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Home is wherever your private equity firm takes you

A qualitative analysis comparing cross-border and domestic transaction multiples in private equity acquisitions within the Nordics*

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ABSTRACT

<i>Title:</i>	Home is wherever your private equity firm takes you - <i>A qualitative analysis comparing cross-border and domestic*¹ transaction multiples in PE acquisitions of Nordic companies</i>
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<i>Key words:</i>	Private Equity, Buyouts, Cross-Border, Valuation, Nordic market, Liability of foreignness, M&A Waves
<i>Research question:</i>	Are valuations (measured by EV/Revenue) achieved in cross-border PE acquisitions of Nordic companies, significantly larger than those achieved in domestic* transactions? Is the multiple larger during M&A waves or larger with geographic distance?
<i>Purpose:</i>	This study aims to analyse potential disparities in the valuation multiple (EV/Revenue) when Nordic companies are acquired by PE firms in cross-border acquisitions compared to domestic* acquisitions, considering the influence of information asymmetries. Additionally, it aims to investigate variations in these multiples during periods of increased M&A activity and in correlation with the geographical distance between the capital cities of the involved countries
<i>Methodology:</i>	The study employs a quantitative analysis using a deductive approach, conducting multiple regression on secondary data from Orbis. It investigates relationships between variables based on 206 acquisitions from 2003-01-01, to 2022-12-31.
<i>Theoretical perspectives:</i>	The theoretical framework includes acquisition and uncertainty perception theories, drawing on prior research on cross-border transactions, M&A waves, and the Nordic market.
<i>Results:</i>	The findings reveal a significant correlation between cross-border transactions and EV/Revenue multiple, whereas no such relationship is observed for M&A waves or geographical distance.
<i>Conclusions:</i>	In conclusion, this study confirms that cross-border transactions yield, on average, 81.5 percent larger EV/Revenue multiples compared to transactions within the Nordics, however, cross-border transactions inherently lead to elevated valuation multiples due to factors like information asymmetry.

¹ In this study domestic* is defined as being within the Nordic region (Sweden, Norway, Denmark, Finland and Iceland)

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TABLE OF CONTENTS

1 INTRODUCTION	4
2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW	7
2.1 Conceptualization of PE firm	7
2.2 Conceptualization of M&A	7
2.2.1 Theories about cross-border vs domestic (Liability of Foreignness)	7
2.2.2 Information asymmetry and adverse selection	8
2.2.3 M&A Waves	9
2.3 The Nordic PE Market	11
2.4 Literature Review	12
2.4.1 Cross-border vs domestic acquisitions	12
2.4.2 M&A waves	15
2.4.3 PE Buyouts in the Nordics	16
2.5 Hypothesis	17
3 DATA AND METHODOLOGY	18
3.1 Method Selection	18
3.2 Data Collection	18
3.3 Data adjustments	21
3.4 Multivariate Analysis	21
3.4.1 Regression Specification	22
3.4.2 Dependent variable	25
3.4.3 Explanatory variables	26
4 EMPIRICAL RESULTS	29
4.1 Descriptive Statistic	29
4.2 Regression Results	32
4.3 Robustness test	34
5 ANALYSIS AND DISCUSSION	37
5.1 EV/Revenue multiple achieved in acquisitions	37
5.2 Cross-Border acquisitions during M&A waves	40
5.3 Geographic distance in cross-border acquisitions	42
5.4 Other Significant Variables	43
6 CONCLUSION	45
6.1 Food for thought	46
REFERENCE LIST	47
APPENDIX	54
Appendix 1: EV/Revenue and Deal Value against Normal Curve	54
Appendix 2: Logarithm of EV/Revenue and Deal Value against normal curve	55
Appendix 3: Fixed Effects Years	56
Appendix 4: Fixed Effects Industry	57

1 INTRODUCTION

Mergers and Acquisitions (M&A) have been prominent in corporate history since the early 1900s, when the first distinct wave of M&A transactions began (The Boston Consulting Group, 2007). Private Equity (PE) firms, which first emerged in 1946, play a pivotal role in the M&A market, acquiring controlling stakes in companies to implement operational and strategic changes to maximise value (Kaplan & Strömberg, 2009). Over time, PE involvement in mergers and acquisitions has increased, with PE firms accounting for a notable percentage of total M&A transactions (Baker et al., 2015). Despite the upward trend in M&A, activity fluctuates cyclically, characterised by distinct waves identified since the inception of M&A (The Boston Consulting Group, 2007). Bouwman et al. (2009) and Duchin and Schmidt (2013) explored the valuation effect of M&A waves and found that M&A activity during periods of high economic activity (booms) is associated with lower returns, and value can even be destroyed during these times.

While the market for M&A is ever expanding, the dynamics of the economy are creating an interesting environment for PE firms. Globalisation is enabling a more interconnected world, which is contributing to more cross-border acquisitions taking place. In light of these observations, the question of how valuable such acquisitions are compared to domestic ones arises. Hammer et al. (2021) found that cross-border transaction multiples were significantly larger than domestic ones using a world-wide sample between 1997 and 2010. This suggests that cross-border acquisitions come at a higher cost for acquirers and are associated with an informational disadvantage. Hammer et al. (2021) further states that the valuation multiples are lower if the target company has previously been public or has local partners. In other words, factors that increase accessibility to information about the firm, on average, decrease the transaction values. Alternatively, the likelihood of completing an acquisition where the bidders have overshot the intrinsic value of the firm, is lower.

Beyond the measurable accounting and economics, the extent of information asymmetry depends on the ability of the potential acquirer to understand the culture, customs and intangibles that make the business exactly what it is. Naturally, a good understanding of the business as a whole is much more difficult if the potential acquirer is far away from the company in question. The Economist (2013, p.9) proclaimed the Nordic Model to be the

“next supermodel”, highlighting its transparency. The Nordic Model has characteristics of high economic and social value that have been praised globally. The PE market in the Nordics is known to be of high quality and has been perceived to outperform the broader European market (Stepstone Group, 2024). The research that has previously been done, such as that by Hammer et al. (2021) and Buchner et al. (2018), could therefore have less relevance to the Nordic market, considering its distinction to the rest of the world. For Nordic companies looking to sell, an understanding of who the most valuable acquirer would be is critical in the transaction decision making.

The purpose of this study is to analyse potential disparities in the valuation multiple (EV/Revenue) when Nordic companies are acquired by PE firms in cross-border acquisitions compared to domestic* acquisitions, considering the influence of information asymmetries. Additionally, it aims to investigate variations in these multiples during periods of increased M&A activity and in correlation with the geographical distance between the capital cities of the involved countries. The study seeks to answer the following question:

Are valuations (measured by EV/ Revenue) achieved in cross-border PE acquisitions of Nordic companies, significantly larger than those achieved in domestic acquisitions? Is it larger during M&A waves or larger with the geographic distance?*

The research conducted by Hammer et al. (2021) underscores a global trend: cross-border acquisitions are associated with 25-37 percent higher EV/Revenue multiples compared to domestic acquisitions. However, empirical evidence regarding the disparities in valuation multiples (EV/Revenue) achieved in cross-border buyouts by PE firms versus domestic ones is scant, especially concerning Nordic samples. Rose et al. (2018) contend that the Nordic region displays somewhat distinct M&A characteristics compared to markets in the United States (US), Great Britain (GB), and Europe overall, making it an intriguing area for investigation. Previous studies by Hammer et al. (2021) and Buchner et al. (2018) have limitations, notably their focus on the period from 1997 to 2010. As posited by Moura (2023), the PE market has steadily expanded in the last decade, underscoring the importance of examining data post-2010 and considering factors like the interconnectedness of the Nordic countries. Significant societal and economic shifts, particularly the surge in globalisation, have occurred since the conclusion of these studies, potentially impacting various relevant factors. Hence, it is imperative to analyse more recent data to obtain a comprehensive

understanding of the subject matter. Notably, previous studies on PE firms have overlooked the consideration of M&A waves and geographical distance, highlighting the need to address these gaps. Analysing the valuations achieved in cross-border buyouts by PE firms compared to domestic buyouts in this region could provide valuable insights, significantly advancing the understanding of the field.

To address the research question, cross-sectional data spanning from January 1, 2003, to December 31, 2022, is utilised, exclusively focusing on target companies from the Nordic region, including Sweden, Denmark, Finland, Norway, and Iceland. The sample comprises 206 data points, which are subjected to analysis through eight different multilinear regression models. The primary finding indicates that the EV/Revenue multiple tends to be larger in cross-border acquisitions compared to domestic* ones. However, no statistically significant results are observed regarding the timing of acquisitions within M&A waves or the impact of geographical distance.

In this section and going forward, **domestic*** is defined as acquisitions that take place within the Nordic region (comprising Sweden, Norway, Denmark, Finland and Iceland), not necessarily within the same country. It is also important to note that a larger valuation multiple would imply a more expensive acquisition for the PE firm and a more valuable transaction for the acquired company, meaning that the informational asymmetries would benefit the target.

The paper proceeds as follows: Section two outlines the theoretical framework, hypotheses, and previous literature. Section three explains the methodology, including data collection and analysis techniques. Section four presents empirical findings and diagnostic tests within the theoretical framework. Section five analyses and discusses the results, connecting them to existing literature. Finally, section six concludes by summarising key findings, discussing implications, and suggesting future research paths.

2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Conceptualization of PE firm

The broader business model of PE firms revolves around identifying undervalued investment opportunities and targeting companies with significant growth potential. To make these investments, PE firms raise capital from various large investors to invest in equity positions in companies. One type of investment strategy for PE firms is buyouts, which entail a group of investors acquiring a company from its current owners. This acquisition is typically financed through funds from a PE firm and loans from banks (Baker et al., 2015). Another type of PE acquisition is a going-private transaction whereby it acquires 100 percent ownership of a public company and transitions it into a privately held entity. Leveraging previously committed capital, PE funds can invest in projects and companies with promising returns, particularly in challenging market conditions where raising capital may be difficult. This enables them to capitalise on opportunities that may not be readily accessible to other investors (Gaughan, 2017).

Private equity firms navigate through various challenges and opportunities within the investment landscape, resulting in cyclical patterns of private equity activity (Kaplan & Strömberg, 2009). The financial crisis of 2007–2008 and subsequent sovereign debt crises significantly impacted the number of PE acquisitions. There was a sharp decline in deal volumes, and PE investors faced restricted access to financing. However, PE activity began to rebound in 2012, supported by measures taken by central banks in the US and Europe to stimulate credit and stock markets. Favourable market conditions persisted in 2013, enabling PE investors to return record amounts of cash to their investors and complete more acquisitions (Baker et al., 2015).

2.2 Conceptualization of M&A

2.2.1 Theories about cross-border vs domestic (Liability of Foreignness)

Conceptually, the rationale for cross-border M&A mirrors that of domestic M&A. Both are driven by the belief that acquiring another entity will enhance value or utility, as perceived by the acquiring firm's managers (Erel et al., 2012). DePamphilis (2022), for example, states

arguments for international expansion including industrial diversification, leveraging intangible assets, tax considerations, and overcoming market entry barriers. Another argument for cross-border M&A is economies of scale that can be achieved more easily by selling offshore. Firms may consider selling to emerging markets because lower costs there attract firms aiming to reduce expenses and improve competitiveness, despite potential challenges with worker productivity (DePamphilis, 2022).

Stulz (2005) found that the target's country plays the most important role in determining the level of capital flow, even more so than its industry, and points out that more developed and richer countries are involved in more M&A transactions. In a similar vein, Erel et al. (2012) found that specific country-level factors, like currency appreciation and macroeconomic performance, play a crucial role in making M&A significantly more attractive to the acquiring company. Evidently, the odds of acquiring a firm in a nearby country are substantially higher than the odds of acquiring a firm in a country further away (Erel et al. 2012).

The research by Stulz (2005) demonstrates its findings using a hypothetical world where the only frictions are explicit costs such as taxes. In this world, financial globalisation is always beneficial to both parties according to neoclassical theories. The argument is that the total welfare created by the acquisition is sufficiently large because barriers to capital flow are broken down when risks are shared better. In reality, of course, the result may change when friction is added back to this hypothetical world.

2.2.2 Information asymmetry and adverse selection

Information asymmetries, in the context of M&A transactions, is a phenomenon where parties have unequal access to information and results in one party possessing more detailed or more valuable information than the other (Corporate Finance Institute, n.d. a).

Adverse selection is a consequence of information asymmetry in which the participant is unable to distinguish between projects with different credit risks (Bebczuk, 2003). A widely cited theory by Akerlof (1970) called 'The market for Lemons' addresses the adverse selection caused by Information Asymmetries in the market for used cars. He explores this market, where buyers do not have access to the same information about the used cars as sellers and therefore cannot determine their true quality. This results in a situation where the

market equilibrium cannot be reached - where sellers are unwilling to sell cars for a price reflecting their true, intrinsic value and buyers cannot determine this true value of the car, due to information asymmetry. This relation between quality and uncertainty can cause the market to collapse (Akerlof, 1970). Although the author's theory focuses specifically on the market for used cars, it can be applied to other markets equally.

In most M&A transactions, a core issue arises from two features related to adverse selection: the acquirer's inability to value the target firm correctly and the requirement to agree on a price. There are certain safeguards in place in a sales process, such as a thorough due diligence process and information sharing to get an idea of the quality. However, ultimately, there remains a certain level of difficulty in credibly portraying the value of a firm when the seller is incentivised to inflate quality and the buyer does not have access to the same level of information to make their own assessment (Akerlof, 1970). In the same fashion as in the Market for Lemons, this adverse selection may cause inherently valuable deals to fall through because the bidder's estimate of the company value is below what the seller thinks the firm is worth. If the prospective seller instead overshoot the valuation, the seller would accept the offer, even if the acquirer then ends up overpaying (Reuer, 2005).

Another concept related to adverse selection is known as the winner's curse problem. As outlined by Varaiya and Ferris (1987), when multiple bidders compete for a takeover target, the winning bidder tends to be one that overestimates the target's intrinsic value. This tendency can lead to subsequent returns being less positive or even negative (Varaiya & Ferris, 1987).

2.2.3 M&A Waves

The concept of merging with, or acquiring another company, has officially been around since the early 1900s. In line with the economy, M&A activity is cyclical. At times of political and economic unrest or downturn, acquirers are less active. Around 1991, 2002 and 2010, for example, the market saw troughs in M&A volume following the respective recessions. These downturns take years to recover (PricewaterhouseCoopers, n.d.). The Boston Consulting Group (2007), released a report in 2007 which has become widely known, and which identifies six distinct waves in the history of M&A. These waves are typically precipitated by a mix of economic, regulatory, and technological shifts. The Boston Consulting Group (2007) states that each wave had distinct characteristics and outcomes. At the beginning of the

1900s, there was a first surge of market consolidation, making up the first wave (The Boston Consulting Group, 2007). More recent waves have been driven by the internet bubble around 2000 and a trend of industry consolidation around 2006 due to the subprime mortgage crisis facilitated by globalisation. While historically concentrated in the US, this trend of waves has now expanded globally, with Europe and Asia also experiencing heightened participation, particularly during the sixth wave (Gaughan, 2017).

A merger wave is defined as “a sequence of time periods (two or more) in which the probability of a merger occurring is above the unconditional expected probability of a merger” (Rhodes-Kropf & Viswanathan, 2004, p.2706). *Figure 1*, published by the imaa-institute (n.d), shows that a wave began in the early 1990s, and one in 2004. The Boston Consulting Group (2007) report was released in 2007 and specifically identified six distinct waves up to that point. According to Berk and DeMarzo (2023) the sixth wave was kick started in 2004 and there have been ups and downs in M&A activity as shown in *Figure 1*. Berk and DeMarzo (2023) argue that this wave ended in the Global Financial Crisis in 2008, but then picked up again in 2015. This was followed by another slow down due to Covid-19 and it picked up again in 2021, to then continue until 2022. Although there have been peaks and troughs following the 2004 wave, the wave simply slowed down during the Global Financial Crisis and the Covid-19 pandemic, but they do not characterise these ups and downs as being their own distinct waves (Berk & DeMarzo, 2023).

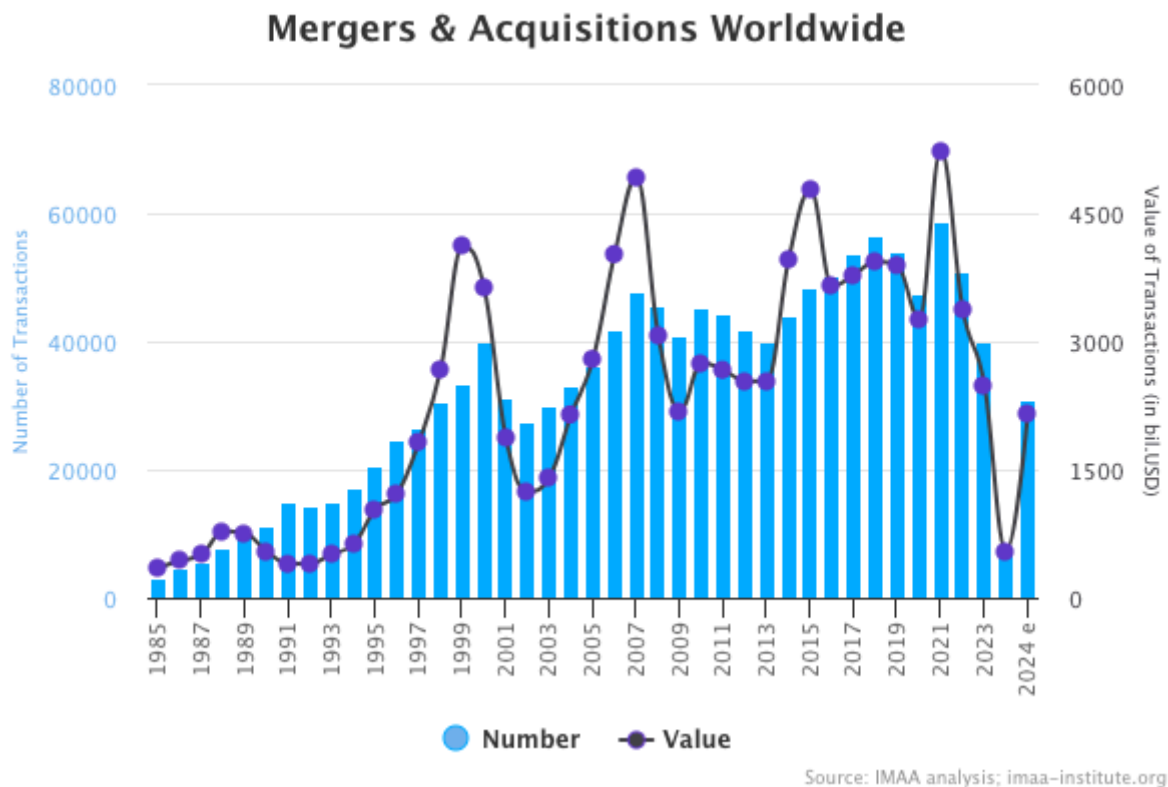


Figure 1: Mergers and Acquisitions Worldwide (imaa-institute, n.d)

Both the number of acquisitions and transaction multiples are influenced by the state of the economy. During economic downturns, financing becomes more expensive and less accessible, leading to a decrease in M&A activity and affecting deal pricing. This is because credit markets tighten, increasing borrowing costs and limiting the availability of funds for acquisitions. Consequently, companies may become more cautious in pursuing mergers and acquisitions, impacting both the volume and valuations in acquisitions. Lower availability of financing can lead to reduced competition for deals, often resulting in lower transaction multiples and valuations (PricewaterhouseCoopers, n.d.).

2.3 The Nordic PE Market

The PE deals activity in the Nordics has steadily increased in the past ten years, from an estimated €26.3 billion worth of acquisitions completed in 2012 and an estimated €1,103 billion in 2022. Sweden, with a higher gross domestic product (GDP) than the other Nordic countries, has maintained the largest share of the Nordic PE market in the past decade. However, the entire region has seen substantial PE activity. The majority of PE deals fall

within the range of €100-500 million. Interestingly, there has been a notable absence of deals below €25 million or above €1 billion, indicating a concentration in mid-sized acquisitions (Moura, 2023).

The Covid-19 pandemic in 2022 brought about significant shifts in the dynamics of the PE industry, particularly impacting leveraged buyouts (LBOs). The subsequent rise in interest rates made debt more expensive, further affecting investment strategies and deal structures in the region (Moura, 2023). Despite a decrease in the number of funds closed in 2022, totaling only ten compared to 31 in the previous year, the amount of capital raised remained substantial at €15.6 billion. This amount represents almost a third of Europe's overall fundraising volume, underscoring the significance of the Nordic market in the PE landscape (Moura, 2023).

The resilience and growth trajectory of the Nordic PE market highlight its importance as a key driver of investment activity in Europe. Moving forward, the region is likely to continue attracting attention from both domestic and international investors, further solidifying its position in the global PE market (Stepstone Group, 2024).

2.4 Literature Review

2.4.1 Cross-border vs domestic acquisitions

Information asymmetries are a major reason acquirers tend to experience lower benefits from acquisitions than targets (Humphery-Jenner et al., 2017). In cross-border acquisitions, according to a study from Hammer et al. (2021), the effect of information asymmetries is more severe, as international acquirers tend to have even less direct access to information about the firm, compared to those who operate in the same region due to both geographical and cultural distance. This more severe disadvantage implies that the value of cross-border acquisitions tends to be lower when compared to domestic ones. Zaheer (1995) refers to the 'Liability of Foreignness' and suggests this stems from at least four different factors, the relative influence of which is industry dependent. These factors are, firstly, the geographical distance leading to measurable costs like travel, secondly, firm-specific costs arising from lack of operations in and knowledge of the location, thirdly, intrinsic costs to the target country relating to issues such as nationalism and lack of legitimacy in selling to a foreign

acquirer and, lastly, costs connected to the target country, like legal restrictions and regulations (Zaheer, 1995).

There have been several studies to prove this, including one completed in 2017 with a focus on GB (Adedeji et al., 2017). This study found that cross-border acquisitions were significantly less profitable to bidders during the late 1990s and the early 2000s. Another study by Moeller et al. (2005) was done on the US market, whereby stock and operating measures were used to determine how cross-border acquisitions from the perspective of US acquirers differed when compared to domestic ones. Again, it was found that US bidders who acquired cross-border targets experience both significantly lower announcement returns and operating performance than those who make domestic acquisitions (Moeller et al., 2005).

Hammer et al. (2021) explored valuation multiples of 1149 global PE acquisitions and found that those in cross-border acquisitions were significantly larger when compared to domestic ones. In other words, the target was compensated more for each Euro of revenue and the acquirer benefitted less financially. Again, the study concluded that this spread is due to information asymmetries in cross-border acquisitions because certain characteristics of the target company, which provide more information to the acquirer, reduce the spread in valuation multiples between cross-border and domestic acquisitions. For example, if the acquired company was previously public, the difference in valuation multiple was lower. Moreover, Hammer et al. (2021) suggest that local partnering, where foreign PE firms join with a domestic PE firm in a syndicate, mitigates informational disadvantages. They found that cross-border buyouts with local partners have lower valuation multiples than purely domestic buyouts, indicating synergies between the domestic firm's local knowledge and the foreign firm's international experience, which increases transparency and reduces valuation disparities. These factors increase the transparency of the firm, helping to reduce valuation disparities (Hammer et al., 2021).

An important nuance that Achleitner et al. (2011) noted in their study, which may influence these factors, is that the relative size effects of the target firm are further valuation drivers. Achleitner et al. (2011) state that the absolute and relative performance measures of the firm are influenced by size. This means that, even if information asymmetries are not directly influenced by the size of the firm, other performance measures are. Because firms are valued

based on these performance measures by potential acquirers, the valuations may be indirectly influenced by the size of the firm.

When PE firms invest overseas, there are more complications associated with pricing. Without local connections, they may encounter more difficulties in finding affordable opportunities. Cultural and geographical differences also lead to information gaps, making it harder to assess target values accurately. This increases the risk of overpaying, especially if foreign market risks are not considered. Lastly, lacking expertise in specific countries or industries may weaken their negotiation power, making it harder to secure favourable prices (Hammer et al., 2021).

Another study by Buchner et al. (2018) highlights the underperformance of cross-border venture capital (VC) investments relative to equivalent domestic acquisitions in terms of deal-level returns. It examined 6529 investments worldwide during 1971–2009 and found that cross-border investments significantly underperform compared to equivalent domestic investments. VC firms usually pursue cross-border buyouts when they have a strong history in their home market but struggle to find enough suitable targets there. Foreign firms may also confront the challenge of accepting higher prices, leading to reduced returns, as a consequence of limited investment opportunities in their saturated home markets (Buchner et al., 2018).

On the other hand, Albuquerque et al. (2019) found that cross-border M&A activity in an industry generates positive firm valuation spillovers to other local firms operating in the same industry as the target. It highlights that product market competition and differences in investor protection are important conditions for these valuation spillovers to occur. Moreover, a study of PE-firms provided by Humphery-Jenner et al. (2017) observed that cross-border acquisitions face challenges due to information asymmetries. However, the presence of prior experience and connections in the target market from previous deals by the PE firm is viewed favourably, potentially mitigating some of these challenges (Humphery-Jenner et al., 2017).

These previous studies concerning information asymmetries spark some interesting questions. The logical conclusion of information asymmetries would be that acquirers in cross-border acquisitions tend to put forward less accurate company valuations, while acquirers in domestic acquisitions are more likely to get it right. This is simply because of the deeper

level of understanding the domestic acquirers have, resulting in a ‘Liability of Foreignness’ (Buchner et al., 2018). Building on this, it would make sense that cross-border acquisitions are generally either as expensive, or more expensive than their domestic counterparts. This conclusion is derived from the assumption that targets, who have the most information about their value out of everyone, will not accept valuations below what they believe their intrinsic value is. Domestic acquirers, who do not have the same amount of information as the targets themselves, but more than international acquirers do, would make bids that are roughly in the right ballpark. Cross-border acquirers, who have the least access to information, however, might make bids that are far too low or far too high as well as some that are about right. The targets will disregard those that are far too low and, assuming their key objective is value maximisation, accept the highest offers. This concept is the classic winner’s curse, which states that the winning bid is likely to exceed the intrinsic value of the firm (Varaiya & Ferris, 1987).

2.4.2 M&A waves

There have been multiple studies on merger waves and the potential causes of these, though not many considering M&A transactions made by PE firms specifically. Schleifer and Vishny (1989) found that there is a trend of managers using entrenchment techniques to make themselves more valuable to shareholders, which reduces the likelihood of takeover. Building on this, Garfinkel and Hankins (2011) found that the size of merger waves is associated with risk management decisions made by firms. Noting that vertical integrations are an effective tool for risk management, the study found a clustering of vertical integrations within merger waves and that there is a positive association with the number of these and merger waves. Bouwman et al. (2009) mentions the abundance of research into M&A activity around booms and busts of the economy and further examines the quality of these transactions. Both this study by Bouwman et al. (2009) and Duchin and Schmidt (2013) found that M&A activity during high economic activity (booms) are associated with lower returns and value can even be destroyed during these times. Bouwman et al. (2009) specifically found that announcement returns for acquirers are higher during boom periods, but that long run returns are lower. Duchin and Schmidt (2013) confirm with their study that the average long run returns of mergers completed during such periods are worse. Contrary to these findings, Xu (2017) identified within-wave deals as exhibiting superior post-merger operating performance compared to outside-wave deals. This suggests that later mergers within a wave

benefit shareholders due to reduced information asymmetry, potentially facilitated by learning from peers. Additionally, Xu (2017) highlights differing behaviours among firms during merger waves. Smaller and younger firms tend to act more aggressively to survive, while larger and older firms, possessing greater market power, are less inclined to take significant risks early in a wave (Xu, 2017).

2.4.3 PE Buyouts in the Nordics

In accordance with Westerholm (2006), this study views the Nordic region as a single market due to the Swedish, Finnish, and Danish markets merging into the OMX-integrated markets. OMX-integrated markets are a consolidation of these countries' exchanges and a division of Nasdaq. This integration has led to the convergence of institutional features, distinguishing them from continental markets (Westerholm, 2006). Alongside this, the concept of private equity has significantly established itself in the Nordic region. Sweden is recognized as a leading country in the private equity industry, with only GB surpassing it in international presence relative to GDP (Næss-Schmidt et al., 2017). However, there is little research about PE buyouts of Nordic firms specifically. Spliid (2013) highlights that PE firms in the Nordic region have grown in recent years, attracting more international investors than previously. He argues, however, that Nordic PE firms are more restricted when compared to their US counterparts, with less access to fundraising and tighter government controls to reduce tax advantages in the industry. This could imply that, from the Nordic PEs' point of view, the ability to pay high valuation multiples could be limited. It could therefore be the case that Nordic PE firms are simply not able to pay the same high valuation multiples that their American counterparts can offer (Spliid, 2013).

2.5 Hypothesis

Hypothesis (1):

H₁: Cross-border PE acquisitions are associated with larger EV/Revenue multiples than domestic buyouts due to informational disadvantages of foreign acquirers.*

This thesis explores whether cross-border private equity acquisitions of Nordic companies are associated with larger EV/Revenue multiples compared to domestic* acquisitions, due to the informational disadvantages faced by foreign acquirers. Prior research indicates that information asymmetries are more pronounced in cross-border acquisitions, potentially leading to larger valuations as foreign acquirers compensate for their informational deficits.

Hypothesis (2):

H₂: The EV/Revenue multiple is larger during M&A waves.

Several studies have examined merger waves and their causes, noting trends such as managers using entrenchment techniques and risk management decisions to influence deal flow. Most of the research cited earlier indicates that M&A activity during economic booms is associated with lower long-term returns, meaning larger multiples.

Hypothesis (3):

H₃: A larger geographical distance between the capital cities of the target's and acquirer's countries is associated with a larger EV/Revenue multiple.

Geographical distance complicates cross-border acquisitions, making it harder for acquirers to conduct thorough due diligence and understand the nuances of the target's country. This challenge may result in larger EV/Revenue multiples as a way to navigate the complexities of distant markets.

3 DATA AND METHODOLOGY

3.1 Method Selection

This study aims to investigate potential disparities in the valuation multiple (EV/Revenue) when Nordic companies are acquired by PE firms in cross-border acquisitions compared to domestic* acquisitions, considering the influence of information asymmetries. Additionally, it aims to investigate variations in these multiples during periods of increased M&A activity and in correlation with the geographical distance between the capital cities of the involved countries. For the study a sample from 2003-01-01 to 2022-12-31 will be used. The research design adopted is a cross-sectional study with secondary data from 206 acquisitions collected for testing and analysis through multivariate regression.

3.2 Data Collection

In order to extract a relevant and reliable sample set from the database Orbis managed by Bureau Van Dijk's, several search criteria were applied to the database. These search criteria are explained further below.

1. The deal is labelled "Completed".
2. The acquisition was completed between 1st of January 2003, and 31st of December 2022.
3. The target company must be located within the Nordic region, including Sweden, Denmark, Finland, Norway or Iceland.
4. The deal type must be either management buy-in, management buyout or institutional buyout.
5. The deal must have a known Modelled Enterprise Value.

This period is chosen to ensure a comprehensive range of data without delving too far back, which could introduce incomplete data and lead to more significant dropouts. Additionally, this timeframe encompasses the period before the sixth M&A wave and the fluctuations during the sixth M&A wave, allowing us to address the hypothesis regarding the potential influence of time on cross-border acquisition valuations. Data for the year 2023 is not

included because there is incomplete information regarding the first fiscal year revenue available at the time of the study (beginning of 2024).

The target company can have any ownership type. Both publicly traded and privately held firms are considered to ensure a diverse sample size. The target firm must be located in one of the Nordic countries as defined in the search criteria above. If the target firm has operations in multiple countries, it must have headquarters in a Nordic country to be included in the sample. Previous studies by Hammer et al. (2021) and Buchner et al. (2018) have explored similar sample sets, but with no geographic restriction for the target firm. This study seeks to investigate if the findings hold true specifically for targets within the Nordic countries. Acquirers considered in this study are selected with no geographic restrictions and can be located anywhere around the world.

In line with the study by Hammer et al. (2021), the deal type must be either management buy-in, management buyout or institutional buyout, and the deal must have a known Modelled Enterprise Value to be able to calculate the EV/Revenue multiple. This metric is explained further in *Section 3.4.2* below.

The initial screening revealed 356 acquisitions meeting the specified criteria. Despite applying the filter for "a known modelled enterprise value". Despite these criteria, the search function returned 58 acquisitions that did not have this information available on Orbis, resulting in a sample of 298. The number of acquisitions is therefore smaller than originally expected. This raises concerns about the reliability of the EV/Revenue values that were exported into the Excel file from the Orbis database. To eliminate this concern, a comparison of each EV/Revenue data point in the exported Excel file is made against the Orbis source directly.

Of these 298 data points, 104 had missing data on EV/Revenue due to unavailable revenue information. In these cases, Revenue data for the first fiscal year of the target company is manually gathered from Orbis. Using this manual approach, 42 of these 104 missing data points could be added back in, while 62 companies still lack this information. The 62 entries removed due to missing EV/Revenue information are dispersed across years and acquirer countries. Consequently, removing these entries does not significantly alter the dispersion within the overall sample. A further 16 acquisitions have blank values in the "deal financing"

column, implying no involvement from PE firms. Following the approach of Hammer et al. (2021), pure management buyouts without PE deal financing are excluded from the sample. Finally, there were 22 data points that were buy and builds, where a target was partially acquired by a (group of) PE firm(s) initially and the same acquirers purchased more shares of this firm later on. This means there were multiple transactions involving the same target and the same acquirers. In these cases, the transactions were combined and a weighted average of the EV/Revenue multiple is taken. The multiples are weighted by the ownership stake acquired in the relevant transaction. The 22 data points were reduced to 8. Consequently, the final sample comprises 206 acquisitions.

In the final sample of 206 acquisitions, 146 are domestic*, and 60 are cross-border. This is a similar fraction to that found by Hammer et al. (2021). Following the methodology outlined by Hammer et al. (2021), if a transaction involves more than one acquirer, it is classified as domestic* or cross-border according to the country of the lead acquirer. Specifically, if the lead acquirer is from a cross-border country, the transaction is categorised as cross-border, and if it is from a domestic* country, it is classified as domestic*.

After these adjustments and with these search criteria applied, the authors consider the sample, despite the mentioned dropouts, to provide a representative picture of the population. Because the dropouts are not considered to be systematic in nature, a random selection is assumed.

To ensure completeness, the dataset is checked against results gathered from the same search strategy applied to CapitalIQ. CapitalIQ contains both fewer relevant acquisitions and less accurate information about these transactions, when compared to Orbis. The data points are compared using two different methods. Firstly, summary statistics are used to compare the overall structure of the datasets, such as total number of acquisitions available in each and the available data for each transaction. Secondly, spot checks are done to compare certain acquisitions both between the databases and against information provided by trustworthy news outlets online. Orbis consistently proves to be the most complete and most accurate.

3.3 Data adjustments

A number of adjustments are made to ensure the required assumptions for Ordinary Least Squares are met, as well as to linearise the data and to remove outliers.

A number of outliers were detected in a high-level analysis of the data set. For example, a multiple of 2,448.49 which is clearly an extreme value, as well as some other large multiples that contributed to a prominent right skew of the data. This can be seen in *Appendix 1*. To address such outliers and the skew, and to linearize the data, the dependent variable is transformed using a natural logarithm. A natural logarithm transformation of the acquisition multiple removes the strong right skew. *Appendix 2* shows the histogram of the log transformed dependent variable after the log transformation is applied. The distribution closely resembles a normal distribution, endorsing the suitability of a linear regression model.

Similar to the EV/Revenue variable, the independent variable *Deal Value* included some extreme values, shown in *Appendix 1*. Consequently, it is also logarithmically transformed to mitigate the skewness in the variable (see *Appendix 2*).

3.4 Multivariate Analysis

Building upon the prior work of Hammer et al. (2021) and Buchner (2018), this study adopts a multivariate analysis approach.

Additionally, fixed effects are incorporated into the model for *Year* and *Industry*. By including fixed effects in the model, differences in the intercept or baseline level of the dependent variable across different units can be controlled for, while still allowing the coefficients of the independent variables to vary. This mitigates bias from omitted variables and unobserved heterogeneity, making the estimates more reliable and avoiding multicollinearity issues. To capture the relationship between the variables, the study uses three interaction terms, namely one between *Lead Acquirer CB dummy* and *Wave*, one between *Lead Acquirer CB dummy* and *Geographic Distance* and lastly one between *Lead Acquirer CB dummy* and *Nordic partner*.

3.4.1 Regression Specification

To evaluate the relationship between cross-border acquisitions and EV/Revenue, eight different regression models are considered. The regressions are specified below, with a table, *Table 1*, defining the variables beneath these.

Regression Model 1:

$$LN(EV/Revenue)_i = \alpha_0 + \beta_1 \text{Lead Acquirer CB dummy}_i + \gamma_t \text{Year FE}_i \\ + \delta_k \text{Industry Target FE}_i + \varepsilon_i$$

Regression Model 2a:

$$LN(EV/Revenue)_i = \alpha_0 + \beta_1 \text{Lead Acquirer CB dummy}_i + \beta_2 \text{Acq1}_i + \beta_3 \text{MBO / MBI}_i \\ + \beta_4 LN(\text{Deal Value})_i + \gamma_t \text{Year FE}_i \\ + \delta_k \text{Industry Target FE}_i + \varepsilon_i$$

Regression Model 2b:

$$LN(EV/Revenue)_i = \alpha_0 + \beta_1 \text{Lead Acquirer CB dummy}_i + \beta_2 \text{Acq1}_i + \beta_3 \text{MBO / MBI}_i \\ + \beta_4 LN(\text{Deal Value})_i + \beta_5 \text{Nordic Partner}_i + \\ + \beta_6 \text{Lead Acquirer CB dummy} * \text{Nordic Partner}_i \\ + \gamma_t \text{Year FE}_i + \delta_k \text{Industry Target FE}_i + \varepsilon_i$$

Regression Model 3a:

$$LN(EV/Revenue)_i = \alpha_0 + \beta_1 \text{Lead Acquirer CB dummy}_i + \beta_2 \text{Acq1}_i + \beta_3 \text{MBO / MBI}_i \\ + \beta_4 LN(\text{Deal Value})_i + \beta_5 \text{Wave} + \\ + \gamma_t \text{Year FE}_i + \delta_k \text{Industry Target FE}_i + \varepsilon_i$$

Regression Model 3b:

$$LN(EV/Revenue)_i = \alpha_0 + \beta_1 \text{Lead Acquirer CB dummy}_i + \beta_2 \text{Acq1} + \beta_3 \text{MBO / MBI}_i \\ + \beta_4 LN(\text{Deal Value})_i + \beta_5 \text{Wave}_i + \varepsilon_i$$

Regression Model 3c:

$$\begin{aligned}
LN(EV/Revenue)_i = & \alpha_0 + \beta_1 \text{Lead Acquirer CB dummy}_i + \beta_2 \text{Acq1}_i + \beta_3 \text{MBO / MBI}_i + \\
& + \beta_4 LN(Deal Value)_i + \beta_5 \text{Wave}_i + \\
& + \beta_6 \text{Lead Acquire CB Dummy} * \text{Wave}_i + \gamma_t \text{Year FE}_i + \\
& + \delta_k \text{Industry Target FE}_i + \varepsilon_i
\end{aligned}$$

Regression Model 4a:

$$\begin{aligned}
LN(EV/Revenue)_i = & \alpha_0 + \beta_1 \text{Lead Acquirer CB dummy}_i + \beta_2 \text{Acq1}_i + \beta_3 \text{MBO / MBI}_i + \\
& + \beta_4 LN(Deal Value)_i + \beta_5 \text{Geographic Distance}_i + \\
& + \beta_6 \text{Lead Acquirer CB Dummy} * \text{Geographic Distance}_i + \\
& + \gamma_t \text{Year FE}_i + \delta_k \text{Industry Target FE}_i + \varepsilon_i
\end{aligned}$$

Regression Model 4b:

$$\begin{aligned}
LN(EV/Revenue)_i = & \alpha_0 + \beta_1 \text{Lead Acquirer CB dummy}_i + \beta_2 \text{Acq1}_i + \beta_3 \text{MBO / MBI}_i + \\
& + \beta_4 LN(Deal Value)_i + \beta_5 \text{Geographic Distance}_i + \\
& + \beta_6 \text{Lead Acquirer CB Dummy} * \text{Geographic Distance}_i + \varepsilon_i
\end{aligned}$$

Variable	Description
Lead Acquire CB dummy <i>Source</i>	A dummy to indicate whether the transaction is domestic or cross-border. <i>Orbis</i>
Acq1 <i>Source</i>	A dummy to indicate whether there are multiple acquirers. <i>Orbis</i>
MBO / MBI <i>Source</i>	A dummy to indicate if the transaction is a Management Buyout (MBO) or Management Buy-In (MBI). <i>Orbis</i>
LN (Deal Value) <i>Source</i>	The natural logarithm of the deal value. <i>Orbis</i>
Nordic Partner <i>Source</i>	A dummy to Indicate the presence of a Nordic acquirer in transactions with multiple acquirers. <i>Orbis</i>
Lead Acquire CB Dummy * Nordic Partner <i>Source</i>	An interaction term to indicate, if the transaction is cross-border, whether there is a non-lead Nordic partner involved. <i>Orbis</i>
Wave <i>Source</i>	A dummy to indicate if the acquisition is made within a M&A wave. <i>Berk and DeMarzo (2023)</i>
Lead Acquire CB Dummy * Wave <i>Source</i>	An interaction term to indicate, if the transaction is cross-border, whether it completed during an M&A wave. <i>Berk and DeMarzo (2023), Orbis</i>
Geographic Distance <i>Source</i>	The geographic distance between capital cities of the target country and the country of the lead acquirer (in km) <i>Distance.to (n.d)</i>
Lead Acquire CB Dummy * Geographic Distance <i>Source</i>	An interaction term to indicate, if the acquisition is cross-border, what the geographical distance between the capital city of the target country and the capital city of the lead acquirer is. <i>Distance.to (n.d), Orbis</i>
Year # <i>Source</i>	A dummy to indicate if the transaction completed in the relevant year (there are twenty dummies for year) <i>Orbis</i>
Industry target # <i>Source</i>	A dummy to indicate the industry of the target (there are six dummies for industry) <i>Orbis</i>

Table 1: Variable Definitions

3.4.2 Dependent variable

The valuation multiple (EV/Revenue) reflects the amount of money the acquirer is willing to pay for each unit of the target's revenue. Unlike earnings multiples, they are difficult to manipulate and never negative, even for companies in distress. Hence, the revenue multiple is easily compared across different companies and industries, even if accounting standards or the firms' financing decisions differ. Notably, it is a single number and therefore conveys limited information, especially about the expenses of the firm. A company that earns high revenues, but also has high expenses, would effectively have a revenue multiple that portrays a more favourable financial position of the firm (Damodaran, n.d.). For the purposes of valuing different companies across different industries, the revenue multiple is a reliable and fair measurement that is easy to calculate (Corporate Finance Institute, n.d. b).

A study by Achleitner et al. (2011) emphasises the significance of the EBITDA multiple in the PE industry. However, using EV/EBITDA comes with a downside: it often leads to a reduced sample size due to missing information or negative EBITDA figures, which can impact the baseline findings of the current study. Conversely, studies by Hammer et al. (2021) and Arcot et al. (2015) suggest using EV/Revenue multiples. Furthermore, as highlighted by Hammer et al. (2021), utilising EV/Revenue multiples for entry valuations offers distinct advantages. This metric provides consistent availability and reliability, as sales figures - and consequently the multiples derived from them - cannot be negative, making EV/Revenue multiples a dependable and easily accessible valuation tool.

The actual metric extracted from Orbis is called *Post-deal Modelled Enterprise Value multiple on operating revenue/turnover First avail. yr.* The variable used in this study will be formula (1) defined by Moody's Analytics (2023):

$$\text{Post - Deal Multiple} = \frac{\text{Modelled Enterprise Value}}{\text{Operating revenue or turnover}} \quad \text{Formula (1)}$$

Moody's Analytics (2023) defines Modelled Enterprise Value as formula (2):

$$\begin{aligned} &\text{Equity value} + \text{Short term Financial Debts \& Long term Financial debts} - \\ &- \text{Cash \& Cash equivalents} \end{aligned} \quad \text{Formula (2)}$$

For companies where the multiple is not available, the operating revenue or turnover is collected from Orbis for the first fiscal year following the acquisition for the target company.

3.4.3 Explanatory variables

For the study, seven different explanatory variables are used in combination with two fixed effects and three interaction terms, inspired by Hammer et al. (2021). The variables used for the analysis are:

Lead Acquire CB dummy, *Year*, *Industry*, *Acq1*, *MBO/MBI*, *LN(Deal Value)*, *Nordic Partner*, *Lead Acquire CB Dummy*Nordic Partner*, *Wave*, *Lead Acquire CB Dummy*Wave*, *Geographic Distance*, *Lead Acquire CB Dummy*Geographic Distance*.

Firstly, a dummy variable, *Lead Acquire CB dummy*, defines the acquisition type equal to one (1) if the acquisition is cross-border and zero (0) if it is domestic*. If the company was acquired by more than one firm, the acquisition is considered cross-border if the lead acquirer is of a non-domestic* country. This is the same approach taken by Hammer et al. (2021) and Buchner et al. (2018) and is the independent variable.

The remainder of the following variables are the control variables of the study. The variable *Year* (the year in which the acquisition was completed) is included, with fixed effects incorporated as dummy variables for each year, following Hammer et al. (2021) and Xu (2017). This results in the creation of 20 dummy variables, with one reference group, see *Appendix 3*, each representing the unique characteristics of its respective year.

The variable *Industry* refers to the industry of the target company and is used as a fixed effect. The industries are Utilities, Services & Retail, Manufacturing & Construction, Hospitality & Leisure, Financial Services and Other and individual dummy variables are created for each, see *Appendix 4*. This approach aligns with Hammer et al. (2021) and Xu (2017).

A dummy variable, *Acq1*, takes the value of zero (0) if there is only one acquirer involved in the transaction and one (1) if there were multiple acquirers. This approach is consistent with the methodologies outlined in Officer et al. (2010) which argues that acquisitions involving

multiple acquirers are priced significantly lower compared to acquisitions with a single acquirer.

The *Nordic Partner* dummy is defined similarly to Hammer et al. (2021). This variable is one (1) for a cross-border buyout where a foreign lead PE firm partners with a domestic* PE firm in a syndicate, and equals zero (0) otherwise. This means that the cross-border acquisition is supported by a domestic* partner. Hammer et al. (2021) argue that local partnering in a syndicate serves as an effective remedy to avoid adverse pricing effects. To test for this the interaction term *Lead Acquire CB Dummy*Nordic Partner* is used to determine the impact of Nordic partners on cross-border acquisitions.

The dummy variable *MBO/MBI* takes the value of one (1) if the acquisition is a Management Buyout (MBO) or Management Buy-In (MBI), and zero (0) otherwise, indicating institutional buyouts. Notably, only three acquisitions in the sample fall into the MBO/MBI category. Consistent with Hammer et al. (2021), a management dummy variable is included to mitigate the potential influence of private information on the firm's valuation in management buyouts.

LN(Deal Value) represents the disclosed modelled enterprise value of the buyout deal. It is used as a proxy for firm size, a notion supported by Achleitner et al. (2011), who argue that it can impact both the absolute performance and the relative significance of various value drivers in acquisitions. Achleitner et al. (2011) control for the size of the firm by using a natural logarithm of the enterprise value. Because the values in this dataset are also skewed and contain outliers, the same approach is used in this study. The data is sourced from Orbis and the enterprise value is taken to be the deal value upon completion.

A dummy variable *Wave* is also used which aligns with Xu (2017). A dummy is included in the regression, which is one (1) in the years during which there is an M&A wave, and zero (0) when there is not. According to the definition in *section 2.2.3* by Berk and DeMarzo (2023), the following values are assigned to each of the years: One (1) is assigned to the years from 2004-2007, from 2015-2018 and 2021-2022. Zero (0) is assigned to the years from 2008-2014 and 2019-2020. As per *Section 2.2.3*, there were no further distinct waves following the 2004 wave. However, the M&A slowdowns following the Global Financial Crisis and the Covid-19 pandemic are defined as there not being a wave for the purposes of this study. To determine if the dependent variable, EV/Revenue, is larger for cross-border

acquisitions during waves, an interaction variable is constructed, *Lead Acquire CB Dummy*Wave*. This follows Xu's (2017) emphasis on investigating whether value is generated or lost during cross-border merger waves.

Lastly, as per Buchner et al. (2018), this study considers geographic distance, *Geographic Distance*, measured as the distance between the capitals of the acquiring and target companies' countries in kilometres. To ensure a consistent calculation of distance, the website Distance.to (n.d) is used. This is in line with Buchner et al. (2018) suggesting that greater geographic distances lead to lower returns, which would translate to a larger EV/Revenue for the current study. For truly domestic counties, the distance is zero and for all others, including different countries within the Nordics, the distance is more than zero. From this, an interaction term between *Geographic Distance* and the *Lead Acquirer CB dummy* is calculated to examine the impact of distance on cross-border acquisitions. In domestic* acquisitions, both the *Lead Acquire CB dummy* variable and the distance are zero (0). In acquisitions within the Nordics that are not truly domestic, the distance is non-zero, but the *Lead Acquire CB dummy* is zero (0). In cross-border acquisitions, the *Lead Acquire CB dummy* variable is one (1), and the distance is greater than zero. This means that only in the case of cross-border transactions to acquirers outside of the Nordics, the interaction term is non-zero.

4 EMPIRICAL RESULTS

4.1 Descriptive Statistic

Tables 2 to 4 describe the data from three different perspectives. *Table 2* shows the frequency and percentage of acquisitions in each of the twenty years considered. Evidently, the most acquisitions were completed in 2021, 2019, 2017 and 2004, with the bulk of transactions being in the latter part of the study. Overall, the acquisitions are relatively well dispersed across the years, particularly the cross-border acquisitions. The number of acquisitions presented in *Table 2* are also presented as a graph in *Figure 2*.

Transaction year	Total sample		Cross border		Domestic	
	N	%	N	%	N	%
2003	6	3%	1	2%	5	3%
2004	15	7%	3	5%	12	8%
2005	8	4%	2	3%	6	4%
2006	12	6%	4	7%	8	5%
2007	6	3%	1	2%	5	3%
2008	6	3%	1	2%	5	3%
2009	6	3%	2	3%	4	3%
2010	7	3%	2	3%	5	3%
2011	14	7%	4	7%	10	7%
2012	14	7%	6	10%	8	5%
2013	6	3%	2	3%	4	3%
2014	12	6%	4	7%	8	5%
2015	9	4%	1	2%	8	5%
2016	10	5%	4	7%	6	4%
2017	16	8%	6	10%	10	7%
2018	12	6%	3	5%	9	6%
2019	20	10%	7	12%	13	9%
2020	7	3%	1	2%	6	4%
2021	18	9%	5	8%	13	9%
2022	2	1%	1	2%	1	1%
Total	206	100%	60	100%	146	100%

Table 2: Sample distribution by year

The M&A waves shown in *Figure 1* are reflected in the sample distribution by year in *Table 2*. Around 2007 there was a large wave which corresponds approximately with the slight uplift in acquisitions in 2006. Similarly, between 2016 and 2019, both *Figure 1*, *Figure 2* and *Table 2* display a slight uplift in the number of acquisitions. As demonstrated in *Figure 2*, the Nordic acquisitions data has a similar overall wave structure when compared to *Figure 1*. The difference between *Figure 1* and *Figure 2* could be due to the low overall number of

acquisitions in the Nordics in relation to the number of worldwide acquisitions. The peaks and troughs of M&A transactions are expected to be at slightly different times to the worldwide market because the Nordic market is slightly segregated from the rest of the world.

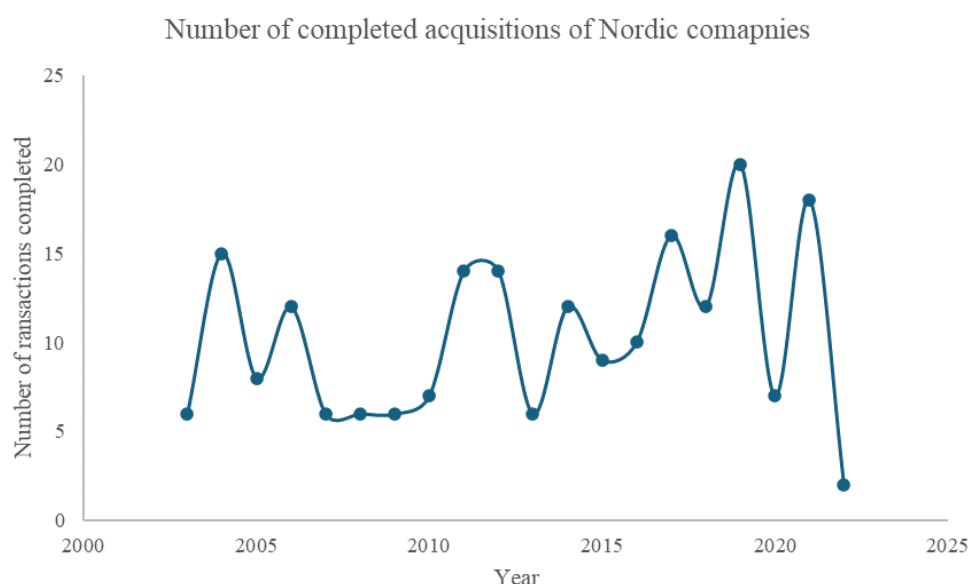


Figure 2: Number of PE acquisitions of Nordic companies per year

The data is grouped into six different industries, as illustrated in *Table 3*. A large portion of the acquisitions involved targets in Manufacturing & Construction, Services & Retail and Other, distributed across domestic* and cross-border acquisition types.

Target major sector	Total sample		Cross border		Domestic	
	N	%	N	%	N	%
Financial Services	2	1%	0	0%	2	1%
Manufacturing & Construction	59	29%	16	27%	43	29%
Utilities	5	2%	5	8%	0	0%
Hospitality & Leisure	10	5%	1	2%	9	6%
Services & Retail	63	31%	19	32%	44	30%
Other	67	33%	19	32%	48	33%
Total	206	100%	60	100%	146	100%

Table 3: Sample distribution by industry

Table 4 shows the number of acquirers by county, as well as the number of targets by country. In the sample considered, the most acquisitions occur between Swedish targets and Swedish acquirers. Finland and GB have the second most active acquirers and a low number of

acquirers are from outside of Europe. Hammer et al. (2021) found a similar result, and that the majority of acquisitions inside Europe are made by GB. Although Iceland is also considered in the sample selection, there are no acquisitions of targets in these countries that ultimately end up in the sample set. Hence, only Denmark, Finland, Sweden and Norway are shown in this table.

Lead Acquirer country code				Target country code			
	Country	N	%	DK	FI	SE	NO
				N	N	N	N
DK	Denmark	5	2%	1	1	3	-
FI	Finland	37	18%	-	35	2	-
SE	Sweden	78	38%	-	6	63	9
NO	Norway	26	13%	-	-	8	18
LU	Luxembourg	3	1%	1	1	1	-
DE	Germany	2	1%	-	1	1	-
GB	Great Britain	31	15%	3	3	14	11
US	United States	15	7%	2	1	7	5
AU	Australia	4	2%	-	2	1	1
CH	China	1	0%	-	-	-	1
FR	France	1	0%	-	-	1	-
CA	Canada	1	0%	-	-	-	1
IE	Ireland	1	0%	-	-	1	-
SG	Singapore	1	0%	-	-	-	1
Total		206	100%	7	50	102	47

Table 4: Sample distribution by country

Table 5 shows summary statistics of the variables that are not fixed effects. This includes all but the *Year* and *Industry* dummies. It should be noted that *Lead Acquiror CB dummy*, *Acq1*, *MBO/MBI*, *Nordic Partner* and *Wave* are dummy variables, so are exclusively equal to zero (0) or one (1). The fractions for *Lead Acquiror CB dummy* and *Acq1* are similar to those found by Hammer et al. (2021). However, Table 5 also indicates that only one percent of the transactions are *MBO/MBI*, in contrast to 26 percent reported by Hammer et al. (2021). 71 percent of the acquisitions have a *Nordic Partner* dummy variable equal to one (1), which is significantly higher than the one percent found in Hammer et al. (2021).

	Mean	Median	S.D	Min	Max	25 % ile	75 % ile	Count
Lead Acquire CB dummy	0.29	-	0.45	-	1.00	-	1.00	206
Acq1	0.17	-	0.38	-	1.00	-	-	206
MBO / MBI	0.01	-	0.12	-	1.00	-	-	206
LN (Deal Value)	11.56	11.56	1.94	5.52	16.12	10.35	12.80	206
Nordic Partner	0.71	1.00	0.45	-	1.00	-	1.00	206
Wave	0.55	1.00	0.50	-	1.00	-	1.00	206
Geographic Distance	1,161.06	-	2,721.30	-	15,966.00	-	1,153.00	206

Table 5: Descriptive statistics of explanatory variables

4.2 Regression Results

A summary of all regression results is presented in *Table 6* below. Variables that are labelled *omitted* are not included in the regression model due to collinearity. *Year_20* serves as the reference group for the fixed effects for years. For the industry fixed effect, in Regression Models 3a and 3c, *Industry_1* is used as the reference group, while *Industry_6* is the reference group in all other models.

	Regression model							
	1	2a	2b	3a	3b	3c	4a	4b
R squared	0.1462	0.2177**	0.2779***	0.2177**	0.1090***	0.2177**	0.2237**	0.1145***
Prob > F	0.2163	0.0153	0.0006	0.0153	0.0003	0.0214	0.021	0.0004
Number of observations	206	206	206	206	206	206	206	206
Lead Acquire CB dummy	0.97** (0.02)	0.67* (0.09)	2.43** (0.04)	0.67* (0.09)	0.57 (0.14)	0.7 (0.22)	1.04** (0.04)	0.88* (0.07)
Acq1		-0.38 (0.42)	-1.04** (0.04)	-0.38 (0.42)	-0.15* (0.73)	-0.38 (0.42)	-0.36 (0.46)	-0.12 (0.79)
MBO / MBI		-4.31*** (0.01)	-4.55*** (0)	-4.31*** (0.01)	-4.69*** (0)	-4.31*** (0.01)	-4.23*** (0.01)	-4.72*** (0)
LN (Deal Value)		0.23** (0.02)	0.24** (0.02)	0.23** (0.02)	0.20** (0.03)	0.23** (0.02)	0.23** (0.03)	0.19** (0.03)
Nordic Partner			2.13* (0.06)					
Lead Acquire CB Dummy * Nordic Partner			1.55 (0.32)					
Wave				-1.86 (0.36)	0.02 (0.96)	-1.84 (0.37)		
Lead Acquire CB Dummy * Wave						-0.05 (0.95)		
Geographic Distance							0 (0.74)	0 (0.9)
Lead Acquire CB Dummy * Geographic Distance							0 (0.68)	0 (0.96)
Year 1	-0.3 (0.88)	0.61 (0.76)	0.64 (0.74)	0.61 (0.76)		0.6 (0.76)	0.78 (0.7)	
Year 2	-0.68 (0.72)	0.13 (0.94)	0.07 (0.97)	0.13 (0.94)		0.12 (0.95)	0.31 (0.87)	
Year 3	-0.01 (1)	0.65 (0.73)	0.61 (0.74)	0.65 (0.73)		0.64 (0.74)	0.7 (0.72)	
Year 4	-0.56 (0.77)	0.03 (0.99)	0.05 (0.98)	0.03 (0.99)		0.02 (0.99)	0.22 (0.91)	
Year 5	-0.84 (0.68)	0.37 (0.85)	0.25 (0.9)	0.37 (0.85)		0.36 (0.86)	0.41 (0.83)	
Year 6	0.04 (0.99)	0.5 (0.8)	0.51 (0.79)	-1.37 (0.35)		-1.36 (0.35)	0.68 (0.73)	
Year 7	0.76 (0.71)	1.86 (0.36)	1.53 (0.44)	omitted		omitted	2 (0.33)	
Year 8	-2.77 (0.16)	-2.3 (0.23)	-2.37 (0.2)	-4.16*** (0)		-4.16*** (0)	-2.27 (0.24)	
Year 9	-0.65 (0.73)	-0.26 (0.89)	-0.37 (0.83)	-2.12* (0.09)		-2.12* (0.09)	-0.22 (0.9)	
Year 10	-0.55 (0.77)	0.05 (0.98)	0.31 (0.86)	-1.81 (0.15)		-1.81 (0.15)	0.18 (0.92)	
Year 11	-3.3* (0.1)	-1.86 (0.35)	-1.93 (0.31)	-3.72*** (0.01)		-3.72*** (0.01)	-1.82 (0.36)	
Year 12	-1.01 (0.59)	-0.53 (0.77)	-0.83 (0.64)	-2.39* (0.06)		-2.39* (0.06)	-0.24 (0.9)	
Year 13	-2.7 (0.16)	-2 (0.29)	-2.1 (0.25)	-2 (0.29)		-2.01 (0.29)	-1.9 (0.32)	
Year 14	-1.62 (0.4)	-1.07 (0.57)	-1.28 (0.48)	-1.07 (0.57)		-1.07 (0.57)	-0.88 (0.64)	
Year 15	-1.4 (0.45)	-0.76 (0.67)	-0.52 (0.77)	-0.76 (0.67)		-0.77 (0.67)	-0.77 (0.67)	
Year 16	-0.58 (0.76)	-0.34 (0.85)	-0.26 (0.89)	-0.34 (0.85)		-0.34 (0.85)	-0.23 (0.9)	
Year 17	-0.82 (0.65)	-0.54 (0.76)	-0.61 (0.72)	-2.4** (0.05)		-2.4** (0.05)	-0.42 (0.81)	
Year 18	-1.68 (0.4)	-0.59 (0.76)	-0.32 (0.87)	-2.45* (0.09)		-2.45* (0.09)	-0.46 (0.81)	
Year 19	-0.57 (0.76)	-0.34 (0.85)	-0.6 (0.73)	-0.34 (0.85)		-0.34 (0.85)	-0.25 (0.89)	
Year 20	omitted	omitted	omitted	omitted		omitted	omitted	
Industry 1	1.36 (0.54)	0.93 (0.66)	1.5 (0.47)	omitted		omitted	0.62 (0.77)	
Industry 2	1.54 (0.28)	1.44 (0.3)	1.76 (0.19)	0.51 (0.79)		0.51 (0.79)	1.09 (0.45)	
Industry 3	1.55 (0.2)	1.34 (0.25)	1.77 (0.12)	0.41 (0.82)		0.41 (0.82)	0.99 (0.41)	
Industry 4	1.41 (0.24)	1.3 (0.26)	1.54 (0.17)	0.38 (0.84)		0.37 (0.84)	1 (0.41)	
Industry 5	1.49 (0.22)	1.37 (0.24)	1.72 (0.13)	0.44 (0.81)		0.44 (0.81)	1.05 (0.39)	
Industry 6	omitted	omitted	omitted	-0.93 (0.66)		-0.92 (0.67)	omitted	
Constant	-1.06 (0.62)	-3.97 (0.11)	-6.25** (0.02)	-1.18 (0.58)	-2.65*** (0.01)	-1.18 (0.58)	-3.77 (0.13)	-2.55** (0.02)

Table 6: Regression Results. The symbols ***, **, * denote significance at 1%, 5% and 10%, respectively

As shown in *Table 6*, Regression Model 1 is not significant at any of the specified levels and is therefore not a good fit for explaining the dependent variable in terms of the independent ones used in this model. Regression Model 2a takes into account whether more than one acquirer was involved in the acquisition, whether it was an MBO or MBI and the value of the deal. Regression model 2b further takes into account whether a Nordic partner was involved in the deal, even if the lead acquirer was non-Nordic. Regression Model 2b has an overall larger significance compared to Regression Model 2a and is significant at the one percent level. The difference between Regression Models 2a and b - and 3a is the inclusion of a wave dummy in Regression Model 3a, but the exclusion of the *Nordic Partner* variables considered in 2b. Because the variable *Wave* has no significant impact on the model overall, there is no difference in terms of these models' fits or significance. Regression Model 2a- and 3a are both significant at the five percent level. The fixed effects for both years and industries are excluded in Regression Model 3b to decrease the degrees of freedom and to allow the wave dummy to capture the effects independently. This model is statistically significant at the one percent level. Regression Model 3c, which includes an interaction term between the *Lead Acquirer CB dummy* and *Waves*, is statistically significant in explaining the variation in the dependent variable at the five percent level. Regression Models 4a and 4b incorporate geographic distance. Regression Model 4a exhibits the highest R squared value of all models at 22.37 percent, suggesting that the independent variables in this model explain 22.37 percent of the variation in the dependent variable. This model achieves statistical significance at the five percent level. Regression Model 4b is a slight modification of 4a by removing the fixed effects for year and industry. This adjustment is intended to decrease the degrees of freedom, enabling a clearer assessment of the impact of the interaction term between *Lead Acquirer CB dummy* and *Geographic Distance*. Regression Model 4b is statistically significant at the one percent level. By isolating this interaction term, the analysis aims to better understand how geographic distance influences the valuation multiples in cross-border acquisitions.

As shown in *Table 6*, the independent variable *Lead Acquirer CB dummy* is significant at the five percent level in Regression Models 1, 2b and 4a and at the ten percent level in Regression Models 2a, 3a, and 4b. For all Regression Models, *LN(Deal Value)* is significant at the five percent level. Additionally, the variable *MBO/MBI* is significant at the one percent level.

For Regression Model 2b, *Nordic Partner* is significant at the ten percent level and *AcqI* is significant at the five percent level. No significant relationship can be found between the interaction term *Lead Acquirer CB dummy* and *Nordic Partner*.

There is no significant relationship observed between the variable *Wave* and the dependent variable in any of the models, Regression Model 3a- to c. Similarly, in Regression Model 3c, there is no significant relationship found between the interaction variable *Lead Acquirer CB Dummy*Wave* and the dependent variable EV/Revenue. For Regression Model 3a and 3c, six of the years are significant, none of these years are within the previously defined waves.

Finally, in Regression Model 4a and 4b, the analysis indicates no relationship between the distance between capitals and the valuation multiple, as well as in the interaction term *Lead Acquirer CB Dummy* Geographic Distance*.

4.3 Robustness test

Two robustness tests are completed to understand how the results change when certain variables are redefined.

The first robustness test is to redefine cross-border acquisitions. If an acquisition is defined as domestic only if it is truly domestic (meaning within the same country instead of within the Nordics), the results change as shown in *Table 7*. Regression Model 2b is used for this robustness test because this includes all variables except those used to test Hypothesis (2) and (3). The original *Lead Acquirer CB dummy* is replaced with a *TrulyCBdummy*, which is one (1) when the acquisition is truly cross-border and zero (0) when the acquisition is truly domestic. Changing the definition of cross-border acquisitions changes the results of the regression model slightly, but the overall model remains significant. The original regression model has an R squared of 0.26 and an F value of 0 (at 2d.p.), compared to this robustness check which has an R squared of 0.24 and an F value of 0 (at 2d.p.). The *Truly dummy* variable is significant at the one percent level, but the coefficient is now 1.51 instead of 3.53 for the original *Lead Acquire CB dummy*. This reinforces the original definition of

cross-border acquisitions, which is to treat all countries in the Nordic region as a single geographic location.

	Regression model
	Regression model 2
R squared	0.244***
Prob > F	0.004
Number of observations	206
TrulyCBdummy	1.51*** (0)
Acq1	-0.69 (0.15)
MBO / MBI	-3.87*** (0.01)
LN (Deal Value)	0.3*** (0)
Nordic Partner	1.27** (0.02)
Year 1	0.8 (0.68)
Year 2	0.06 (0.97)
Year 3	0.39 (0.84)
Year 4	0.01 (1)
Year 5	-0.2 (0.92)
Year 6	0.55 (0.77)
Year 7	2.02 (0.32)
Year 8	-2.68 (0.16)
Year 9	-0.64 (0.72)
Year 10	0.23 (0.9)
Year 11	-2.05 (0.29)
Year 12	-0.8 (0.66)
Year 13	-2.11 (0.26)
Year 14	-1.2 (0.52)
Year 15	-0.94 (0.6)
Year 16	-0.37 (0.84)
Year 17	-0.61 (0.73)
Year 18	-0.89 (0.64)
Year 19	-0.58 (0.74)
Year 20	omitted
Industry 1	0.65 (0.76)
Industry 2	1.31 (0.33)
Industry 3	1.1 (0.34)
Industry 4	1.04 (0.37)
Industry 5	1.14 (0.32)
Industry 6	omitted
Constant	-5.68** (0.03)

*Table 7: Robustness test of cross-border definition. The symbols ***, **, * denote significance at 1%, 5% and 10%, respectively*

A second robustness test is completed to understand whether acquisitions completed in any of the Nordic countries are paying higher multiples compared to the others. For each of the target countries that had completed acquisitions in the test time frame, a dummy variable is added to analyse their effects on the dependent variable. *Table 8* shows the results of this regression. In this analysis, Finland is used as a reference country. A conclusion can only be made about Norway, the coefficient of which is significant at the one percent level. Compared to the other Nordic countries, acquisitions completed of Norwegian target

companies are associated with a larger transaction multiple compared to the other Nordic countries. The purpose of this test is to determine if country-specific factors in the sample lead to larger transaction multiples, which may indicate potential overpayment in certain Nordic countries. The analysis reveals that only the fixed effect for Norway is significant, suggesting that country-specific factors do not uniformly affect the sample. Therefore, while the sample may indicate overpayment in Norway, it does not provide a significant comparison to the other Nordic countries.

	Reression model 2
R squared	0.3049***
Prob > F	0.0002
Number of observations	206
Lead Acquire CB dummy	2.99*** (0)
Acq1	-0.86* (0.08)
MBO / MBI	-4.13*** (0.01)
LN (Deal Value)	0.18* (0.07)
Nordic Partner	2.87*** (0)
Year 1	0.63 (0.75)
Year 2	0.09 (0.96)
Year 3	0.47 (0.8)
Year 4	-0.33 (0.86)
Year 5	0.18 (0.93)
Year 6	0.52 (0.78)
Year 7	1.46 (0.46)
Year 8	-2.46 (0.19)
Year 9	-0.53 (0.77)
Year 10	0.06 (0.97)
Year 11	-2.35 (0.23)
Year 12	-0.85 (0.64)
Year 13	-2.16 (0.24)
Year 14	-1.25 (0.5)
Year 15	-0.81 (0.65)
Year 16	-0.08 (0.97)
Year 17	-0.65 (0.71)
Year 18	-0.47 (0.8)
Year 19	-0.62 (0.72)
Year 20	omitted
Industry 1	0.42 (0.84)
Industry 2	0.96 (0.48)
Industry 3	1.01 (0.38)
Industry 4	0.72 (0.53)
Industry 5	0.73 (0.53)
Industry 6	omitted
TargetcountrycodeDK	0.96 (0.37)
TargetcountrycodeFI	omitted
TargetcountrycodeNO	1.45*** (0.01)
TargetcountrycodeSE	0.7 (0.11)
Constant	-6.07** (0.02)

*Table 8: Robustness test of overpayment by target country. The symbols ***, **, * denote significance at 1%, 5% and 10%, respectively*

5 ANALYSIS AND DISCUSSION

The central hypothesis of this study posits that cross-border acquisitions yield a larger EV/Revenue multiple compared to domestic* acquisitions. Two supplementary hypotheses are formulated to get a deeper understanding of the underlying factors influencing valuation multiples in both cross-border and domestic* acquisitions within the Nordic region: the impact of M&A waves and the geographical distance between the countries involved.

5.1 EV/Revenue multiple achieved in acquisitions

Hypothesis 1: *Cross-border PE acquisitions are associated with larger EV/Revenue multiples than domestic* buyouts due to informational disadvantages of foreign acquirers.*

The results provide evidence of adverse pricing effects in cross-border acquisitions, consistent with previous literature indicating larger EV/Revenue multiples for such deals. This implies a more expensive acquisition for PE firms in cross-border transactions. The authors of the study find that the valuation multiples achieved in cross-border acquisitions are, on average, 81.5 percent larger in cross-border acquisitions when compared to domestic* multiples using regression models 2a, 3a, 4a and 4b. No such conclusion can be drawn from Regression Model 1 because the p value of the overall model indicates a non-significant model. For Regression Model 2b, the coefficient of the *Lead Acquirer CB dummy* is notably large compared to the others. This could be attributed to the limited number of acquisitions where the *Lead Acquire CB Dummy* Nordic Partner* interaction term equals one (1), with only six data points. The small sample size likely skews the coefficient, potentially compromising the robustness of the findings. If there was a larger dataset with more acquisitions fitting the criteria, it is possible that the results might paint a different picture, offering more accurate insights into the impact of having a Nordic partner in cross-border acquisitions. However, the finding of a larger valuation multiple in cross-border acquisitions aligns with the hypothesis and the study by Hammer et al. (2021), as well as with previous literature documenting the underperformance of cross-border acquisitions in terms of returns in a VC context (Buchner et al., 2018). On the contrary, the dependent variable coefficient found in this study is larger than the one found by Hammer et al. (2021), which reports figures between 25 to 37 percent. This implies that cross-border acquisitions involve a greater

degree of overpayment when PE firms invest from outside the Nordic region in the Nordics compared to when Nordic PE firms engage in acquisitions within the Nordics, as examined by Hammer et al. (2021). This indicates that foreign acquirers may face more severe informational disadvantages, leading to larger transaction multiples.

This research, in line with prior literature, supports the hypothesis that information asymmetries significantly affect the valuation outcomes of cross-border acquisitions. One of the reasons that cross-border acquirers encounter difficulties to obtain direct information about target firms could be due to geographical and cultural differences, aligned with the findings of Hammer et al. (2021). This is also supported by Zaheer's (1995) 'Liability of Foreignness framework,' which points to factors like geographical distance, lack of operational knowledge, and regulatory challenges. In this study, these asymmetries are reflected in the larger EV/Revenue multiples seen in cross-border acquisitions, suggesting that limited information access leads foreign acquirers to pay higher prices due to the increased risks and uncertainties involved. There are various potential explanations for consistently larger cross-border multiples due to limited access to information.

Firstly, the winner's curse, as described by Varaiya and Ferris (1987) is likely an important reason for why cross-border acquisitions often have the same or larger valuation multiples than domestic ones, but rarely lower ones. It would make sense that bidders with high information disadvantages make less precise offers with respect to the intrinsic value of the company. Then only those that exceed the offers made by bidders with lower information disadvantages, which are closer to the intrinsic value of the firm, would be accepted by the seller and result in a completed transaction. The regression models considered in this study demonstrate that cross-border acquisitions are associated with larger transaction multiples when compared to domestic ones, which aligns with this analysis.

Additionally, Humphery-Jenner et al. (2017) observe that PE firms in cross-border acquisitions encounter challenges stemming from information imbalances. This perspective also aligns with the concept of winner's curse. Therefore, the findings of this study, coupled with the analysis by Humphery-Jenner et al. (2017), underscore the importance of understanding and effectively managing information disparities to optimise the outcomes of cross-border acquisitions. However, while Humphery-Jenner et al. (2017) suggest that prior experience and connections in the target market can mitigate these challenges, the high

coefficient for *Lead Acquire CB dummy* in this study suggests that such factors may not have a significant mitigating effect in this case. This indicates a need for further research to explore why prior experience and connections did not reduce the information imbalance in these cross-border acquisitions.

Lastly, in analysing the results of this study, the insights from Buchner et al. (2018) are crucial, as they suggest that the acquirers often rely on their past successes in home markets, potentially underestimating the effort needed to succeed in new markets. Based on the results of this study, higher EV/Revenue multiples in cross-border acquisitions compared to domestic* acquisitions indicate that informational disadvantages, such as limited access to local market information and unfamiliarity with the foreign business environment, play a significant role. Buchner et al. (2018) also argue that foreign acquirers might face higher acquisition costs due to fewer investment opportunities in their saturated home markets, aligning with this study's findings that foreign acquirers may accept higher valuation multiples to secure deals in new markets. This empirical evidence supports the hypothesis that informational disparities between foreign and domestic* acquirers significantly impact valuation multiples in cross-border acquisitions, underscoring the importance of considering market-specific information and the challenges of entering new markets when evaluating valuation outcomes.

This study's findings offer empirical support for Westerholm's (2006) theory on the integration of Nordic markets within the OMX framework, which is supported by the robustness tests. This integration signifies more than just economic alignment; it entails the standardisation of rules and market structures across the region. This standardisation reduces information asymmetry, which fosters clarity and fairness in acquisitions within the area, as anticipated by theoretical frameworks supported by Hammer et al. (2021). Contrary to this, the findings in this study suggest that acquisitions of companies in a region with market transparency, like the Nordic region, can achieve comparable results as truly domestic transactions, challenging the belief that domestic acquisitions always perform better than cross-border ones.

From an alternative perspective, the observed trend towards larger EV/Revenue multiples in cross-border acquisitions may be attributed to Spliid's (2013) argument. Spliid (2013) argues that Nordic PE firms face significant challenges in matching the competitive valuation

multiples offered by their American counterparts. These challenges, such as limited access to capital markets and stricter regulatory frameworks, impede the Nordic PE firms' ability to compete effectively internationally. This could be a reason for many of the acquisitions in this dataset being domestic* ones. It could be the case that Nordic PE firms primarily invest in the Nordics because of their struggle to compete with international investors elsewhere. This dataset is primarily composed of domestic* acquisitions within the Nordics, suggesting that the results of this study could be influenced by the challenges faced by Nordic PE firms, as outlined by Spliid (2013). On the other hand, Spliid (2013) has compelling arguments for the potential desire of Nordic companies to sell to Nordic PE firms over international ones. A major one of these arguments is that people in the Nordics have strong positive connotations towards the Nordic region, suggesting that Nordic firms may feel they are in good hands when selling to Nordic PE firms. These arguments would lead to larger EV/Revenue multiples being required to convince Nordic companies to sell to offshore PE firms.

To be able to concretely determine the reason for the larger valuation multiples associated with cross-border acquisitions, a measurement to encompass information availability is required. With the data at hand, it is difficult to determine how much information the bidder had about the target prior to the acquisition, making it impossible to draw a conclusive relationship between information availability and valuation multiples. However, multiple studies have been conducted from various angles and the consensus is that information asymmetries play a major role in acquisitions.

5.2 Cross-Border acquisitions during M&A waves

Hypothesis 2: *The EV/Revenue multiple is larger during M&A waves.*

This study considers various regression models to understand the complexities of M&A waves and their influence on market behaviours. The lack of a significant relationship between valuation multiples and M&A waves in Regression Models 3a, 3b, and 3c causes the study to fail to reject the null hypothesis. There is not sufficient evidence to conclude that M&A transactions have larger EV/Revenue multiples during M&A waves in Regression Model 3a and 3b, nor is there sufficient evidence for a relationship between the dependent variable and the *Lead Acquirer CB Dummy*Wave* in Regression Model 3c, differing from the

findings of Bouwman et al. (2009) and Duchin and Schmidt (2013). The complexity of market dynamics may not be fully captured by the variables included in the analysis. Factors such as changes in regulatory environments or shifts in investor sentiment could influence valuation multiples during M&A waves.

Other unexplored factors may contribute to the non-significant outcome of this study. For example, Xu (2017) suggests that firm size and age influence behaviour during merger waves: smaller, younger firms tend to be more aggressive, while larger, established firms are generally more cautious. This study did not consider firm age as an independent variable, which may have provided a deeper understanding. Including firm age as a control variable might reveal important dynamics in M&A activity, as older firms' risk aversion could obscure significant relationships between merger waves and valuation multiples.

From another point of view, Xu (2017) argues that completing acquisitions during a wave may mitigate information asymmetries. During such periods, companies have more opportunities to gain experience from their peers' activities and market trends due to increased M&A activity, which can lead to a reduction in information asymmetries. This decrease in information asymmetries could potentially result in lower EV/Revenue multiples, as the effect of the winner's curse is reduced when companies have more comprehensive access to company information. This would mean that bidders are less likely to surpass the valuation by substantial amounts. Due to the insignificant variable, this study does not provide sufficient support for a conclusion on the Hypothesis (2). However, the study cannot definitively conclude that M&A waves do not lead to lower multiples. Further research is needed to explore this potential effect more thoroughly.

Out of the 206 observations analysed between 2003 and 2022, 114 occurred within M&A waves. It should be noted that this distribution might not be uniform due to major economic crises like the 2008 Financial Crisis and the Covid-19 pandemic in 2020. These events influenced M&A activity, potentially biasing the analysis. The prevalence of M&A activity during crisis periods might skew valuation multiples. Variation in industry sectors and geographic regions within the sample could also influence responses to M&A waves, adding complexity to the analysis. Considering these factors is crucial to drawing robust conclusions. For the interaction term *Lead Acquirer CB dummy * Wave*, only 31 observations have a non-zero value which means that the results are restricted, making it more challenging to

draw statistically significant conclusions. Introducing another time period, such as the fifth M&A wave, could yield different results, warranting further investigation. Considering the combined influence of M&A waves and cross-border acquisitions on EV/Revenue could provide deeper insights into market dynamics.

5.3 Geographic distance in cross-border acquisitions

Hypothesis 3: *A larger geographical distance between the capital cities of the target's and acquirer's countries is associated with a larger EV/Revenue multiple.*

This hypothesis is established off the back of Buchner et al. (2018) and Zaheer (1995) who had the idea that informational asymmetries are not the same between all countries. In this study, geographical distance served as a proxy for assessing whether information asymmetry increases with distance. Regression Model 4a and 4b considered the whole sample, however only 89 data points have a non-zero geographic distance, causing this variable to be truncated. This means that the variation is in a small part of the sample, suggesting there could be issues like non-normal residuals and a non-uniform distribution. The results of Hypothesis (3) yield significant models, but no conclusion can be drawn about the impact of geographical distance on valuation multiples. In other words, there is not sufficient evidence to conclude that the valuation multiple is larger when the distance between capitals is larger. Although no statistically significant relationship is established between these variables, the idea that the valuation multiples increase with higher information asymmetries between countries could be explored further using different proxies for distance. For example, cultural or economic distance could have a larger effect of information asymmetries than geographical distance, as well as the thoroughness of the due diligence process in the acquisition or advisors involved in the transaction. There could, for example, be a relationship between the thoroughness of the due diligence process, which would be directly related to information availability, and the valuation multiple. The geographic distance between capital cities may have been an inappropriate proxy to use for distance between countries due to the advanced communication technologies that exist nowadays that allow for easy communication and a measurement of cultural distance could have been more insightful.

Building on the results of this study, the factor influencing information asymmetry may be the act of engaging in cross-border acquisitions itself, rather than the physical distance between the involved parties. This suggests that, regardless of how far apart the transacting entities are geographically, the complexities inherent in cross-border deals lead to the larger valuation multiples, because of other factors, such as information asymmetry. The findings highlight the importance of recognizing and effectively managing these informational disparities, irrespective of the geographical distance. This insight underscores the necessity for rigorous due diligence processes, effective communication strategies, and the involvement of experienced advisors to address information asymmetry and enhance the success of cross-border acquisitions.

5.4 Other Significant Variables

The negative coefficients, significant at the one percent level, associated with the *MBO/MBI* variable in all regressions excluding Regression Model 1, indicate that management buy-in or buy-out involvement correlates with a decrease in the EV/Revenue ratio by a coefficient of -4.33 to -4.72. This suggests that acquisitions that are management buy-ins or buy-outs tend to have significantly lower valuation multiples. Potential reasons for this could include increased uncertainty, strategic shifts, or operational challenges associated with these acquisitions. It would be interesting to conduct further research to explore the specific mechanisms underlying this relationship and to better understand the nuances of cross-border PE acquisitions involving management buy-in or buy-out. However, given there were only three observations that were MBO/MBI, the results should be interpreted with caution, as the findings could change considerably with a larger sample size.

The significance of *LN(Deal Value)* at the five percent level, with a positive coefficient between 0.19 and 0.24 in all regressions that consider this variable, which aligns with Achleitner et al. (2011), provides insight into the relationship between deal size and EV/Revenue. The results indicate that the valuation multiple is larger when the firm size is bigger. This contradicts the hypothesis that a larger firm size would correlate with a lower multiple - a surprising result, given the lower information asymmetries in larger firms. Hammer et al. (2021) obtained comparable findings, with notably larger coefficients ranging between 0.34 and 0.36. However, their study delved deeper into this phenomenon, exploring additional layers of analysis. Their measurement of firm size differed from the one used in

this study. Hammer et al. (2021) measured firm size as a comparison to the mean deal size, while this study took the deal size as a proxy for firm size directly. This may not have been an appropriate proxy for firm size, given that acquirers value firms based on future cash flows or potential they see in the firm, as opposed to current size of the firm. Upon reflection, larger multiples correlate directly with deal size - if a larger multiple is applied to a given firm, then the deal size becomes larger. Hence, a different proxy for firm size, such as that used by Hammer et al. (2021) or number of employees, or revenue may have been a more appropriate measurement to use. From another point of view, it could also be the case that larger firms, which typically offer greater transparency and more established operations and financial histories, attract larger multiples.

In Regression Model 2b, *Acq1* is significant at the five percent level. The negative correlation between *Acq1* and the valuation multiple aligns with Hammer et al (2021). However, it is important to note that there were only 36 transactions with more than one acquirer, which may limit the robustness of the results. While it can be concluded from this study, that valuation multiples tend to be lower when more than one acquirer is involved in the transaction, this result should be considered with caution, given the relatively small sample size. Further research with a larger sample size would be necessary to get a solid understanding.

In Regression Models 3a and 3c, certain years, such as 2010-2011, 2013-2014, and 2020-2021, exhibit significance levels ranging between one and ten percent. This observed significance can be attributed to the presence of the *Wave* dummy variable, which may not fully isolate independent effects. This underscores the necessity for cautious interpretation of results, as it raises concerns about potential spurious correlations stemming from the interaction between year-specific and *Wave* dummy variables.

6 CONCLUSION

In conclusion, this study provides empirical evidence supporting the central hypothesis that cross-border acquisitions tend to yield larger EV/Revenue multiples compared to domestic* ones, namely acquisitions within the Nordics. On average, cross-border PE acquisitions exhibit 81.5 percent larger transaction multiples compared to domestic* ones. The findings are consistent with existing literature, indicating that informational disadvantages faced by foreign acquirers contribute to the larger valuation multiples observed in cross-border deals. Additionally, the analysis underscores the importance of understanding and managing information disparities to optimise the outcome of cross-border acquisitions. For Nordic companies looking to sell, this study concludes that they will, on average, receive higher valuations if they sell to overseas acquirers.

Regarding the impact of M&A waves, the results do not provide significant evidence of larger EV/Revenue multiples during such periods. Further investigation, incorporating factors such as firm age and the thoroughness of due diligence processes, could yield deeper insight into the dynamics of M&A activity within different firm cohorts.

The examination of geographical distance to assess whether information asymmetry increases with distance does not yield significant results. However, it may be the act of engaging in cross-border acquisitions itself, rather than the amount of physical distance, which leads to larger valuation multiples due to other factors, such as information asymmetry. This highlights the importance of addressing information disparities independent of geographical distance.

Overall, while the regression models exhibit explanatory power, the authors acknowledge the complexity of market dynamics and the limitations of the variables included. Future research could explore additional variables and refine methodologies to enhance understanding of valuation multiples in cross-border acquisitions within the Nordic region.

6.1 Food for thought

The results of this study provide significant evidence to support the first hypothesis, that cross-border valuation multiples tend to be larger than domestic* ones. The second and third hypotheses build on the first one in an attempt to get a deeper understanding of what factors further influence the size of the valuation difference. It would be interesting to investigate this from different angles and consider a larger range of factors that could potentially influence valuation differences.

The non-significance of the results to hypothesis two and three could be due to the sample size. There were 206 observations in total, but once this group is split into the year categories and further into cross-border or domestic* classifications, the individual groups sometimes contain only a few observations. To obtain sample results that are applicable to the real world, a larger data set may be required. Another reason for non-significance may be the definition of waves. This study is aligned with the definition of waves outlined in The Boston Consulting Group (2007) and Berk and DeMarzo (2023). These reports are based on US markets and this study specifically focuses on the Nordics. This means a different definition of waves could be warranted to yield significant results in the Nordics.

Exploring factors such as cultural nuances, regulatory environments, and market conditions unique to the Nordic region could provide interesting perspectives not considered in this study. It could be valuable to incorporate measurements of cultural differences between countries instead of geographic distance to understand the true effect of non-physical distance. Considering the evolving landscape of cross-border acquisitions and the impact of technological advancements on information sharing, future studies could also examine the role of digital platforms and data analytics in reducing information disparities and enhancing valuation accuracy. Expanding the scope of analysis to include qualitative data through interviews or case studies with industry experts could provide deeper insights into the drivers of valuation disparities and uncover implications for stakeholders involved in cross-border acquisitions. Lastly, given the potential impact of economic crises and global events on M&A activity and valuation multiples, future research could explore the resilience of cross-border acquisitions and valuations during periods of economic uncertainty, providing tools to navigate volatile market conditions.

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Figures

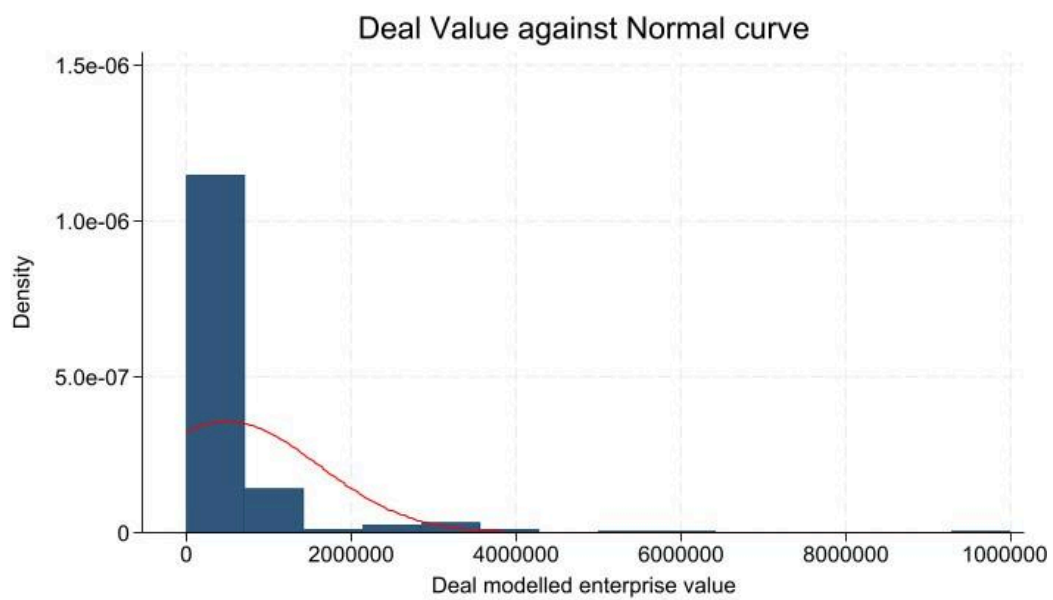
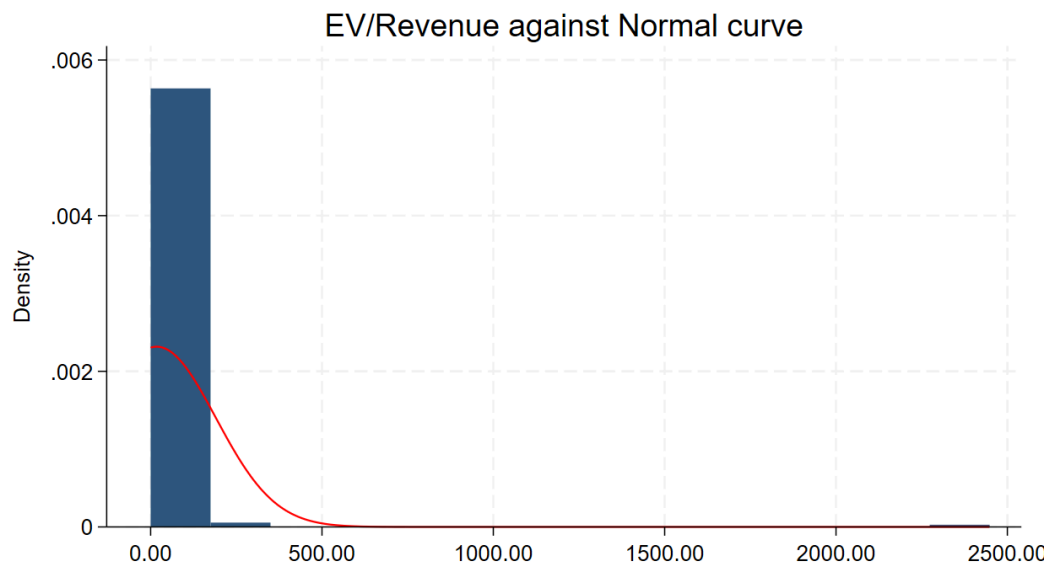
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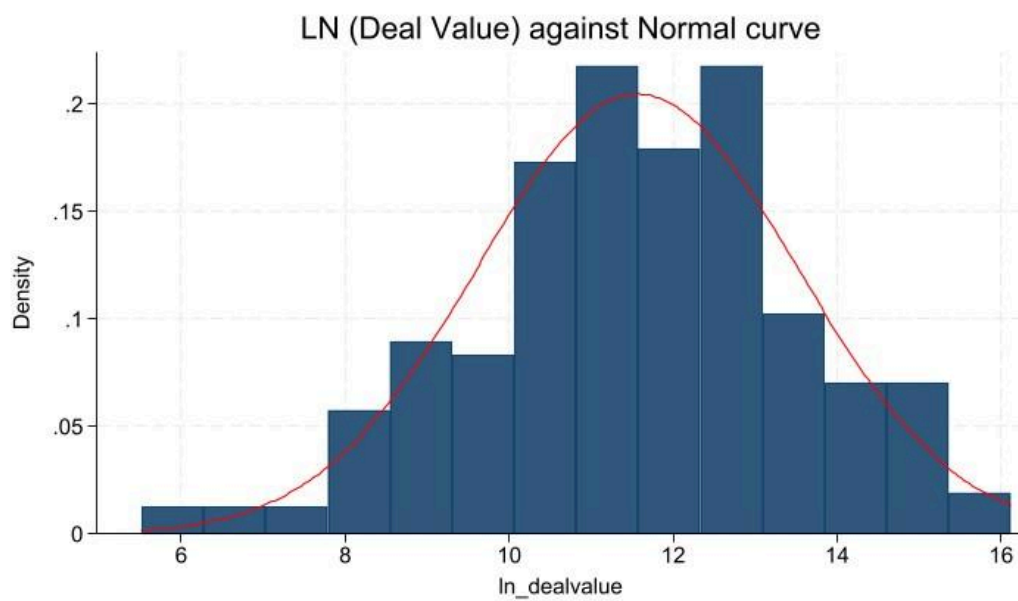
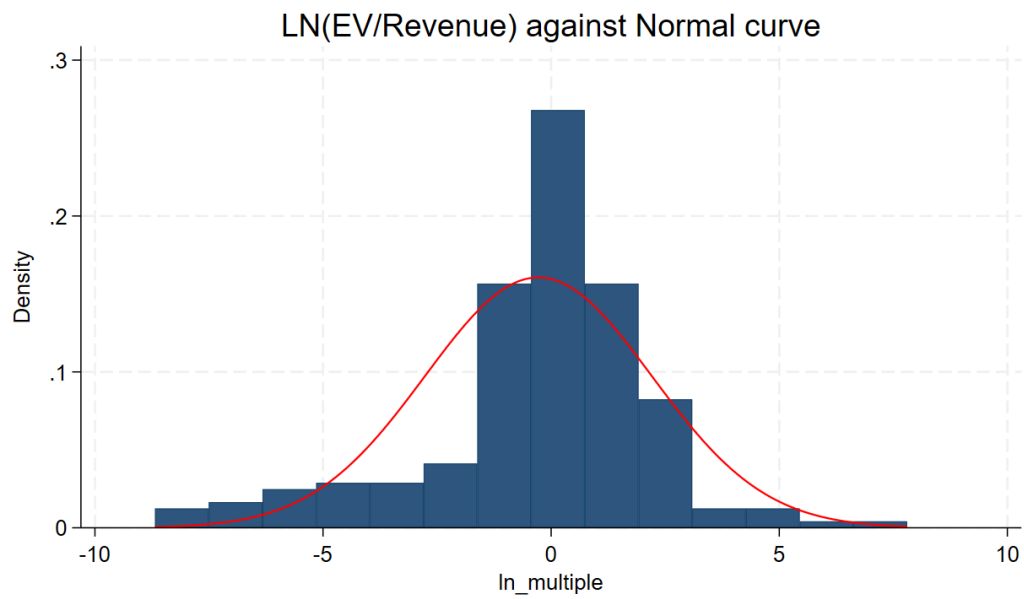
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APPENDIX

Appendix 1: EV/Revenue and Deal Value against Normal Curve



Appendix 2: Logarithm of EV/Revenue and Deal Value against normal curve



Appendix 3: Fixed Effects Years

	Year
Year1	2003
Year2	2004
Year3	2005
Year4	2006
Year5	2007
Year6	2008
Year7	2009
Year8	2010
Year9	2011
Year10	2012
Year11	2013
Year12	2014
Year13	2015
Year14	2016
Year15	2017
Year16	2018
Year17	2019
Year18	2020
Year19	2021
Year20	2022

Appendix 4: Fixed Effects Industry

	Industry
Industry1	Financial Services
Industry2	Hospitality & Leisure
Industry3	Manufacturing & Construction
Industry4	Other
Industry5	Services & Retail
Industry6	Utilities