and Wright, 2007; Brander, Amit and Antweiler, 2002). Therefore, we expect syndicated deals to have a low degree of information asymmetry and thus experience a low likelihood of being partially exited.

*H<sub>7</sub>: Syndicated investments are less likely to be exited partially*



### 3.8 Geographic Proximity

Giot and Schwienbacher (2007) argue that portfolio companies have an increased chance of financial success if they are being located in the proximity of the investors. This was confirmed by Cumming and Dai (2010) who found that there is a negative relationship between the distance of the PE firm and the performance of the portfolio company. As a third party buyer will face greater uncertainty regarding the portfolio company's quality for companies located more distantly from the selling PE firm, we hypothesize that these investments will have a higher likelihood of being partially exited.

*H<sub>8</sub>: Partial exits are more likely when the portfolio company is located more distantly from the selling PE firm*

## 4 Sample and Data

This section provides a description of the data set used for the analysis. First, we present the initial data set, adjustments made to the data and potential sample selection problems. Next, we display the sample distribution and descriptive statistics and compare the dataset to the data of related studies.

### 4.1 Initial Data Set

Data on all completed M&A transactions between 2002 and 2012 where both the target and vendor were located in the Nordic region<sup>2</sup> is obtained through the database Zephyr, provided by Bureau van Dijk. The data from Zephyr contains information regarding the transactions and details about the involved parties. Only transactions where the vendor is a PE firm are considered. As partial IPO exits are defined as when the PE firm continues to hold a stake in the portfolio company for more than one year after the IPO date, 2012 is chosen as the upper limit as we would be unable to determine the extent of any IPO exits made after this year. The reason for only including transactions from 2002 at earliest is purely because of data availability, as we recognize that details regarding M&A transactions are difficult to obtain further back in time. The geographic scope is chosen because of several reasons. Firstly, the availability of accounting data in the Nordic region is high as all joint-stock companies and financial institutions must submit annual financial reports that are made public. Secondly, the

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<sup>2</sup> Sweden, Norway, Denmark and Finland

Nordic PE industry is one of the most developed in Europe and has seen a high level of activity during the last decade (Spliid, 2013). Additionally, even if differences exist between the Nordic countries, they have more economic factors in common than most European countries (Ibid.). This enables us to collect a sample of adequate size without it being too heterogeneous.

## **4.2 Adjustments to Initial Data Set**

To be able to carry out the analysis, a number of adjustments and additions to the data set are made. Data regarding the development stage of each investment involved in the transaction is collected from the Argentum Market Database which is a database tracking all PE transactions in the Nordic region, provided by the Norwegian asset manager Argentum. The investment duration for each portfolio company is obtained through manual searches in Zephyr and complemented by information available on the PE firms' websites and through press-clips obtained through the newspaper database Factiva. As a proxy for capital available to the PE firms, data from EVCA regarding capital raised in the Nordic region during the years 2002-2012 is used. Pre-deal target company financial data is acquired through the database Orbis, also provided by Bureau van Dijk. From Orbis we also obtain information regarding industry classifications of each target company.

A major constraint in studying PE is the lack of access to sensitive and confidential data such as details regarding the sizes of equity stakes sold and realized investments' exit values. As the former is needed to determine whether the exit is full or partial and the latter is needed to calculate the market to book ratio (where the deal value is used as market value of equity), this results in observations where one or several variables are missing. To deal with this we apply so called complete case analysis, which means that all observations with missing variables are excluded. Generally, the use of complete case analysis assumes that the missing information is missing randomly as this otherwise would give rise to a sample selection bias (Little and Rubin 1987). For our sample, this might not be the case as smaller deal sizes have a lower likelihood of being reported as pointed out by Strömberg (2008). This also leads to a smaller proportion of earlier stage investments in the adjusted sample compared to the full sample as the investment stage often is strongly correlated to the absolute size of the firm value (Landström, 1992). However, since the analysis in this study is based on the logistic regression model this should not be a problem, as a logistic regression applied on samples with excluded observations is problematic only when the probability of missing data is

dependent on both the response variable and the explanatory variables (Allison, 2001). As our sample has nearly the same proportion of partial exits (29.7%) as the total sample of exits (32.5%) this is unlikely to be the case.

To keep the market to book ratio as accurate as possible, observations where more than 1.5 years has passed since the last reporting of financial data prior to the transaction, are excluded. Allowing longer time periods would present inaccurate book values of equity and hence distort the ratio. For the same reason, companies with negative consolidated equity are removed. Further, a few observations missing financial data are excluded. Lastly, a number of transactions where the investment date or stage of development can not be determined are deleted.

*Table 1. Data set and sample selection*

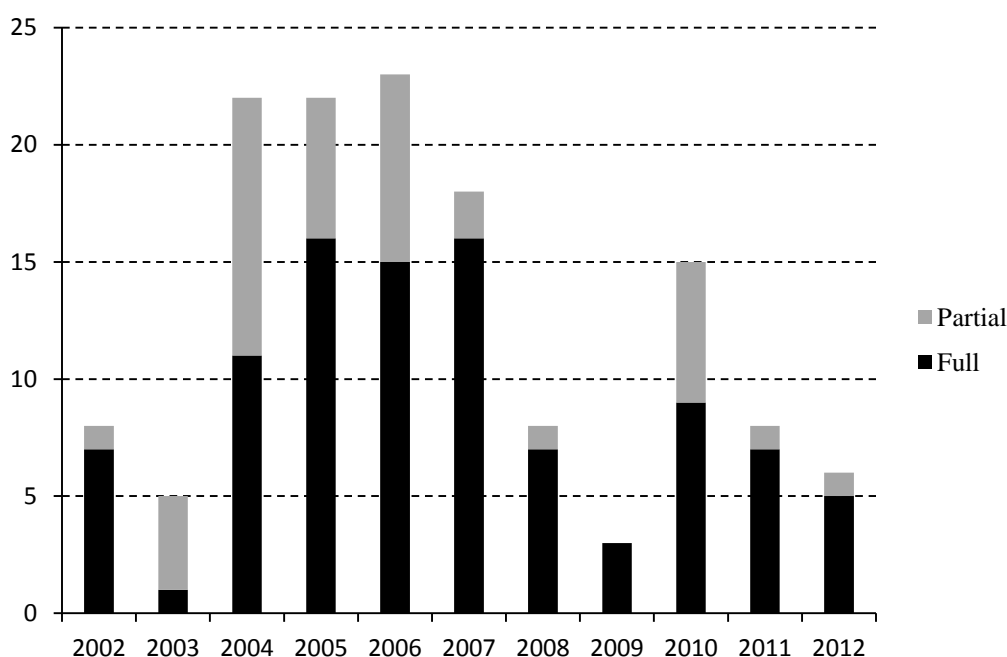
Criteria	Exits
1 Initial data set for period and region	646
2 Disclosed deal value	274
3 Size of stake disclosed <sup>1</sup>	210
4 Shareholders' funds disclosed <sup>2</sup>	185
5 With negative equity in books excluded <sup>3</sup>	172
6 With date of book value further than 1,5 years from transaction excluded	162
7 With market/book over two standard deviations from mean excluded	156
8 With information lacking on development stage when invested excluded	146
9 With information lacking on duration excluded	138
<b>Final data set</b>	<b>138</b>

A small book value of equity can have an immense effect on the companies' market to book ratios. To prevent firms with very low consolidated shareholder's equity from distorting the market to book variable, a threshold has to be determined for what should be considered as an outlier. To set an appropriate threshold, annual data for all S&P500 companies from 2002 to 2012 are obtained from the Compustat database. The average (3.62) and standard deviation (22.62) of their market to book ratio is used to calculate an interval in which roughly 95% of all values are likely to be in (constituting of the average with two standard deviations added), resulting in a cut-off value of 48.86. Observations in our data set above this value are dropped. All adjustments have been summarized in table 1.

### 4.3 Sample Distribution

The sample remaining after observations with missing data are excluded consists of a total of 138 exits made by 48 different PE firms. Forty-one of the 138 exits are partial exits. As seen in Figure 1, a majority of the exits occur during the boom period of 2002-2007, which is not surprising given the overall high activity of the Nordic PE industry during these years. The effects of the crisis years 2008 and 2009 are evident by the drastic downturn in amounts of exits made. A strong recovery in 2010 can be observed, again followed by lower exit quantities in the subsequent years. The proportion of partial exits varies between approximately 10% to 40% between the years. 2003 and 2009 stand out as extreme years with 80% and 0% partial exits, respectively.

*Figure 1. Annual distribution of full and partial exits*



### 4.4 Descriptive Statistics and Comparisons with Related Studies

Table 2 summarizes the data by the different exit vehicle used. In line with Giot and Schwienbacher (2007), IPO exits show the highest market to book ratio and shortest investment duration. Secondary sellings are the most common exit vehicles used during the period, closely followed by acquisition exits. Only a handful of IPOs and very few management buyouts are observed. These results differ from the North American sample studied by Cumming and MacIntosh (2003) which contained a larger proportion of IPOs and

management buyouts. The low amount of MBOs in our sample can be attributed to regional differences, as PE exits through MBOs in the Nordic region are relatively rare (EVCA, 2014). Further, even if the IPO market in the Nordic region is active in itself, it is not used to a high extent by PE firms for exiting their investments (Spliid, 2013).

Cumming and MacIntosh (2003), as well as Félix et al (2009), included write-offs in their sample used to analyze partial exits. Write-offs can be seen as a way of exiting the investment in the case where the portfolio company fails. However we choose to exclude write-offs as Zephyr, our main source for data, only records M&A transactions to which write-offs are not counted. In addition, the exclusion of write-offs can be motivated by the fact that no information asymmetry can arise between a seller and a buyer in a write-off as there is no buyer.

*Table 2. Private equity full and partial exits summarized by exit vehicle*

Exit vehicle	Number of portfolio companies	Extent of exit		Average market to book value	Average investment duration	High-tech	Biotech	Syndicated investment	Distant investment
		Full	Partial						
IPO	9	3	6	13.03	3.43	1	3	2	2
Acquisition	61	56	5	7.76	5.21	20	3	17	13
Secondary Sale	66	36	30	6.41	5.58	24	9	3	9
Management Buyout	2	2	0	3.75	3.61	0	0	0	0
<b>Total</b>	<b>138</b>	<b>97</b>	<b>41</b>	<b>7.40</b>	<b>5.25</b>	<b>45</b>	<b>15</b>	<b>22</b>	<b>24</b>

Table 3 summarizes the data by development stage of the exited companies. The largest group of exits is small-cap buyouts, followed by venture stage investments. Cumming and MacIntosh's (2003) dataset included a higher amount of early stage investments compared our dataset, which is more shifted towards later stage investments. This is not surprising as Cumming and MacIntosh's (2003) data was hand-collected with a stronger focus on PE firms specialized in earlier stage investments compared to our data collection, which is not focused on any particular development stage. As mentioned above, information regarding smaller deals is also less likely to be disclosed to the public, resulting in a relatively higher amount of omitted early stage observations. However as mentioned, the method used in the analysis mitigates this potential selection bias problem.

*Table 3. Private equity full and partial exits summarized by development stage*

Development stage	Number of portfolio companies	Extent of exit		Average market to book value	Average investment duration	High-tech	Biotech	Syndicated investment	Distant investment
		Full	Partial						
Seed	7	6	1	7.08	6.48	2	3	1	1
Venture	36	21	15	13.28	4.92	22	7	5	6
Small-cap buyout	67	51	16	4.79	5.08	14	2	11	10
Mid-cap buyout	13	10	3	4.87	6.12	2	2	3	4
Large-cap buyout	15	9	6	7.28	5.49	5	1	2	3
<b>Total</b>	<b>138</b>	<b>97</b>	<b>41</b>	<b>7.40</b>	<b>5.25</b>	<b>45</b>	<b>15</b>	<b>22</b>	<b>24</b>

Table 4 summarizes the data by the extent of the exit. The average market to book ratio is higher for partially exited firms than for fully exited firms which is in line with Cumming and MacIntosh's (2003) sample. However, the average market to book ratio for the full sample is considerably higher than for the sample of Cumming and MacIntosh (2003). As our sample contains a majority of exits made during the boom years of 2002-2007, this is not surprising as the market valuations of companies was at a higher level during this time (Hess, Kretzmann, Maaz and Pucker, 2012) compared to the period of 1992-1995 which Cumming and MacIntosh (2003) studied. Observing the other variables, the average duration and proportion of high-tech firms are comparable to the sample of Cumming and MacIntosh (2003). Also, the sample contains a similar proportion of partial exits compared to the sample used by Cumming and MacIntosh (2003).

*Table 4. Private equity exits summarized by extent of exit*

Extent of exit	Number of portfolio companies	Average market to book value	Average investment duration	High-tech	Biotech	Syndicated investment	Distant investment
Full	97	5.92	5.47	33	6	17	19
Partial	41	10.90	4.73	12	9	5	5
<b>Total</b>	<b>138</b>	<b>7.40</b>	<b>5.25</b>	<b>45</b>	<b>15</b>	<b>22</b>	<b>24</b>

## **5 Methodology**

This section explains how our study of partial exits is conducted. We start by presenting the variables used to approximate the degree of information asymmetry between the seller and buyer of each transaction. Next, we present the model used in the regression analysis and the additional statistical tests used to ensure the strength of the results.

### **5.1 Definition of Variables**

#### **5.1.1 Response and Explanatory Variables**

Our response variable is a binary variable with two outcomes; partial or full exit. The variable assumes the value 0 for all partial exits and the value 1 for all full exits. Our explanatory variables are exit vehicle, development stage, investment duration, capital availability, market to book ratio, industry type, syndication and the sellers' proximity to the investment. All variables but investment duration, capital availability and market to book ratio are categorical variables. To integrate categorical variables in a regression model it is necessary to decide on a reference category and define dummy variables for each one of the remaining categories. This means that if a categorical variable has  $n$  categories,  $n-1$  category dummy variables will be defined. The reason for this is to avoid the problem of perfect collinearity which means that there is a very strong correlation between two of the predictor variables in the regression. The coefficient of the excluded category will instead be integrated into the coefficient of the constant.

With regards to exit vehicle, each transaction is classified according to the definitions of IPO, acquisition exit, secondary selling and management buyback described in the theory section. However, the one year cut-off point for partial IPO exits proposed by Cumming and MacIntosh (2003) was adjusted to 1.5 years as the average Nordic lock-up period is longer than the average American or Canadian lock-up period (Beck-Friis and Geijer, 2010). As no partial management buybacks are recorded these observations are excluded from the regressions as they become perfect predictors of the outcome. Secondary selling is chosen as the reference variable.

The number of different development stages defined by previous research include seed, start-up, early stage, expansion stage, buyout and turn-around (Sahlman, 1990; MacDonald, 1992). However, the data obtained from Argentum is not granular enough to provide information in

line with the these stages. Instead, the categories provided is seed, venture, small-cap buyout, mid-cap buyout and large-cap buyout where seed includes both companies in the seed and start-up stages and venture includes companies in both the early and expansion stage. The subcategories of buyout are determined by the size of the company at the time of the buyout where small-cap is defined as companies smaller than M250 EUR, large-cap as companies larger than M500 EUR and mid-cap as companies in between these thresholds. Seed stage is chosen as the reference variable.

The duration is calculated by subtracting the deal date from the investment date and is specified in years. For observations where the exact date, given by day, month and year, is missing the investment date is approximated by full months and in a few cases by full years.

The variable for capital available is defined as the change in capital available during the year of the exit compared to the year before, with the data segregated by country and year. Upon raising capital the PE firm normally only has a limited period of time to invest it (Gompers and Lerner, 2004). This gives the PE firm incitements to invest the raised capital in new portfolio companies within a relatively short period of time. Realized capital gains are excluded as these often are ineligible for reinvesting (Ibid.).

The market to book ratio is calculated by dividing the equity deal value of the transaction by the book value of equity reported prior to the transaction. In the case of partial exits the proceeds will be lower than for the sale of the whole company which would bias the market to book ratio downwards. We have therefore adjusted the market values upward depending on the fraction of equity received in the transaction.

To define firms within the high-tech and biotech sectors we use the three-digit SIC codes of each company. To define which sub-industries to include we apply the same definition as Core, Guay and Buskirk (2003) who studied the equity valuation process of high-tech and biotech firms. As our hypothesis is established on the proposition that high-tech and biotech firms are harder to value we find their industry definition relevant to our study. The sub-sectors included for the high-tech variable were computer equipment, software, communications and electronics. Likewise, a dummy variable is created for firms in the biotech sector. The reference variable is in this case the non-high-tech/biotech firms. To control for the enhanced degree of information asymmetry created by the buyers accelerated problem of valuing high-tech/biotech firms exited through IPOs, we create an interaction variable by multiplying the high-tech/biotech variables with the IPO variable.



To determine whether the investments are syndicated or not we examine all previous transactions involving the target company in Zephyr. If any other PE firm invested at the same time as the vendor firm the transaction is classified as syndicated. Also if any other PE firm invested either previous or after the vendor firms entry and was still invested at the time of the exit the transaction is classified as syndicated. The reference variable is the non-syndicated investments.

To estimate the vendor firm's proximity to the portfolio company we determine whether the transaction involving the vendor and the target company had been a cross-border investment or not. A cross-border investment is defined as when the selling PE firm invested in a portfolio firm located in another country than where the PE firm's headquarter is located (Wright, Pruthi and Lockett, 2005). All cross-border transactions are labeled as distant from the vendor. Non-distant investments are chosen as the reference variable.

### **5.1.2 Control Variables**

Previous research carried out by MacIntosh (1997) and Cumming and MacIntosh (2002a) suggested that institutional and legal differences between US and Canadian capital markets affected the investment and exit behavior of PE firms. They argued that the three main reasons found for this was that; (1) the countries had different legally stated lock-up requirements for IPOs, affecting the PE firms holding duration post-IPO of a portfolio company; (2) the extent of so called government sponsored PE firms (GSPE) varied between the countries, distorting investment and exit behavior as the incitements of GSPE managers differ from the incitements of managers of other types of PE firms; (3) the skill level of the PE managers varied between the countries, also distorting the investment and exit behavior. As our study includes PE firms from four different countries it is adequate to examine whether any of these differences apply to the countries included in the sample.

In contrast to USA and Canada, lock-up periods are not regulated by law in any of the Nordic countries. Instead, the lock-up period is decided on a contractual basis between the underwriter of the IPO and the selling PE-firm (Beck-Friis and Geijer, 2010). Therefore, we believe that any country specific effects on post-IPO holding durations will be weak to nonexistent.

Isaksson, Cornelius, Landström and Junghagen (2004) concluded that GSPE firms had a strong presence in Sweden and that their behavior differed from other PE firms'. To our

knowledge, no studies of GSPE firms have been conducted in the other Nordic countries but anecdotal evidence show that GSPE firms are present in all countries, i.e. Argentum of Norway, Vaekstfonden of Denmark and Finnish Industry Investments of Finland. However, the extent of the GSPE firms' presence may vary between the countries.

Data from EVCA reveals that during the last two decades, there are considerable differences between the countries regarding PE investments in terms of volume and quantity. The investment volume in Sweden amount to more than four times the amount in Norway, Denmark and Finland, separately. This implies that Swedish PE managers have considerably more experience than their Nordic peers.

To control for country-specific differences in GSPE presence and PE manager experience we include a control variable for the country of the vendor where Sweden is set as reference category.

As the sample contains observations from a relatively long time period, there is a probability of annual cyclicalities or market timing effects influencing the extent of exits. To control for any time fixed-effects, year dummies are included with 2012 as reference category. As a result of this, the observations from 2009 are omitted as no partial exits were made during 2009, hence making the variable for 2009 a perfect predictor of the outcome.

## **5.2 Regression Model Specification**

### **5.2.1 Full Sample Estimates**

As the response variable is discrete, a linear regression model is not suitable since the basic assumptions of the model are violated (Wooldridge, 2012). Therefore, we use the logistic regression model to analyze the variables influencing the extent of the exit. The logistic model, as all choice models, assumes that the response variable is determined by the explanatory variables, while the explanatory variables are decided by external factors. It also assumes that the relation between the response variable and the explanatory variables is ambiguous, resulting in the dispersion of the observations around the functional relationship (Greene, 2011). The logistic regression uses the maximum likelihood method for estimation which is robust to the non-normally distributed standard errors stemming from the binary nature of the response variable (Chatterjee and Hadi, 2012).

The general logistic regression function follows below, with  $\pi$  being the probability that  $Y = 1$  when  $X = x$ :

$$\pi = \Pr(Y = 1 | X = x) = \frac{e^{\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p}}{1 + e^{\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p}}$$

By specifying the model for our regression and linearizing the function using the so called logit transformation we reach the final full regression model:

$$\begin{aligned} \ln\left(\frac{\pi_i}{1 - \pi_i}\right) = & \alpha_0 + \beta_{i,1} \times \text{IPO}_i + \beta_{i,2} \times \text{AQ}_i + \beta_{i,3} \times \text{Venture}_i + \beta_{i,4} \times \text{BOS}_i + \beta_{i,5} \\ & \times \text{BOM}_i + \beta_{i,6} \times \text{BOL}_i + \beta_{i,7} \times \text{Duration}_i + \beta_{i,8} \times \text{CAP}_i + \beta_{i,9} \times \text{MTB}_i \\ & + \beta_{i,10} \times \text{BTech}_i + \beta_{i,11} \times \text{TEC}_i + \beta_{i,12} \times \text{Tech} * \text{IPO}_i + \beta_{i,13} \times \text{SYN}_i \\ & + \beta_{i,14} \times \text{DIST}_i + \gamma_{i,1} + \gamma_{i,2} + \varepsilon_i \end{aligned}$$

Where:

- (i)  $\pi$  = The probability of a full exit,
- (ii)  $\alpha_0$  = The intercept,
- (iii) IPO = Dummy variable indicating IPO,
- (iv) AQ = Dummy variable indicating acquisition,
- (v) Venture = Dummy variable indicating early/expansion stage investment,
- (vi) BOS = Dummy variable indicating small-cap buyout stage investment,
- (vii) BOM = Dummy variable indicating mid-cap buyout stage investment,
- (viii) BOL = Dummy variable indicating large-cap buyout stage investment,
- (ix) Duration = Investment duration in years for the selling PE firm,
- (x) CAP = Change in capital available over the year the vendor,
- (xi) MTB = Market-to-book ratio for the portfolio company,
- (xii) TEC = Dummy variable indicating if the target is a high-tech firm,
- (xiii) BTE = Dummy variable indicating if the target is a biotech firm,
- (xiv) Tech\*IPO = Interaction variable between technology firms and IPO,
- (xv) SYN = Dummy variable indicating if the transaction is syndicated,
- (xvi) DIST = Dummy variable indicating if it is a distant investment,
- (xvii)  $\gamma_{i,1}$  = Time and fixed effects,
- (xviii)  $\gamma_{i,2}$  = Vendor country fixed effects and
- (xix)  $\varepsilon_i$  = The error term of the regression.

To determine the appropriateness of the right-hand side variables Akaike's information criterion (AIC) is used. The process involves defining a series of models with different specifications. Next, the AIC value for each model is calculated and the models are ranked from best to worst where the preferred model has the lowest AIC value.

### **5.2.2 Subsample Estimates Segregated by Time-periods, Development Stages, and Countries**

To test the robustness of the model and to investigate whether differences exist in the determinants of partial exit between different groups of observations, a number of subsample regressions are carried out. Because of smaller sample sizes, some explanatory variables are excluded in order to avoid problems of perfect collinearity. The issue of smaller sample sizes when doing maximum likelihood estimations was studied by Hart and Clark (1999) who found that despite smaller sample sizes there was little or no problem with type 1 errors. This ensures that the statistical validity of the subsample regressions is still strong even if the subsamples contain fewer observations than the full sample estimates.

Spliid (2013) described the years of 2000-2007 as the boom period of Nordic PE where especially the amount of LBOs saw a sharp increase. The subsequent period was marked by the financial crisis which brought smaller deal sizes, stricter credit conditions and poorer access to new investor capital (Spliid, 2013; EVCA, 2014). To test the model's robustness and investigate potential differences between the periods, we run two separate regressions; the first only with observations recorded during the boom years of 2002-2007 and the second only with observation from the period of the financial crises of 2008-2012.

As mentioned above, this study applies a broad definition of PE, spanning from earlier stage investment (often defined as venture capital) to later stage investments (often defined as buyouts). As the rationale for investing in early stage companies differs from the rationale for investing in late stage companies (Bertoni, Ferrer and Martí 2013) we run two separate regressions, one with only early stage (seed and venture) investments included and one with only late stage (buyouts) investments included.

Compared to the other Nordic countries, the Swedish PE industry has seen a higher level of activity since the years of its founding (EVCA, 2014). During these last years, just short of two thirds of the total PE investments have been made by Swedish PE firms (Ibid.). To test the robustness of the model and further investigate any regional differences, two separate

regressions are carried out, one including only exits of Swedish PE firms and one including only exits of PE firms from the other three countries included in the full sample.

### 5.3 Concerns over Endogeneity and Collinearity

The portfolio companies' market to book ratios are used to estimate the effect of the firms' expected growth rate on the extent of exit. However, the underlying reason for a PE firm to partially exit a portfolio company is to achieve a higher exit value. As the estimated effect of an explanatory variable on a response variable is inconsistent when that explanatory variable is determined simultaneously with the response variable (Murray, 2006) the market to book ratio might therefore suffer from endogeneity if a partial exit leads to a different full exit value. In order to statistically test for the presence of endogeneity in the market to book ratio we follow the instrumental variable procedure provided by Foster (1997).

In the case of endogeneity, the bias lies in the market value of equity ( $M$ ) of the company rather than the book value of equity ( $B$ ) which stays unaffected by the exit value. Therefore, we first regress the market value on a number of instrumental variables, using an ordinary least squares regression. Finding appropriate instrumental variables is difficult, as most variables usually used to instrument deal size such as industry of the target company, age of the firm, type of deal and year of the deal has a high likelihood of being correlated to the extent of exit. The variables that can be used without risk are the number of employees working at the portfolio firm at the year of the exit, the net income of the year previous to the transaction and the geographic location of the portfolio firm. The number of employees and net income of the portfolio company have a low probability of being determinants of the extent of the exit and any regional differences in extents should depend on the country of the vendor rather than the country of the target. However, the as firms' values change over time because of both firm-specific and country-specific factors (Erel, Liao and Weisbach, 2011), the country of the target composes a valid determinant of the deal value. Next, the coefficient estimates from this regression are used to form fitted values for market value,  $\hat{M}$ . The fitted values are subsequently divided by the shareholders' equity at the time of the exit to reach a fitted market to book ratio,  $\widehat{MTB}$ . The original market to book ratio is then substituted by the fitted market to book ratio in the logistic regression to produce an unbiased estimate.

Additionally, we investigate for the presence of collinearity between the right-hand side variables by examining the Variance Inflator Factor (VIF). Our strongest concern regards

collinearity affecting the estimates of the capital availability variable, as this variable is decided on a vendor country and year basis for each observation. As both vendor country and time fixed-effects are included in the regression model there might be a problem of strong correlation between the fixed effects variables and the capital availability variable. Also, the VIF will reveal if any other variables are strongly interrelated.

## **5.4 Limitations of Methodology**

All PE firms organize their investments by setting up funds with a limited life span, usually between 10 and 12 years from inception (Naidech, 2011; Sahlman, 1990). When the end of the PE fund's investment horizon is reached, all remaining holdings must be exited in order to return the capital contributions to the PE firm's investors (also called limited partners) in a liquid form. As a partial exit implies that a part of the investment is retained in its illiquid form, it should therefore be impossible to make a partial exit when the fund's life has come to an end. Potentially, this is a factor that could distort our dataset as the sample would include investments fully exited that would have been only partially exited unless the fund had reached its termination date. We call this the "fire sale" problem which means that the PE fund is forced to sell an investment to a lower value than it would have been able to do if it were able to partially retain the investment for a longer period of time. A fire sale is therefore an inferior form of exit as it does not maximize the potential value of the investment. However, we expect the occurrence of fire sales to be rare for a number of reasons. The first is that the contract between the PE managers and the limited partners of all PE funds include provisions to extend the life of the funds when necessary, to provide the PE firm more time to liquidate the fund's remaining investments in an orderly manner (Naidech, 2011; Sahlman, 1990). The second is that PE firms are often contractually prohibited to make reinvestments of capital harvested from old investments, after a period of a few years from the funds' inception (Naidech, 2011; Gompers and Lerner, 2004). This prevents investment from being made too late in the funds life, thereby mitigating the risk of a forced fire sale. Ideally, to control for the occurrence of fire sales, the remaining time of the fund's life would be included in the data of this study. But since information regarding the length of PE funds' lives is almost always proprietary and not accessible to others than the limited partners of the fund, we have no possibility of incorporating this variable into our study.

## 6 Results and Analysis

In this section we provide the results of the logistic regressions and evaluate the hypotheses formulated above. We also analyze how our findings relate to the results of previous studies. Initially, we present and discuss the results of the full sample estimates, followed by the different subsample estimates. Next, we assess the results of the instrumental variable regression and investigate the presence of collinearity.

### 6.1 Full Sample Estimates

Table 5 presents the logistic full sample estimates for the effect of factors influencing the decision to partially exit an investment. As all partial exits are noted with the value “0” and all full exits “1”, significant negative coefficients indicate a greater likelihood of a partial exit while significant positive coefficients indicate a greater likelihood of a full exit. When interpreting the categorical variables, their coefficient must be considered in comparison to the reference variable of each category.

Using Akaike’s information criteria (AIC) we find that the optimal model fit is achieved by substituting the three size specific buyout variables (indicating small-cap buyout, mid-cap buyout and large-cap buyout) with a single buyout variable, independent of the buyout’s firm size. Also, the variable for distant investment is excluded as AIC indicated a stronger model fit without the variable (the variable also showed to be insignificant in the full sample estimates). The steps of fitting the model using AIC, with corresponding tables, are presented in the appendix.

When testing the overall model for how well the observations fit, we receive a concordance index (percentage of correctly classified observations) of 88%. This indicates a strong classification rate, but the result should be treated with caution as the model is fitted on the same data sample used to test the performance of the model (Efron, 1982). Additionally, the regression model has a high r-square (0.51) and show a statistically significant p-value (0.004) for the G-test. The p-values reported are all two sided significance tests. The regression is carried out with robust standard errors to correct for the occurrence of heteroskedasticity since this had a distinct impact on the estimated standard errors.

The coefficients of the IPO and acquisition exit variables should be interpreted in comparison to secondary sales, which is the reference variable of the category. No conclusion regarding

whether IPOs are more or less likely to be exited partially can be drawn. This is probably a consequence of the low number of IPO exits included in the sample. It could also be a result of how the variable is defined, recording all exits where the PE firm sells the shares within 1.5 years of the IPO date as full. As the escrow periods are decided on a contractual rather than a regulatory basis, the spread of different escrow periods is likely to distort the variable. However, the results show, in line with our hypothesis, that acquisition exits are a significant predictor for increasing the probability of a full exit at the 5% significance level. This is consistent with the fact that buyers involved in an acquisition often possess a high level of competency within the portfolio company's area of business as well as a stronger position to gain access to inside information regarding the portfolio company.

Further, we hypothesized for the development stage when invested, *ce teris paribus*, that an earlier stage investment would give rise to a higher degree of information asymmetry. Thus, we expected a negative sign for the seed and venture stages and a positive sign for the buyout stage. In line with our hypothesis, we observe that venture stage investments increase the likelihood of a partial exit (significant at the 10% level). However, buyout investments also have a negative sign, significant at the 10% level. The reason for this can probably be attributed to the reference variable, seed investments. As 7 out of 8 seed investments are full exits, the coefficients of the other investment stage variables are likely to be affected negatively as these investment stages show a lower fraction of full exits in comparison to seed investments.



*Table 5. Full sample logistic estimates of the extent of exits*

	Coefficient	z-Statistic	p-Value <sup>a</sup>
Constant	2.463	1.219	0.223
IPO	0.709	0.425	0.671
Acquisition exit	3.974	2.553	0.011
Venture stage	-3.431	-1.688	0.091
Buyout stage	-2.848	-1.716	0.086
Duration	0.296	2.415	0.016
Capital availability	0.709	2.128	0.033
Market/book	-0.164	-2.171	0.030
High-tech	2.119	2.013	0.044
Biotech	-2.229	-1.247	0.212
IPO*Tech	-1.791	-0.761	0.447
Syndication	-1.671	-1.434	0.152

<sup>a</sup>Two-sided test

As PE firms are specialized in mitigating information asymmetry between the managers of the firm and outside investors (Sahlman, 1990) we predicted that a longer investment duration would decrease the need for making a partial exit. The results are in support this proposition, having a positive coefficient for the variable, statistically significant at the 5% level. These results contrast to Cumming and MacIntosh (2003) who found no evidence for this hypothesis. However, the results are in line with the two more recent studies of Cumming and Walz (2010) and Félix et al. (2009) who both observed a positive relationship between the duration of the investment and the probability of a full exit.

We hypothesized that an increase in capital available to the PE firms would increase the likelihood of a partial exit, expecting a negative sign of the coefficient. However, the results have a positive coefficient, significant on the 5% level. A reason for this could be the fact that PE firms are affected by economies of scale when investing, meaning that the cost of maintaining an investment is not proportionate to size of the holding (Cumming and MacIntosh, 2003). Thus, the remaining part of a partial exit will take up a disproportionate amount of resources from the PE firm compared to before the partial disposal. This will give the PE firm incitements to dispose its investments fully when their managers monitoring abilities are under constraint and new investments are to be made. The effect of this would be opposite to the effect of increased information asymmetry due to shorter investment durations.

The positive coefficient of the variable hence indicates that the former effect is stronger than the latter.

A higher market to book ratio was hypothesized to indicate higher growth, hence enhancing the uncertainty about the future profitability of the portfolio company. Therefore we expected a negative sign for the coefficient as a partial exit would mitigate the uncertainty stemming from the higher expected growth rate. The results support this hypothesis, significant on the 5% level. This is consistent with Cumming and MacIntosh's (2003) findings, although they could only show a significant result on the 10% level, for their Canadian subsample.

Companies in the high-tech and biotech industries are characterized as difficult to value; hence we hypothesized these firms to have a higher likelihood of being partially exited. The coefficient for high-tech firms is significant at the 5% level, although it does not have the expected sign. The explanation for this could be that the Nordic region has a high fraction of investors specializing in high-tech firms. Therefore, the investors' high level of competency within the high-tech firms' area of business would mitigate the information asymmetries, making a partial exit unnecessary. The coefficient for biotech firms has a negative sign but is insignificant. Furthermore, we believed that the informational asymmetries would be enhanced in the case of a high-tech firm undergoing an IPO exit, increasing the need for a partial exit. Therefore we expected the interaction variable to have a negative sign. However, this hypothesis is not confirmed as the variable proves to be insignificant, even if it has the expected sign.

Further, the results do not demonstrate that firms backed by a PE-syndication lower information asymmetries, as is hypothesized. The variable has a negative coefficient, which is surprising as a syndicated investment should signal that the portfolio company has undergone multiple due diligence processes. However, this result is in line with Cumming and Walz (2010) who also found a negative coefficient for the variable. This puts the certifying effect of syndicated investments up to question.

Finally, some of the control variables are significant in the way that we expected. The portfolio company has a higher probability of being partially exited if the PE firm is Norwegian. This is not surprising as the Norwegian PE managers are likely to be less experienced compared to the Swedish PE managers. Also, we observe that the exit extents are affected by annual cyclicalities and market timing effects as for example partial exits are more

likely in 2003 and less likely in 2002. The full sample estimate including control variables can be found in the appendix.

## **6.2 Subsample Estimates**

As mentioned above, some of the right-hand side variables have to be excluded in the subsample regressions in order to avoid problems of perfect collinearity. However, we are able to include the Distant Investment variable for the seed/venture and buyout subsample regressions. All the regressions have a fairly high r-square, ranging from a low of 0.25 for the sample containing Norwegian, Danish and Finnish vendors to 0.49 for the subsample of early stage investments, and show statistically significant p-values for the G-test (values can be found in the appendix).

### **6.2.1 Boom and Financial Crisis Years**

Table 6 presents the logistic estimates for the subsamples only including observations during the boom years of Nordic PE (2002-2007) and the years of the financial crisis (2008-2012), respectively. During the boom years, IPOs are significantly predicting a higher probability for a full exit. This is consistent with the findings of Gompers and Lerner (2004) who found that PE firms tend to exit their investments through an IPO more quickly during times of favorable market conditions. Also, this confirms that the higher amount of publicity surrounding IPOs during periods of strong market performance lowers the degree of information asymmetry as the investors have the chance to become more informed about the portfolio company (Bergström et al., 2006).

Acquisition exits are more likely to be exited fully during both the boom and financial crisis years. The duration variable is not significant for either of the periods, but has the expected sign. The variable for increases in capital availability has differently signed coefficients during the boom years and financial crisis years. During the boom years the coefficient is significantly negative, indicating that increases of capital available to the PE firms increase the extent of partial exits. This is in line with the hypothesis but contradicts the results of the full sample estimates. During the financial crisis years the coefficient of capital availability is positive, however insignificant. This may indicate that the variable has different effects, depending on the market conditions. In periods of large increases of capital available, as during the boom years, the need for partial exits to mitigate premature divestment seems to be the strongest. During periods of smaller increases or even decreases, as during the years of the

financial crisis, full exits seem preferred to not lose the economies of scale that larger investments bring.

The market to book variable has the expected sign during both periods but is only significant during the boom years. As market to book ratios usually are elevated during periods of strong market performance (Hess, Kretzmann, Maaz and Pucker, 2012) the value of signaling the true quality of the company through a partial exits might be higher. The high-tech variable is insignificant during both periods. However, the results show that biotech companies are more likely to be exited partially during boom years. Lastly, the syndication variable is insignificant and has differently signed coefficients during the periods.

*Table 7. Logistic estimates of the extent of exits during boom years and financial crisis years*

	Private Equity Boom Years			Financial Crisis Years		
	Coefficient	z-Statistic	p-Value <sup>a</sup>	Coefficient	z-Statistic	p-Value <sup>a</sup>
Constant	1.101	1.626	0.104	-6.603	-1.339	0.181
IPO	3.058	2.316	0.021	N/A <sup>b</sup>	N/A <sup>b</sup>	N/A <sup>b</sup>
Acquisition exit	4.350	2.215	0.027	7.176	2.188	0.029
Duration	0.009	0.099	0.921	0.735	1.431	0.152
Capital availability	-0.307	-1.695	0.090	0.193	0.706	0.480
Market/book	-0.129	-2.551	0.011	-0.050	-0.799	0.424
High-tech	0.212	0.300	0.764	0.862	0.488	0.626
Biotech	-3.577	-2.774	0.006	2.267	1.244	0.213
Syndication	-2.344	-1.228	0.219	3.677	0.964	0.335

<sup>a</sup>Two-sided test

<sup>b</sup>Variable excluded to avoid collinearity problems. Similarly, variables not shown excluded to avoid collinearity problems

## 6.2.2 Early Stage Firms and Late Stage Firms

Table 7 provides the logistic estimates for the subsamples only including seed/venture (early stage) firms and buyout (late stage) firms respectively. The IPO variable is omitted for early stage investments due to collinearity and the variable is insignificant for late stage firms. Acquisition exits has the expected positive sign for both type of firms but is significant only for late stage firms. This is in line with the recent trend where secondary buyouts have become more frequent. In the case of secondary buyouts, the buyer is highly sophisticated and often possesses a strong skill set to further enhance the portfolio company's operations (Sousa, 2010).

Duration has the expected sign for both groups of companies but is only significant for early stage firms. An explanation for this could be that the PE managers' ability to mitigate the information asymmetry with time has a stronger effect for seed and venture stage companies than for companies in the buyout stage. The capital availability variable has differing signs of the coefficients for the groups, none of them significant. Early stage firms have a higher likelihood of being exited partially if they are biotech firms or have a high market to book value. The corresponding late stage estimates are not significant, even if they have the expected sign. The variable for high-tech firms is significant on the 10% level for late stage firms, but however shows the opposite sign to what was hypothesized. The interaction variable between IPO and technology is omitted due to collinearity for the early stage group. Although it has the expected sign for the late stage estimate, the variable is insignificant.

The syndication variable is significant for late stage firms; however it does not have the expected sign. As mentioned above, this is in line with the findings of Cumming and Walz (2010). Lastly, we hypothesized that firms located more distantly from the seller would be marked with a higher degree of information asymmetry as firm performance correlates to the proximity of the owner (Cumming and Dai, 2010). However, for the early stage estimate, the distant investment variable predicts a higher likelihood of a full exit. We have no explanation for this puzzling result.

The regression model has a distinctively higher explanatory value for early stage investments than for late stage investments, with pseudo r-square values of 0.31 and 0.49, respectively. This indicates that our theoretical framework achieves a better fit for seed and venture stage investments than for buyout investments. The reason for this could be that firms in earlier stages are more marked by high levels of information asymmetry than later stage investments, thereby increasing the value of partial exits as a signal of quality overall.

*Table 8. Logistic estimates of the extent of exits for seed/venture and buyout stage firms*

	Seed/Venture Stage Firms			Buyout stage Stage Firms		
	Coefficient	z-Statistic	p-Value <sup>a</sup>	Coefficient	z-Statistic	p-Value <sup>a</sup>
Constant	1.623	0.907	0.364	-0.875	-0.896	0.370
IPO	N/A <sup>b</sup>	N/A <sup>b</sup>	N/A <sup>b</sup>	0.585	0.486	0.627
Acquisition exit	2.083	1.271	0.204	4.341	2.813	0.005
Duration	0.358	1.754	0.079	0.210	1.436	0.151
Capital availability	0.070	1.466	0.143	-0.039	-0.484	0.628
Market/book	-0.189	-2.439	0.015	-0.041	-0.567	0.571
High-tech	-1.120	-0.786	0.432	1.284	1.664	0.096
Biotech	-4.016	-2.473	0.013	-0.753	-0.799	0.424
IPO*Tech	N/A <sup>b</sup>	N/A <sup>b</sup>	N/A <sup>b</sup>	-0.441	-0.289	0.772
Syndication	1.361	1.110	0.267	-2.834	-2.014	0.044
Cross-border	3.968	2.896	0.004	0.555	0.614	0.539

<sup>a</sup>Two-sided test

<sup>b</sup>Variable excluded to avoid collinearity problems. Similarly, variables not shown excluded to avoid collinearity problems

### 6.2.3 Sweden and Norway/Denmark/Finland

Table 8 presents the logistic estimates for the subsamples only including observations with a Swedish vendor and a Norwegian, Danish or Finnish vendor, respectively. For the Swedish estimate, the IPO variable has the expected sign but is not significant. The variable is omitted due to collinearity for the other countries. The coefficients of both the Swedish subsample and the other country subsample support the hypothesis of acquisition exits leading to a lower likelihood of partial exits. Similarly the market to book ratio variable is significant for both groups, indicating that partial exits are more likely the higher the market/book value of the investee firm. None of the other variables are significant, although many of them have the expected sign in both countries, i.e. duration and biotech. Overall, there seem to be small differences between the two groups regarding the outcome of the estimations, supporting our hypothesis that the Nordic countries are fairly homogeneous in terms of regulatory and economic environment.

*Table 9. Logistic estimates of the extent of exits in Sweden and Norway/Denmark/Finland*

	Sweden			Norway, Denmark and Finland		
	Coefficient	z-Statistic	p-Value <sup>a</sup>	Coefficient	z-Statistic	p-Value <sup>a</sup>
Constant	0.344	0.437	0.662	0.708	0.232	0.816
IPO	1.684	0.773	0.439	N/A <sup>b</sup>	N/A <sup>b</sup>	N/A <sup>b</sup>
Acquisition exit	3.830	2.451	0.014	2.730	3.113	0.002
Venture stage	0.034	0.039	0.969	0.630	0.231	0.817
Buyout stage	N/A <sup>b</sup>	N/A <sup>b</sup>	N/A <sup>b</sup>	-0.774	-0.264	0.792
Duration	0.097	0.970	0.332	0.034	0.308	0.758
Capital availability	-0.117	-0.883	0.377	0.087	1.413	0.158
Market/book	-0.153	-2.375	0.018	-0.106	-1.670	0.095
High-tech	1.019	1.295	0.195	-0.079	-0.073	0.942
Biotech	-0.811	-0.931	0.352	-1.246	-0.653	0.514
IPO*Tech	-1.149	-0.488	0.626	N/A <sup>b</sup>	N/A <sup>b</sup>	N/A <sup>b</sup>
Syndication	-1.139	-1.006	0.315	-0.442	-0.291	0.771

<sup>a</sup>Two-sided test.

<sup>b</sup>Variable excluded to avoid collinearity problems. Similarly, variables not shown excluded to avoid collinearity problems

### 6.3 Additional Analyses and Robustness Checks

As mentioned above, one of our main concerns regarding the methodology is that the market to book variable, or more precisely the deal size, might suffer from an endogeneity bias if a partial exits leads to a different full exit value. To test for this we instrumented the deal value using three exogenous variables: the number of employees the year of the exit, the net income the year previous to the exit and the country of the portfolio company. The R-squared from this regression is reasonably high at 0.55 (the OLS estimates can be found in the appendix). The instrumental variable logistic estimate for the full sample is presented in the appendix. The results are similar to the results of the original full sample estimate. The only difference is that the capital availability variable is not significant anymore while the biotech variable turns significant on the 10% level. Given the lack of robustness in the subsample regressions, it is not surprising that the capital available variable does not sustain its significance. The market to book variable is still significant at the 5% level. The instrumental variable regression provides strong evidence that endogeneity has not affected the logistic coefficient estimates of the full sample. Additionally, the Concordance Index stays largely unaffected at 86% as well as the R-squared which has a value of 0.51.

The variance inflator factor (VIF) is used to test for collinearity among the right-hand side variables. Our concern regarding the capital availability variable is unwarranted as it returns a low value of 1.58 which does not indicate any presence of collinearity. However, the Buyout variable proves to be collinear as it returned a VIF value (11.38) greater than 10. To examine the effects of this the Buyout variable is substituted by the Seed variable, thereby setting the Buyout variable as reference for the development stage variables. This does not change the results of the regression. The VIF value of the Seed variable does not indicate any collinearity (1.27). We also examine the effect of excluding all development stage variables. This does not change either the significance levels or coefficients of the other variables.

## **7 Conclusion**

When exiting their investments, PE firms can either make a full or partial exit. The former implies disposing of the whole stake in the portfolio company while the latter means that a part of the stake is retained. The purpose of this thesis was to analyze whether a higher degree of information asymmetry between the selling PE firm and the buyer increases the likelihood of a partial exit, in order to signal the investment's quality. Our research was based on Cumming and MacIntosh (2003) and examined Nordic data from the period 2002-2012. Consequently the data was analyzed using a logistic regression model with the extent of exit as a dependent variable and various proxies for information asymmetry as independent variables. We also analyzed a number of subsamples to test the robustness of the model and to further investigate potential differences between different groups of observations in our data.

The thesis contributes to the current state of knowledge in a number of ways. Firstly, it extends the understanding of the Nordic PE market which despite its prominence has seen little research describing and analyzing its underlying mechanisms. Secondly, it validates the results of Cumming and MacIntosh (2003) and extends their research by including factors as syndication and geographical proximity in the analysis.

Generally, we found evidence supportive of that a higher degree of information asymmetry between the selling PE firm and the buyer increases the likelihood of a partial exit. Moreover, we were able to show significant results for several proxies hypothesized to be important factors in increasing, or diminishing, information asymmetry upon exit. A variable significantly increasing the likelihood of a PE firm making a partial exit was the market to book ratio, implying that a higher expected growth of the company amplifies the uncertainty



and level of information asymmetry. The test for endogeneity in the market to book value did not indicate any presence of such effects.

Acquisition exit and longer investment duration are found to reduce the degree of information asymmetry and enhances the probability of the PE firm making a full exit of its investment. Our findings regarding changes in capital availability are somewhat contradictory, indicating that an increase in capital availability may have two opposite effects on the likelihood of making a partial exit.

Further, we found indications of differences between the subsamples regarding the determinants of partial exits even if several of the significant variables of the full sample estimates proved to be robust. During the boom years, the more favorable market condition increased the probability of making a full exit through an IPO. Also the elevated market to book values enforced the need for partial exits compared to the subsequent period of the financial crisis where market valuations were lower. We also found indications of that the theoretical framework achieved a better fit for seed and venture stage investments than for buyout investments. Lastly, we observed no differences regarding the determinants for a partial exit between Sweden and the other Nordic countries included. However, the full sample estimates showed that partial exits were more likely in Norway compared to Sweden, probably caused by the lower degree of experience of the Norwegian PE managers.

Further research regarding the certifying effects of syndication could be needed as our results indicated, contradictory to our hypothesis, that syndication of an investment increases the probability of a partial exit. Another interesting area for future research would be to further investigate how the differing rationales for early stage and late stage investments affect the determinants of partial exits.

## Appendix

*Table 10. Descriptive statistics separated by vendor country*

Vendor country	Number of portfolio companies	Extent of exit		Average market to book value	Average investment duration	Bio-tech	Other high-tech	Syndicated investment	Cross-border transaction
		Full	Partial						
Denmark	12	9	3	5.96	6.72	0	4	3	1
Finland	12	10	2	7.36	5.60	0	5	5	5
Norway	22	9	13	10.04	4.20	5	9	1	0
Sweden	92	69	23	6.96	5.26	10	27	13	18
<b>Total</b>	<b>138</b>	<b>97</b>	<b>41</b>	<b>7.40</b>	<b>5.25</b>	<b>15</b>	<b>45</b>	<b>22</b>	<b>24</b>

*Table 11. Full sample estimates of the extent of exits including control variables*

	Coefficient	z-Statistic	p-Value <sup>a</sup>
Constant	2.463	1.219	0.223
IPO	0.709	0.425	0.671
Acquisition exit	3.974	2.553	0.011
Venture stage	-3.431	-1.688	0.091
Buyout stage	-2.848	-1.716	0.086
Duration	0.296	2.415	0.016
Capital availability	0.709	2.128	0.033
Market/book	-0.164	-2.171	0.030
High-tech	2.119	2.013	0.044
Bio-tech	-2.229	-1.247	0.212
IPO*Tech	-1.791	-0.761	0.447
Syndication	-1.671	-1.434	0.152
Danish vendor	-1.364	-1.126	0.260
Finnish vendor	1.853	1.256	0.209
Norwegian vendor	-1.602	-1.984	0.047
2002	3.355	2.158	0.031
2003	-5.601	-2.872	0.004
2004	-1.436	-1.030	0.303
2005	0.151	0.126	0.900
2006	-1.893	-1.128	0.259
2007	2.326	1.348	0.178
2008	-0.457	-0.190	0.849
2010	-1.458	-1.028	0.304
2011	2.488	1.009	0.313

<sup>a</sup>Two-sided test.

*Table 12. AIC variable selection process, step 1*

Model	ll (null)	ll (model)	df	AIC
Full model	-82.15543	-39.36977	27	132.7395
Exit vehicles excluded	-82.15543	-49.48901	25	148.9780
Development stages excluded	-82.15543	-41.92576	23	129.8515
Size-specific buyout stages excluded	-82.15543	-39.91806	25	129.8361
Duration excluded	-82.15543	-42.23768	26	136.4754
Capital available excluded	-82.15543	-44.77565	26	141.5513
Market/book excluded	-82.15543	-43.26096	26	138.5219
All tech variables excluded	-82.15543	-45.99327	24	139.9865
Syndication excluded	-82.15543	-40.38737	26	132.7747
Distant investment excluded	-82.15543	-39.53503	26	131.0701
Vendor country dummies excluded	-82.15543	-43.30926	24	134.6185
Time fixed effects excluded	-82.24631	-53.07579	18	142.1516

*Table 13. AIC variable selection process, Step 2*

Model	ll (null)	ll (model)	df	AIC
Full model	-82.15543	-39.91806	25	129.8361
Exit vehicles excluded	-82.15543	-51.02523	23	148.0505
Development stages excluded	-82.15543	-41.92576	23	129.8515
Duration excluded	-82.15543	-42.50986	24	133.0197
Capital available excluded	-82.15543	-44.79098	24	137.5820
Market/book excluded	-82.15543	-43.83893	24	135.6779
All tech variables excluded	-82.15543	-46.02010	22	136.0402
Syndication excluded	-82.15543	-41.25084	24	130.5017
Distant investment excluded	-82.15543	-39.98944	24	127.9789
Vendor country dummies excluded	-82.15543	-43.31508	22	130.6302
Time fixed effects excluded	-82.24631	-53.69103	16	139.3821

*Table 14. AIC variable selection process, Step 3*

Model	ll (null)	ll (model)	df	AIC
Full model	-82.15543	-39.98944	24	127.9789
Exit vehicles excluded	-82.15543	-51.10316	22	146.2063
Development stages excluded	-82.15543	-42.05283	22	128.1057
Duration excluded	-82.15543	-42.67417	23	131.3483
Capital available excluded	-82.15543	-44.89131	23	135.7826
Market/book excluded	-82.15543	-43.91960	23	133.8392
All tech variables excluded	-82.15543	-46.02023	21	134.0405
Syndication excluded	-82.15543	-41.36735	23	128.7347
Vendor country dummies excluded	-82.15543	-43.65881	21	129.3176
Time fixed effects excluded	-82.24631	-53.75096	15	137.5019

*Table 15. G-tests and R-square for subsample estimates*

	G test	R-square
Financial crisis years	0.025	0.49
Boom years	0.027	0.37
Buyouts	0.038	0.31
Ventures	0.052	0.49
Swedish vendor	0.037	0.33
Danish/Finnish/Norwegian vendor	0.000	0.25

*Table 16. Linear instrumental variable regression estimate*

	Coefficient	z-Statistic	p-Value <sup>a</sup>
Constant	126900.300	3.277	0.001
Employees	23.087	1.607	0.110
Net Income	11.066	2.294	0.023
Danish target	187562.200	1.159	0.249
Finnish target	-78807.840	-1.450	0.150
Norwegian target	-43162.590	-0.639	0.524

<sup>a</sup>Two-sided test.

*Table 17. Full sample logistic estimates of the extent of exits with instrumental variable*

	Coefficient	z-Statistic	p-Value <sup>a</sup>
Constant	6.554	2.075	0.038
IPO	-0.628	-0.604	0.546
Acquisition exit	3.219	3.208	0.001
Venture stage	-8.160	-2.134	0.033
Buyout stage	-7.011	-2.415	0.016
Duration	0.176	1.662	0.097
Capital availability	0.535	1.289	0.198
Market/book-hat	-0.069	-2.160	0.031
High-tech	2.047	1.643	0.100
Biotech	-4.046	-1.727	0.084
IPO*Tech	-0.521	-0.328	0.743
Syndication	-1.117	-0.977	0.328

<sup>a</sup>Two-sided test

*Table 18. Variance inflator factor (VIF)*

Variable	VIF	Variable	VIF
Buyout	11.38	High-tech	2.26
Venture	6.29	Biotech	2.20
Duration	5.17	2011	2.11
2006	3.47	2002	2.02
Market/book	3.24	2008	1.90
2005	3.20	2003	1.62
2010	3.15	Norwegian vendor	1.60
2004	2.92	Capital availability	1.58
Acquisition exit	2.92	Syndication	1.51
2007	2.79	Finnish vendor	1.48
IPO	2.67	Danish vendor	1.39
IPO*Tech	2.42		

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