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Predictability of Nordic takeover targets – A multinomial approach

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ABSTRACT:

For a long time, mergers and acquisitions have held a vital role as a part of corporate strategies either by enabling tangible growth opportunities or providing an effective mechanism to implement other strategic initiatives of the company. However, despite the general view that the majority of such transactions tend to fail and thus destroy shareholder value in the acquirer company, there seem to exist robust evidence showing the opposite for the shareholders of the target company. Accordingly, those transaction announcements are often associated with high immediate takeover premiums on the target's current share price, and these premiums tend to be effectively resulting from the overrated synergies and thus an overpayment of the asset.

Due to the high anticipated takeover premiums, it is well justified to study the predictability of takeover targets as the ability to identify those targets before the transaction announcement would provide a highly reasonable investment strategy with potential to yield superior financial returns for an investor systematically holding targetable assets in one's portfolio. Further, what supports the existence and sustainability of those takeover premiums is the fact that the theory of efficient market seldomly holds true in practice, hence allowing one to systematically gain superior, above market returns. All things considered, the objective of this study is to examine whether it is possible to predict potential takeover targets well before the deal announcements, which could then form a strong basis for a successful investment strategy able to generate superior financial returns.

The use of financial data for predictive purposes in general is at the very core of the decision-making processes by all companies, investors and managers, and it is not surprising that it has been widely exploited as a basis for the prediction of different corporate events as well, such as bankruptcies and takeovers. The prior literature has indeed been successful in providing robust evidence on the predicting ability of different mathematical models, that are grounded on different corporate finance theories and concepts around the merger motives and takeover predictability. However, the vast majority of prior research has been focusing on major markets only, such as US and UK, while leaving the smaller ones quite unexplored. Hence, this study aims to contribute to this uncovered strand of literature by studying the scarcely researched Nordic markets while adding a Nordic-specific component into the predictive model, together with several other commonly hypothesized theories.

This study implements an empirical analysis of the Nordic stock markets while employing both binomial and multinomial logistic regression analysis to distinguish between the typical characteristics of the target companies in general, but also of two different target types, strategic and financial. A predictive model is to be constructed based on the estimation sample consisting of both Nordic target and non-target companies, and the prediction ability and accuracy of the estimated model is tested by using maximum likelihood method. As the results of the study imply, the obtained model is found to be useful for identifying target-related characteristics and

provide high classification accuracy in predictive use. Also, the proposed Nordic-specific components related to the ownership and share class structures is found to be significant discriminator between target and non-target companies. What is surprising and opposite as hypothesized, the multinomial framework fails to distinguish between strategic and financial targets and thus provide any additional explanatory value over the binomial one. This however might be affected by the fact that there were relatively low number of financial targets within the estimation sample, as public takeovers typically are not considered to be part of the core operations of financial buyers in the Nordics. Altogether, the results give strong support for the hypothesized ability to model takeover likelihood and predict future takeover targets also in the Nordics, which again supports the practical implications of the results as the predictive model can be used as a useful decision-making tool by an investor aiming to generate above-market returns by exploiting the takeover premium anomaly.

KEYWORDS: takeover, M&A, merger, acquisition, takeover predictability, multinomial logistic regression, stock markets

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TIIVISTELMÄ:

Erilaiset yritysjärjestelyt, kuten yrityskaupat ja fuusiot, ovat jo pitkään olleet tärkeitä elementtejä osana yritysten laajempaa strategiaa joko mahdollistamalla kasvua tai tukemalla muita liiketoiminnan strategisia tavoitteita. Tästä huolimatta yleinen näkemys on, että valtaosa yrityskaupoista ja fuusioista epäonnistuu lisäarvonluonnissa ja siten tuhoaa osakkeenomistajien varallisuutta. Vastavuoroisesti, akateeminen kirjallisuus ja aiemmat tutkimukset ovat systemaattisesti todistaneet yrityskauppojen olevan sen sijaan erityisen kannattavia kohdeyrityksen osakkeenomistajille, jotka toimivat transaktiossa myyjäosapuolena. Tämä johtuu siitä, että kohdeyrityksestä maksetaan yleensä yrityskaupan yhteydessä merkittävä preemio, joka välittyy yhtiön osakkeen hintaan heti tiedon tullessa julkiseksi. Näiden hintapreemioiden voidaan yleisesti nähdä johtuvan ostajan tavoiteltujen synergioiden ylioptimistisesta arvostuksesta, siten johtaen merkittävään ylihintaan.

Juuri näiden yritysostokohteista maksettavien hintapreemioiden takia on perusteltua tutkia tulevien transaktioiden ja ostokohteiden mahdollista ennustettavuutta, sillä onnistuessaan se tarjoaisi sijoittajalle erittäin houkuttelevan sijoitusstrategian. Sijoittaja, jonka portfolio systemaattisesti sisältäisi tulevia yritysostokohteita, tulisi näistä maksettavien preemioiden ansiosta hyvin todennäköisesti voittamaan markkinaindeksin ja siten saavuttamaan ylituottoa. Toisekseen mikä tukee tämän sijoitusstrategian pysyvyyttä, ja siten myös lisää sen houkuttelevuutta, on käytännössä tehokkuushypoteesin vahvimman muodon puuttuminen markkinoilta. Tällöin tieto tulevasta transaktiosta tulee asiaankuuluvasti julkiseksi vasta sen nimenomaisella julkaisuajanhetkellä, mahdollistaen haluttujen preemioiden ilmentymisen ja siten niistä mahdollisen hyötymisen. Tämä tutkielma pyrkii siis rakentamaan matemaattisen ennustemallin ja selvittämään onko mahdollista ennustaa tulevia yritysostokohteita pohjoismaisista pörsseistä.

Taloudellisen tiedon hyödyntäminen on aina ollut olennainen osa yritysten, sijoittajien ja johdon suunnittelua sekä päätöksentekoa, minkä innoittamana mitä ilmeisemmin myös erilaisia yritykseen liittyviä tapahtumia, kuten konkursseja tai yrityskauppoja, on pyritty ennustamaan. Aiempien tutkimusten tulokset osoittavatkin, että tulevia yrityskauppoja ja niiden kohteita on mahdollista tunnistaa etukäteen erilaisia menetelmiä ja matemaattisia malleja hyväksikäyttäen, tutkimuksen ollen kuitenkin selkeästi keskittynyt vain kaikkein suurimmille markkinoille, kuten Yhdysvaltoihin tai Iso-Britanniaan, jättäen muut melko tutkimattomiksi. Tästä johtuen, tämä tutkimus keskittyy pohjoismaisiin osakemarkkinoihin pyrkien täyttämään havaitun tutkimusaukon. Lisäksi pohjoismaisilla pörssilistatuilla yhtiöillä on myös usein havaittu olevan hieman valtamarkkinoista poikkeava omistus- sekä osakesarjarakenne, jonka vuoksi on perusteltua tutkia näitä markkinoita omana kokonaisuutenaan.

Tämä tutkielma pitää sisällään empiirisen analyysin Pohjoismaiden osakemarkkinoista, joka pyrkii logistista regressioanalyysiä hyödyntäen tunnistamaan tyypillisiä pohjoismaisen yritysostokohteen tunnusmerkkejä. Näiden analyysistä saatujen parametrien pohjalta rakennetaan siten

ennustemalli, jonka avulla kyseisiä ostokohteita voitaisiin identifioida jo hyvissä ajoin ennen aiotun yritysjärjestelyn julkaisuajankohtaa. Lisäksi malli pyrkii erottelemaan yritysostokohteiden joukosta kaksi eri kohdetyyppiä, riippuen siitä onko kohteen ostajaosapuoli teollinen vai taloudellinen. Lopulta regressioanalyysin tulosten pohjalta rakennettua mallia testataan suurimman uskottavuuden menetelmällä, jonka avulla voidaan mitata mallin ennustustarkkuutta.

Kuten tutkielman tulokset ja mallin osoittama korkea ennustustarkkuus todistavat, rakennettu malli osoittautui hyödylliseksi yritysostokohteiden tunnistamisessa kyeten menestyksekkäästi erottelemaan otoksen sisältämät yritysostokohteet niistä yrityksistä, joihin ei ole kohdistunut yritysvaltaus- tai ostoaikeita. Huomionarvoista on myös se, että vaikka mallin ennustustarkkuus osoittautui hyvin korkeaksi, multinomiaalinen malli ei kuitenkaan ollut kykeneväinen tuottamaan lisäarvoa binomiaaliseen verrattuna, minkä voidaan arvella johtuvan taloudellisten ostokohteiden varsin rajallisesta määrästä suhteessa koko yritysostokohteiden otokseen. Saadut tulokset siis osoittavat, että tutkielman empiirisessä osassa rakennettu matemaattinen malli on kykeneväinen ennustamaan tulevia yritysostokohteita pohjoismaisista pörsseistä ja siten tukevat näkemystä siitä, että mallia voitaisiin myös käytännössä hyödyntää tehokkaana sijoitustyökaluna ja päätöksenteon tukena. Tätä kauppahintapreemioihin pohjautuvaa anomaliaa hyödyntävän sijoittajan voidaankin siten odottaa voittavan markkinaindeksin ja siten saavuttavan ylituottoa.

AVAINSANAT: yritysjärjestelyt, yrityskaupat, yritysvaltaus, regressioanalyysi, logistinen regressio, ennustettavuus, osakemarkkinat

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1 Introduction

For long, mergers and acquisitions (henceforth M&As) have had a vital role in companies' growth and business development strategies, with either synergistic or economical underlying motives and rationales. Despite the fact that a significant share of the M&A transactions in general tends to fail and thus destroy shareholder value in the buyer firm, prior evidence has consistently shown that such transactions can in turn provide superior returns for the shareholders of the target company, as the acquiring party typically pays a substantial premium for the target. Thus, the ability to predict such transactions and potential target companies would intuitively provide a profitable investment strategy for an investor who is systematically selecting and holding shares of targetable companies in one's portfolio. This gives one a justified motive to study whether the possible targets could be predicted well before the transaction or bid announcement.

The use of financial data for predictive purposes in general is at the very core of the decision-making processes by all companies, investors and managers, and it is not surprising that it has been widely exploited as a basis for the prediction of different corporate events as well, such as bankruptcies and takeovers. Starting from those very pioneering studies published already around 1970s, the existing literature has constantly demonstrated certain typical characteristics of takeover targets and provided robust evidence on the predictability of such companies and events. Within those earlier studies, several different methodological frameworks have been proposed to be used, such as multiple discriminant or logistic regression analysis, of which the multinomial framework of logistic regression is seen as the most advanced and recently used method, due to its ability to distinguish between different types of targets and thus provide additional explanatory value. The very same setting will be used within this study as well, in order to account for potential differences in the profiles of targets that are acquired either by strategic or financial buyer, as their profiles might vary due to differing operating rationales of their ultimate buyers. However, the type of buyer is not the only thing being expected to affect to the characteristics of target. As the general motives of takeovers have also varied over time and across the merger waves, it is justified to study the typical

target attributes only during the most recent wave and test the predictability of current target candidates.

However, the vast majority of prior literature around takeover prediction has been focusing on major markets only, such as US and UK, while leaving the smaller ones quite unexplored. Hence, this study aims to contribute to this uncovered strand of literature by studying the scarcely researched Nordic markets while adding a Nordic-specific component into the predictive model – since Nordic companies tend to have more concentrated ownership base and differing share class structure, accounting for these attributes is expected to increase the explanatory power of the predictive model. All the other hypotheses and their underlying explanatory variables within this study are also being grounded on the prior financial literature and theories. Hereby, based on historical financial data, this study aims to build a mathematical model that is able to identify potential takeover targets well before the deal announcement. Lastly, the prediction ability of the obtained model will be tested by using maximum likelihood estimation method in order to provide answer to the ultimate research question of this study, i.e., whether it is possible to identify and correctly predict the future takeover target companies within the Nordic stock markets.

The paper is organized as follows. Chapter 2 provides a theoretical framework for the study and Chapter 3 describes the sample construction, and details the dataset being employed in the empirical part of the study, after which followed by a review of hypotheses, model variables and methodological framework of the study. Chapter 4 presents the results of the estimated multinomial and binomial models, discusses the common characteristics of takeover targets, and finally tests the predictive ability of the proposed model. Chapter 5 concludes.

2 Theoretical framework

This chapter presents the theoretical framework for the study, starting with an introduction of M&A transactions in general, and followed by an overview of merger waves. After that, existing empirical evidence and previous literature around the announcement premiums and takeover prediction is reviewed. Lastly, Nordic-specific components in Nordic targets and takeovers are discussed.

2.1 M&A transactions in general

Generally, M&A refers to the term that is being used to describe the activity of buying, selling and amalgamating companies or business units to reach the owner's or company's strategic objectives. Eis (1969) for example jointly defines merger as a result of either consolidation or acquisition of two or more independent enterprises, where a consolidation refers to the disappearance of the merging companies and direct creation of a new consolidated single entity, and an acquisition referring to the event of one company acquiring another company that is to be absorbed under the acquirer's control. In such transactions, stocks or (in)tangible assets of the target company are purchased for cash, shares, options, debt instruments or with some combination of those. As noted by Nelson (1959, p.3), the role of mergers in the evolution of our economic structure is indisputable, especially of those large, industrial dominants that have grown through different corporate governance related activities, including M&A. Also, as stated by Stigler (1950), there barely doesn't exist any large company that has not grown inorganically, i.e., by exercising M&A transactions. There are numerous different commonly recognized purposes for executing mergers as a part of the company's strategy execution, such as revenue growth, product expansion, increase of competitive advantage, new market-entry, cost reduction, improved efficiency and many other expected synergies that will be beneficial to the merged entity-to-be or to the acquiring company, and these will be discussed in a more detailed manner later within this chapter.

One of the most significant theories around M&A lies within the market for corporate control, initially introduced by Manne (1965), and subsequently studied further by several others such as Jensen and Ruback (1983), who also defines the concept as *"the market in which alternative management teams compete for the right to manage corporate resources"*. The emergence of the theory goes a long way back to the 1950s to the time when the cash tender offer was initially deployed within the US markets (Armour and Cheffins, 2013). Before that, share-for-share exchange offers were mostly used for takeovers. However, this theory gave not only a solid base but also a great rise to a more thorough research and interest among the academicians towards the motivations and rationales of takeovers. Also, over the years, takeovers have increased their popularity as a corporate governance mechanism, as can be seen from the Figure 1 below, that summarizes the increased global M&A transaction activity.

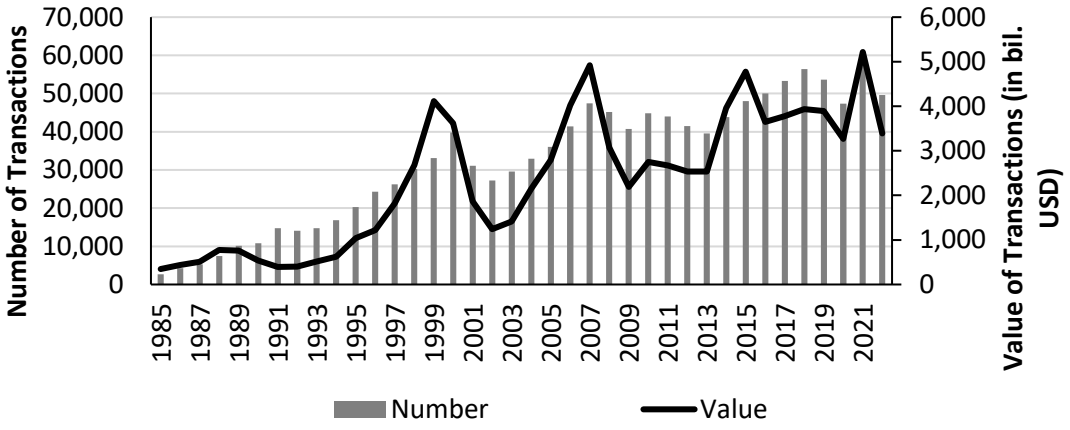

Figure 1. Announced M&A transactions worldwide, 1985-2022 (Institute for Mergers, Acquisitions and Alliances, 2023).

As the historical development of mergers presents above, mergers tend to occur in waves, which is typically followed by a steeper decline both in terms of transaction volumes as well as values. More detailed view on merger waves will be presented later within this chapter, after contemplating the types and motives of such transactions.

2.1.1 Types of M&A transactions

What comes to the merger profiles, there are several different types of M&A transactions acknowledged within the academic literature, that may e.g., vary either regarding the relationship between the acquirer and target, or the method of payment (Berk and DeMarzo, 2017, p. 997). A merger between two or more competing firms at the same stage of production or value chain and operating in the same industry is usually referred as *horizontal merger*, and the main economic effect of such integration lies within the cross-elasticity of demand due to the substitutive products and thus greater market share obtained. Thereby a larger, merged company may significantly benefit from the economies of scale and resulted cost reductions. In a similar manner, a merger between firms engaged in consecutive stages of the production is usually considered to be a *vertical integration*. This type of transaction typically allows enhanced coordination and more centralized management of the value chain but might on the other hand cause difficulties in running such operations due to the remarkably larger size of the merged company. To name a third one, *conglomerate mergers* were relatively popular at a certain point of time in the history, and they were executed to merge companies operating in totally different and unrelated industries to diversify the core business operations, typically to gain some risk reduction, lower cost of debt, increased debt capacity or a better position in terms of liquidity. (Berk and DeMarzo, 2017, pp. 995-1004). However, the value creation has historically proved to be relatively difficult when combining two or more totally unrelated businesses, and the popularity of conglomerate mergers have drastically decreased as they have become relatively rare in the current economy.

The nature of the deal is also highly affected by the type of the buyer. Accordingly, M&A transactions can be classified by the profile of the acquirer, being either a *strategic buyer*, also known as an industrial or trade buyer, or *financial buyer*. The main difference between these buyers is that the first one is acquiring to gain long-term synergies and the latter one, usually referring to private equity firms or financial sponsor, acquiring only to restructure, develop and resell the target after a relatively short holding period to harness some returns (Gemson, 2021). Despite this relatively bald return-centric approach,

financial buyers do still play a significant beneficial role in the larger economy through their efficient (re)allocation of corporate assets (Frydman, Frydman and Trimbath, 2002). According to Baziki et al. (2017), strategic buyers are more focused on certain types of assets, expansion within their core markets, and more long-lasting ownership whereas financial buyers are roughly focusing on restructuring and -organizing target companies to gain higher productivity and profitability through more efficient operations, and thus higher valuation for the asset. And when speaking of financial buyers, the vast rise of private equity buyouts is highly linked to the merger wave occurring in the early 1980s when debt-financed hostile takeovers and buyouts became popular in the market for corporate control, and since then, the private equity market has experienced a major expansion, global buyouts already accounting for 17 per cent of the executed M&A deals in 2021 (Reuters, 2021), not to mention the excluded impact of indirect private equity M&A executed through their existing platform companies. However, coming back to the different buyer types, in some cases the financial buyer takeover may also refer to a management and employee buyout transaction, in which a company is acquired by its current key employees together with some financial sponsor.

What comes to the buyer dynamics in and after the transaction execution itself, financial buyers tend to execute larger deals and might, quite surprisingly, value targets higher than corporate buyers, who undeniably are able to provide more relevant industry experience and expertise instead (Gemson, 2021). In 2022, 40 per cent of the total deal value was a capital provided by a private equity investor (PwC, 2023), which is higher than the respective proportion in terms of deal volume indicating that the deal values are somewhat higher than paid by a strategic buyer. Kaulkin (1995) explains the valuation gap resulting from the evaluation approach in which the financial buyers are looking at the total value of the company, not just single assets or expected synergies as some trade buyers do. Also, the post-transaction dynamics and operation of the acquired or merged company are highly dependent on the type of the deal and buyer. Private equity firms typically can assist a company to capture its maximal growth through increased access to capital, and additional strategic and external expertise, but provide none or very little

contribution related to the operational business functions itself (Kaulkin, 1995). Industrial buyers in turn tend to usually integrate the acquired assets and operations into their own business, and none or very little control remains for the old management and owners as a result of such transaction.

Apart from the buyer types or strategic aspects of the deal, the company being targeted for a takeover can be either a private or public company, and the type of a takeover can be also classified by the dynamics related to the legal form of the acquirer or target. As being in the major interest of this study, but not limited to, it is noteworthy to introduce a generally recognized term *public takeover* (PTO), which refers to the acquisition of the majority of the shares of a public company, whose shares are listed on a stock exchange prior the transaction but delisted as a result of the deal. Takeovers in general are considered to be either hostile or friendly, depending on the dynamics of the bidding process. In a *hostile takeover*, target management strongly resists the takeover and the board have rejected the preliminary intentions and discussions of the potential acquisition of the target company's shares, but the acquirer still continues to pursue the takeover process by making a public offer (also known as a tender offer), or alternatively a creeping tender offer to gain the voting power and control over the current management (Offenberg and Pirinsky, 2015; and Croft and Donker, 2005). On the contrary, an acquisition called *friendly takeover* is typically negotiated in a highly co-operative manner as well as both approved and executed together with the target's board of directors and the management, if the takeover can be seen clearly serving the interests of current shareholders. Naturally, private company acquisitions tend to be friendly as they typically include straight negotiations with the owners, who simultaneously tend to sit in the board as well. Respectively, public takeovers tend to be quite hostile in any case of a public target acquisition.

Public-to-private (PTP) transactions in turn refers to the delisting of the company and substituting the public shareholders by private shareholders, but the differentiating factor compared to PTO is that the initiative comes inside the company, for example from

the management with some major current owner. Obtained post-transaction gains are typically related to cost reductions and decreased burden of mandatory disclosure and reporting, as well as to eliminating potential dissatisfaction resulting from the market's (e)valuation of the firm and its decisions (Geranio and Zanotti, 2012). According to Lehn and Poulsen (1989), other additional gains considered are tax savings, redistribution from bondholders, asymmetric information and mitigation of agency problems. PTP transactions, that experienced a vast rise in popularity within the late 1990s' merger wave, tend to be highly related to the internal corporate governance issues while usually acting as a response to increased takeover threat (Lehn and Poulsen, 1989). PTPs typically involve a *management buyout* (MBO) or *buy-in* (MBI), in which the management becomes an owner, either fully or partially.

Other generally recognised types of acquisitions worth mentioning are *reverse takeover* and *backflip takeover*. The first one occurs in a situation where a private acquirer purchases a public company to gain the listing status without going through the IPO listing process itself (Greene, 2016). The latter one refers to the transaction in which the acquiring company becomes the subsidiary of the target or the merged company, for example to maintain a highly reputable brand or some other competitive advantage of the target company (Mockevicius, 2014).

2.1.2 Motives and reasons to acquire

There are numerous different motives for, and economic effects of mergers recognized, which are clearly linked to the type of integration and buyer as well. Most of the earliest related studies by implication assumed the typical target being just an underperforming company, a valuable asset, or a public company that already has a market-proven fair value (see e.g., Manne, 1965). However, additional evidence has been provided within the later literature and several other motives and rationales are identified regarding the target selection, which in many cases are depending on the type of the buyer. When an acquiring company (i.e., an industrial buyer) aims to meet its strategic objectives, some

M&A transactions are typically involved at some point of the company's lifetime. However, there are still different underlying motives and purposes affecting the decision to acquire, still the expected synergies usually being the main driver for most of the takeovers executed in strategic terms (Berk and DeMarzo, 2017, pp. 998-1004). In many cases, synergies are used to justify takeovers and they are typically expected to be realized either through significant cost reductions via economies of scale, or through increased revenues via higher sales volumes. Accordingly, Chamberlain & Fabre (2016) defines synergies to be related to the additional value creation of the newly merged firm by taking advantage of economies of scale and scope, increased operational efficiencies, and financial capabilities. Synergies may provide the possibility to drive the revenue growth through e.g., new market or territory expansion, product and client base extension, enhanced cross-selling possibilities, new customer segments, new distribution channels, or reduced excess capacity and competition in the market and thus increased market share. However, whereas the revenue-based synergies are typically realized slowly with relatively high risk and effort, cost-based synergies instead are considered to be less risky and quicker to realize (Venzin et al, 2018, p. 38). In mergers, efficiency gains are usually achieved by combined corporate functions and the elimination of duplicative, fixed costs e.g., related to administrative tasks, or by implementing otherwise more efficient management or operational tools into the organization. In some cases, target companies are perceived to be led inefficiently by their current management with inadequate capabilities, and thus seen as a tempting target as the change in corporate control tends to be the easiest way to replace the current management in practice (Jensen and Ruback, 1983).

In addition to cost elimination as a part of the efficiency enhancement, some post-merger cost reductions can also result from the increased negotiation power, or savings in certain costs due to the access to low-cost suppliers or employees, and in acquired technological improvements. What specifically applies to today's relatively fast-developing and technology-driven economy, is the scarcity of expertise, as well as the significant cost and time requirements related to R&D. In accordance, the expertise, innovation and

technological capabilities held by another company is considered to be a significant value-creative motive to acquire and a way to gain competitive advantage (e.g., Ranft and Lord (2002); Puranam, Singh, & Zollo (2006); Berk and DeMarzo (2017, p. 999). As the M&A activity is also seen as a highly critical mechanism to smaller innovation- and technology-driven firms to obtain additional resources (Graebner, 2004), a merger deal is usually mutually beneficial.

Other commonly presented non-strategic motives for industrial M&A presented within the prior literature are managerial overconfidence and self-interest, also referred as agency theory and empire building. In such cases managers are executing M&As to increase the scope of their personal power at the cost of shareholders as those corporate control decisions are driven by self-maximizing decisions instead of economic rationale, and are thus rather destroying value than maximizing the shareholder wealth (e.g. Ross, 1973; and Jensen and Meckling, 1976). This phenomenon however has also been tightly linked to the potential failure of deals.

As mentioned, financial buyers, the other dominant type of acquirer in the market for corporate control, typically acquires to divest the target after a reasonable holding period in order to harness some returns resulting from their active value creation actions and intensive participation in the development of the company. These value creation activities are typically related to organizational restructuring, managerial changes, internal process improvements, strategic implementations and enhanced access to (cheaper) capital. According to Teerikangas (2015), financial buyers generally act as professional investors within the market for corporate control and are typically characterized as business developers and transformers with short- or medium-term time frames, intended to be followed by an exit with reasonable realized financial returns. Also, what is typical for private equity firms is the usage of a significant share of debt financing to lever their investment returns, lent from the banks and institutional investors (Baziki et al. (2017). What comes to the post-transaction execution, financial buyers are mainly focused on

governance aspects instead of integration, which in turn is typically the case with strategic buyers (Teerikangas, 2015). This is how Baziki et al. (2017) also describes the financial buyers, as they are primarily aiming for a reorganization of the target company in order to gain improved productivity and profitability within the operations. To be more specific, Wruck (2008) presents four principles as a foundation for the reorganization approach: governance, decentralized decision-making, adoption of appropriate performance measures and endorsement of a highly incentivized management compensation system. These kinds of reorganization approaches are aiming to create maximal value through an efficient usage of the target's existing knowledge, managerial expertise and (in)tangible assets, and are primarily the most attractive characteristics that a financial buyer typically looks for in a target - in case of finding a such candidate, highly probable future returns are acting as a reasonable motive for takeover. Supporting view of motives is provided by Frydman, Frydman and Trimbath (2002) who show some well-disposed evidence around financial buyers seeking inefficient firms to take over, and through extensive restructuring and aggressive efficiency enhancements increasing the value of the acquired company, and thus gaining superior returns at the time of an exit.

As the motives for acquisitions are clearly different from the strategic acquirer's, it is obvious that there might be significant differences in the deal parameters as stated by Gemson (2021) as well. Accordingly, PE-backed deals themselves tend to be larger despite the tendency of those targets being valued lower than by the competing, strategic bidders in case of an auction (Gorbenko and Malenko, 2014). Among those industrial buyers, synergies are often indeed used as a justification to pay higher premiums for targets, which needless to say, and with regard to the subject of this study, makes it a highly attractive issue to be solved in terms of predictability of those targets. However, and despite being generally agreed that the strategic buyers are acquiring mainly to harness synergies over a long-term time frame, and the financial ones seeking quick and solid financial returns through value-adding reorganization and process improvements, the underlying motives have still drastically changed in the course of time and across the historical waves or mergers. In order to be able to fully understand what drives mergers,

and especially to be able to predict such events, one should be well aware of the history and development of such transactions.

2.2 Overview of merger waves

Merger waves, also equivalently referred as takeover waves, have historically been in the economists' and academicians' great interest, and as a well-known fact, mergers and acquisitions tend to occur in a cyclical wave pattern while being triggered by several commonly identified factors but driven by different underlying motives. Not until the early 1990s, first empirical evidence of the cyclical pattern of takeover activity was finally observed in a statistically formal manner by Golbe and White (1993). However, the existence of such effect has been indisputable across the time well before that and to some extent recognized already in the papers published before the 1950s. Nonetheless, the term merger wave itself refers to the event of rapidly and substantially increased level of M&A transaction activity. More precisely, Rhodes-Kropf and Viswanathan (2004) defines merger wave as a sequence of time periods in which the probability of a takeover occurring is above the unconditional expected probability of a transaction.

But what are the real underlying factors causing an occurrence of such waves have also widely been a topic of academicians' considerable interest across the time and different waves. According to a study conducted by Martynova and Renneboog (2008), and their compiled conclusion of preceding academic findings until then, there exists several commonly identified triggers of booming M&A activity: takeover waves tend to occur during the times of an economic recovery and increased capital available within the market, tend to be affected by some fueling changes in regulatory, and have a tendency to be preceded by some widely recognized shock, e.g., either economical, technological or industrial shock. Indeed, these situations tend to drive the overall valuations of the market upwards, and mergers are more likely to occur in overvalued markets, as proposed by Rhodes-Kropf and Viswanathan (2004) who conclude the general market-wide overvaluation and large intentions to realize that value having a clear tendency to foster merger

waves. What is also found common for most of the waves is the coinciding event forcing an end for the wave. Typically, this is considered to be a general stock market crash, caused by some external shock or wider pressure for a correction within the valuation levels. However, what is seemed to be unique and different across the waves are the underlying motives behind the takeovers in each wave, as shown in history. In order to aim for predicting ability of such events, it is important to understand what the main drivers behind the transactions are, and how they have changed over time.

2.2.1 Different characteristics of historical merger waves

As mentioned, the patterns of M&A activity tend to vary across the different waves as there are different underlying motives, prevailing market conditions and expected economic effects of mergers, which are important aspects when aiming for predicting ability of such transactions. Heretofore, there are six global merger waves identified and acknowledged within the previous literature, complemented by the apparent wave that the global economy was very recently going through until the mid-2022. When looking at the historical transaction volumes, which firmly started to increase again some years after the financial crisis, the seventh wave could be considered to occur. What is surprising is that the stock market crash caused by the global covid-19 pandemic did not pose the wave to burst, but instead it got fuelled by the rapid recovery within financial markets after that, thus resulting the ever-booming M&A activity in 2021, as also stated in Reuters (2021).

Back in the history, the first wave in the 1900s, also called the Great Merger Wave, occurred at the time that is well-known for its rapid changes in technology and increased innovation within the industrial processes. As the transactions at that time tend to lead into a formation of giant, monopolistic industrial companies, the wave is commonly characterized by its horizontal consolidation within the few main industries in the prevailing economy. This is supported and made evident by several studies focusing on the first

merger waves at the beginning of the twentieth century e.g., Stigler (1950), Markham (1955) and Nelson (1959).

However, whereas the mergers during the first wave at 1900s were motivated by the attempt to form industrial monopolies, the compilation of continuous series on mergers occurring in 1920s' wave included strong oligopolistic characteristics, as at the end of the wave the industries in general were dominated by several newly merged companies instead of one giant dominant controlling a large proportion of the market. Accordingly, a common motive behind the vertical merger was an intention to achieve any economies of scale as well as to strengthen the firm's competitive position, as the mergers were obtained between smaller companies operating in the quite-monopolistic industry, but still left out in the formation of such industrial dominants seen within the previous wave (Stigler, 1950). The transformation from monopoly to oligopoly was also driven by the regulatory change in the US as the antimonopoly law was refined after the case of Northern Securities in the end of the first wave, which naturally became a further discouragement to horizontal mergers (Stigler, 1950). However, Eis (1969) studied the effects of this new regulation and the enforcement of such antitrust laws, and concluded that the existence of such legislation did not actually have significant effect on the characteristics of current merger activity, and thus fails to efficiently prevent the reduction of competition. This was also somewhat concluded by Stigler (1966) as well, as the Sherman Act turned out to have only a very modest effect in reducing monopolistic intentions. However, and in addition to the already mentioned oligopolistic trend within the second merger wave, several academicians have also pointed out the obvious existence of vertical and diversified mergers, as proposed e.g., by Markham (1955). Through these vertical integration and product diversification intentions the firms were able to seek improved technical efficiency and financial security.

Mergers during the 1960s wave were all about the diversifying integrations and formation of conglomerate firms, again driven by the regulative changes as the existing leg-

islation (Clayton Act) was complemented with a tighter anti-merger statute of 1950 Celler-Kefauver Amendment. Contrary to the effect of the previously set antitrust regime, this statute was proven to have a significant effect in discouraging horizontal mergers (Stigler, 1966) and thus driving the trend more towards the expanded product range and diversified revenue streams. The underlying motives, that were driving the M&A activity during the third wave, were companies' intentions to seek growth from the broader markets, and this kind of diversification allowed one to increase its value while reducing the earnings volatility. Accordingly, and as Herrmann (1973) concluded based on his questionnaire-based study on takeover motives, conglomerate managers were seeking more of a diversification and reduction of risk rather than managerial economies or expertise.

In turn, the main feature of the 1980s wave was de-conglomeration of firms, congeneric mergers, corporate raiders and hostile takeovers functioning as a common corporate governance mechanism. These trends were triggered by the changes in antitrust policy, deregulation of financial markets, and new innovations within the financial services sector, as well as the technological development within the electronics industry (Martynova and Renneboog, 2008). Previously experienced tendency to diversify business operations turned again towards the willingness to be more industry-focused as companies became more willing to restructure their businesses and eliminate all operational inefficiencies obtained from the attempts to build big conglomerates. For the first time in the history of merger waves, the market for corporate control was also featured by divestitures, hostile takeovers, and going-private transactions within this fourth wave. Additionally, some cross-border activity was also obtained. As the main motive, both Bhide (1990) and Shleifer and Vishny (1991) present the need for reorganizational changes in conglomerated, and thus inefficient business structures, for the corporate control activities experienced within the fourth merger wave.

Driven by economic globalization, recent technological developments, deregulatory actions, and rapid economic recovery as well as booming financial markets, the 1990s wave can be characterized by internationalization, as the takeover market surged on a global

scale, especially in Europe and Asia. Remarkable proportion of the transactions were made cross-border and within the same industry, while the main motive for takeovers was global growth due to the tightening international competition, thus causing an intention to obtain greater economies of scale and emphasize longer term business strategies (Martynova and Renneboog, 2008). This fifth wave subsided due to the global tech bubble and the following stock market crash, but just to surge again at the beginning of the 21st century in a form of the sixth wave, while continuing its previously started industry consolidation and expansion on a global scale. At the latest within that sixth wave in 2000s, the current trend regarding the takeover activity had in general switched from hostile to friendly negotiative, and the low interest rates and cheap capital, resulting from the loosened monetary policies, encouraged the vast rise of Private Equity Funds and leveraged buyouts. Increased shareholder activism was thereby shaping the way companies are managed and affecting strategic choices of the company. During this wave, a relatively large number of companies were also subject to take private transactions and thus delisted by the private equity groups, as those companies were conjectured to have better growth prospects with a more centralized ownership base. Like in every other preceding wave, the sixth wave of mergers also ended with the collapse of the stock market, this time due to the Subprime and global financial crisis.

2.2.2 More recent characteristics of M&A

Very recently, we have experienced a seventh merger wave, which started to evolve sometime after economies being recovered from the financial crisis aftermath, and was further triggered by the global Covid-19 shock and by the related bounce back. The wave in general has been fuelled by numerous factors such as abundance of external capital at tenuous interest rates, favourable monetary policies and government stimulus, ESG as a global megatrend and related desire for impact-positive investments as well as spinoffs of reversed ones, digital reformation of transaction processes, and the forced adoption of the newest technological and digital requirements. According to the PwC's

review of Global M&A Industry Trends (2021), takeover activity will most probably continue to flourish as general optimism within the global economy and the remarkable amount of dry powder held by companies, investors and SPAC buyers will be pushing the deal records further. Also, the acquisitions will most likely be characterized by acquiring different sources of competitive advantages such as technology, innovations, skills and capabilities, since companies' long-term growth will be accelerated by the revenue growth instead of cost synergies. Companies have also widely adopted the attitude to seek additional value through impact implementation and ESG policies included in their business strategy and operations (PwC, 2021; and BCG, 2021). So far, it seems that the latest merger wave has come to its end as the deal volumes in the second half of the 2022 drastically dropped together with the steep decline in global stock market valuations, most likely due to a rising inflation and interest rates as well as increased geopolitical tensions causing times of uncertainty and market volatility (PwC, 2023).

Whereas the purpose and result of the majority of mergers within the first wave in history was a creation of monopolistic industrial dominant, a common goal for mergers within the second wave was oligopoly. This was followed by several other waves characterized by a growth through diversification and creation of conglomerates, corporate divestitures and specialization, hostile takeovers, and attempts to internationalize and grow through cross-border mergers. These trends have shaped the base of companies across time and led to a current economy dominated by more industry-focused, big multinational corporations. However, takeovers nowadays are mostly driven by both strategic and economic rationales, as seen from the development of characteristics towards the latest wave, and the deals are more seen as transformational ones. According to PwC's Annual Global CEO Survey (2021), most company strategies included M&A activity as a tool to accelerate growth, pursue scale and reshape the business with digitalization. This is in line what is concluded already by Wang and Moini (2012) who present the most popular rationales and motives for current M&As being geographical expansion, product extension, growth potential, economies of scale and technical capabilities. They also

conclude that the current focus within M&As is seen to be on core businesses and horizontal transactions instead of diversification. To conclude based on the latest findings, what could intuitively be considered as being typical for the deals executed within the most recent or currently undergoing merger wave, is the clear desire for (technological) innovations, new products, additional capabilities and geographical presence resulting from the increased global trade.

2.3 Takeover profitability and announcement premiums

Despite the ambitious and even reasonable motives behind the majority of corporate control decisions and takeover attempts, the empirical evidence bears witness to the fact that significant share of M&A deals tend to fail to create shareholder value in the acquiring company (see e.g., Block, 1968; Varaiya and Ferris, 1987; Moeller et al., 2005; Sirower and Sahni, 2006; and Craninckx and Huyghebaert, 2011). Unfavorable, value-destroying, and risky decisions or overstated synergy gains can be interpreted from the market's reaction that is following the deal announcement, as the acquirer's stock price appreciation tends to be relatively guarded, or even negative at the time of the announcement. The market's (typically) negative response tends to intuitively reflect investors' skepticism about the takeover decision, valuation of the target, and achievability of the expected synergies (Sirower and Sahni, 2006). As already stated, the expected synergies are typically used to justify the merger itself as well as the acquisition premium to be paid, which refers to the price exceeding the current market value of the target company. However, those premiums tend to effectively result from the overpayment and overvaluation of the magnitude of those expected synergies, value of the control of the firm, and potential growth opportunities (Damodaran, 2011, p. 309), but may intuitively be also affected by the form of payment, especially if a highly valued acquirer is using its stock as part of the payment mechanism. Prior literature is still failing to provide specific economic gains that would warrant such high premiums to be paid on takeover targets (Betton, Eckbo, and Thorburn, 2008, pp. 312-314).

What comes to the valuation of the target in general, the obtained value of takeover (and obviously the premium needed to be paid) is highly dependent on the motives of the transaction, but also on the timing as the empirical evidence indicates that lower value enhancement phenomenon is naturally coincided with mergers that are executed at the end of the merger wave (Martynova and Renneboog, 2008). As mentioned, the most commonly used rationalization for a target's (premium) valuation incorporates at least the value of expected synergies and control of the firm, but some speculative determinants for the paid premium is also piled on managerial hubris, that is proved to have some explanatory power over the large takeover premiums as concluded by Hayward and Hambrick (1997). Historically, the concept of takeover premiums has been studied from several different angles, and a number of explanations and rationalizations have been provided within the prior research. For example, Nielsen and Melicher (1973) concluded that the (low) level of the target's profitability and related operating expectations are significant rationalizations for the above-normal premiums paid by acquiring firms, indicating though some potential recognized operational enhancements to be achieved e.g., through the production and distribution economies, or replacing the current management. Building on a more recent academic findings, Fulghieri and Sevilir (2009) showed empirical evidence of the higher premiums being paid for particularly innovative target firms operating in highly competitive markets and industry.

However, these acquisition premiums have historically yielded superior returns for the shareholders of the target company, which is also considered to be one of the main motives for this study as it would be highly beneficial for investor to be able to identify those potential target companies well in advance and consistently gain above-market returns due to high takeover premiums. According to Nielsen and Melicher (1973), the range for so-called "normal" premium payment for a target shareholder is between 20 and 30 per cent, but above-normal rates does occur as well. Supporting evidence is provided e.g., by Block (1968) who presented even the 35 per cent price appreciation due to the merger announcement as an "merger effect", and similarly by Shad (1969) and Gort (1969) showing a median premium of 22 per cent and 18 per cent respectively being offered

over the market price for the sellers in purchases of their stock for cash. Also Wansley et al. (1983) tested the acquisition premiums by utilizing the results of the prior study by Stevens (1973) to form an investment strategy and generated risk-adjusted annual returns in the range of 10 to 20 per cent by investing in potential target companies holding a certain type of financial profile, as defined by Stevens.

What comes to the more recent evidence around the announcement premiums, Damodaran (2011, p. 309) presents a rough 20 percentage's control premium that the acquirers need to pay to acquire and gain the control of a publicly traded target firm. However, paying a premium over the market price may easily result in overpayment as the market might already incorporate some implications of the current value of the control into the share price. Sirower and Sahni (2006) support the view of sellers being the biggest beneficiaries of mergers, yielding an average premium of 20 percent during the 1995-2001 wave, also similarly documented by Andrade et al. (2001) who showed average three-day abnormal return of 16 percent, and 24 percent over the longer event window, while the median bid premium being approximately at 35 percent. Moeller et al. (2004) provided evidence about superior acquisition premiums being as high as 68 percent on average when acquired by a large firm. BCG's M&A report (2021) presents a slightly higher, but more recently ended long-term average from 1990-2021 for a one-week acquisition premium being at 30.7 percent. While the magnitude of the premium varies depending on the event window around the announcement, the superiority of the announcement premiums for acquisition targets are undisputed across the time, and indifferent regarding the other deal-specific characteristics.

But how sustainable is the concept of takeover premiums? At least in theory, stocks could not be mis-priced and above market-level returns not be systematically achieved due to the prevailing efficiency of the markets, as proposed by Fama (1965) when introducing the efficient market hypothesis. However, as the markets in practice very seldomly, if ever, show a strong form of efficiency while failing to incorporate all the available, both

public and non-public information into the current stock prices, the existence of underpriced assets (i.e., predicted takeover targets-to-be) indeed is possible. Thus, as long as the insider information about the upcoming M&A transaction initiatives do not leak, the share price should not rise before the announcement, hence implying an occurring inefficiency within the market and the market's failure to incorporate private information into the current price of an asset. In other words, as long as the prevailing market conditions are not fully efficient, which practically is very likely, the concept of takeover premiums could allow one to systematically gain superior returns and outperform the market.

2.4 Previous research and empirical evidence on target predictability

Historical accounting data has been widely used for various company analysis and predictive purposes over time, and the usage of financial data and ratios has nowadays evolved far beyond the most traditional ratio analysis used in the history. Probably the best-known pioneering study for corporate event prediction purposes in history is provided by Altman (1968), as he introduced the Z-score to be used for bankruptcy prediction. Altman successfully assessed the analytical quality of financial ratio analysis and developed a universal model by utilizing a multiple discriminant analysis, which thus provided a formula that is able to predict the probability of corporate defaults. This gave a solid, promising base for further studies in the means of predicting different corporate events, such as takeovers. Consequently, and as concluded by Tunyi (2021), the first era of takeover prediction modeling took place roughly during the years 1968-1985 while the focus was solely on an identification of typical characteristics of target firms, captured with several traditional financial ratios.

Indeed, the subject of takeover predictability came into the academicians' greater interests at the turn of the 1970's as Simkowitz and Monroe, as mentioned in Stevens (1973), provided preliminary evidence that there exists a clear distinction between target and non-target financial characteristics, based on which the companies could be classified

accordingly. The finding was thereupon supported by several other subsequent studies as well, with slightly differing set of descriptive variables, such as Stevens' (1973) who found that regardless the motive for takeover, the financial characteristics are able to distinguish between targets and non-targets, or Belkaoui (1978) who also proposed one set of typical financial characteristics for the potential takeover target companies. Similarly, Harris et al. (1982) studied the product market characteristics in addition to financial ones as predictors and found significance within their statistical model, thus strengthening the existing evidence further. Supporting findings were also introduced at that time by several other scientific articles and studies, including e.g., Nielsen and Melicher (1973), Firth and Singh (as mentioned in Bartley and Boardman, 1990), Wansley et al. (1983), Hasbrouck as mentioned in Barnes (1999) and Bartley and Boardman as also mentioned in Barnes (1999). These preliminary studies around the topic were able to develop useful classificatory models while generating classification accuracy around 60 to 75 percent for the sample, and thus obtain valuable insight about the motivations for corporate control activity and takeovers at that time. However, methodological biases have obviously occurred as stated e.g., by Palepu (Ambrose and Megginson, 1992), but the importance of the preliminary findings is still undisputed since they are providing a solid basis and essential fundamentals for the further research. Also, may it be added that Wansley et al. (1983) already had provided some evidence against Palepu's claims about non-random sampling by showing the market being able to identify acquisition targets and merging firms well before the merger announcement date while using randomly selected non-target firms too.

The prior research around M&A prediction has been widely grounded and built upon a few traditional and common conceptions of explanatory hypotheses popularized by Palepu, as mentioned e.g., in Parungao et al. (2022) and adopted by several other subsequent studies as well, such as Ambrose and Megginson (1992), Barnes (1999), Cudd and Duggal (2000), Meador et al. (1996), Powell (1997, 2004), and Walter (1994). This conception being used typically includes the inefficient management hypothesis, growth-resource mismatch hypothesis, industry disturbance hypothesis, size hypothesis,

market-to-book hypothesis, and price-to-earnings hypothesis. Since then, more recent studies have also implemented number of complementary additions into the predictive models taken from the finance literature, such as financial leverage, liquidity, level of capital expenditure, dividend payout policy, and stock market trading related data. In general, these hypotheses grounded on prior finance theories were common for the studies occurring during the so-called second era (1986-2002) of takeover prediction, aiming for more developed and extended prediction models in order to build a superior investment strategy as concluded by Tunyi (2021). Nonetheless, the empirical findings regarding the typical target characteristics do still somewhat vary depending on the epoch of the merger and the currently undergoing trends and motives within the merger market, and no utter results are yet provided. All in all, as noted earlier, there is still a universally shared view and common agreement among the academicians that the financial accounting ratios indeed are useful for characterizing merging companies and acquisition targets, even though the sets of individual ratios are not uniform. Some merger wave related consistency is still found within the prior research as concluded by Sorensen (2000), according to whom the financial ratios related to liquidity, leverage, and growth were the most relevant identifiers for the targets of M&A transactions executed during the third merger wave in the 1960s, which was generally characterized by conglomerate mergers. In turn, targets during the merger periods of 1970s and 1980s were typically identified by the level of financial leverage, and respectively by size and profitability within the mergers in the 1990s while primarily aiming to capture synergistic gains (De Jong and Fliers, 2020). Sorensen also proposes a view that target companies with above average liquidity might to some extent indicate a higher likelihood to be acquired through an exchange of stock, especially in a highly valued market environment.

High accuracy within the predictive models, even up to 90 percent, have been provided by some of the later studies as well with a slightly varying set of predicting variables and different methodological approaches compared to those first papers published around 1970s and 1980s. Bartley and Boardman (1990) for instance studied the relevance of inflation adjusted accounting data to the prediction of M&A transactions and concluded

that there exists considerable stability within the takeover targets' underlying financial characteristics. Also Barnes (1999) studied the predictability of takeovers by using historical financial data, and similarly to Bartley and Boardman stated that the stability of the model and accounting data being used is a vital element to obtain reliable results over time. The industry-relative ratios were thus also advocated in order to increase the predictability of the model. Ambrose and Megginson (1992) in turn proposed the effect of insider and institutional shareholdings being tested on acquisition likelihood together with traditional financial ratios. Several most recent studies have similarly been able to provide significance within their prediction models, such as Slowinski et al. (1997); Powell (1997, 2004); Doumpos et al. (2004); Ali-Yrkkö et al. (2005); Brar et al. (2009); Cornett et al. (2011); Erdogan (2012); Polemis et al. (2012); Wu and Chung (2019); Davis et al. (2020); De Jong and Fliers (2020); Meghouar and Ibrahimi (2021); and Parungao et al. (2022). In addition to the most commonly used form of predictor variable within the models, financial ratios and characteristics, some new variables have been also proposed, as seen e.g., by Brar et al. (2009) with their enhanced model incorporating some market-related data of the potential targets into the models. Also, both Ali-Yrkkö et al. (2005) and Wu and Chung (2019) provided evidence that corporate innovation in terms of owned patents and capitalized R&D costs increases the probability of a company becoming a takeover target. In contrast to the majority of the prior studies around target prediction and the usage of quantitative data, Parungao et al. (2022) were able to build a predictive model with 67% predictive accuracy by exploiting qualitative data retrieved from the target's shareholder letters, as the academic society had been for some time already calling for additional explanatory factors to be included into the models. What can be concluded is that several different explanatory variables have historically held the ability able to predict future targets and provide high accuracy within the prediction models. What also seems to hold true based on related prior literature is the prediction ability being highly independent on the methodological framework being used, as different frameworks have been presented within the history of takeover prediction literature.

2.5 Specifics about Nordic targets and takeovers

Historically, takeovers and merger waves have been mostly identified, documented, and studied within the major markets such as US, and reliable empirical evidence on European transactions is provided not until the beginning of 1960s for the UK and early 1980s for Continental Europe alone. Even nowadays, there is very limited amount of evidence provided around the takeovers in the Nordics, and especially related to the prediction ability of such events. In addition to the scarcity of prior Nordic-focused research, and what makes it interesting to study the predictability in the Nordics, is that there occurs slightly different dynamics compared to those major ones such as UK or US which could potentially provide some differentiative factors to be utilized further within the prediction model.

First referring to European companies in general and their governance structure, as they are typically based on more concentrated ownership. The control of such mid-sized publicly listed companies is typically held quite narrow and family-based, whereas in US and UK more widely (Geranio and Zanotti, 2012). Whenever there are big families as a major owner, there seems to be differing share class structure as well. Founding families tend to protect their control and voting power over the company by issuing different types of share classes with different voting rights, and this seem to especially apply to Nordic firms as quite many listed firms intuitively have such structure. Another difference mentioned by Geranio and Zanotti is regarding the nature of buyer type, as the core activity of financial buyers in the US tend to be buying out listed companies and taking them private, whereas in Europe it is rarer, and the focus is more on buying private ones and eventually exiting through an IPO.

Moreover, these European rules seem to apply to Nordics as well. In addition, Nordic stock exchanges are in general way smaller than those of the major markets such as US. As the size and number of companies in the Nordics is relatively lower, it is evident that there is also higher industry concentration, typically due to few bigger players dominating the local markets in terms of size. Similarly, as with European firms, Nordic companies

also tend to have highly concentrated ownership base, typically consisting of government or institutional investors (Khalfan and Wendt, 2020). And probably also due to those ownership dynamics, the companies listed in the Nordic stock exchanges seem to be more matured and from the bigger-end out of the local universe of companies, as institutional investors such as pension funds typically prefer companies with low-risk profiles and good ability to pay dividends. Hence, the age distribution of companies tends to be narrower and more tilted towards the matured end. However, due to these special characteristics of the local companies, and the mentioned scarcity of research, Nordic markets could offer an interesting setting to study takeovers and potential predictability of such events.

3 Data and research methodology

This section develops the methodological framework used to model takeover target predictability, in order to capture superior financial returns at the time of merger announcement or to help the management to make better decisions. After introducing the data and sample selection, the selected theoretical hypotheses are reviewed together with the proposed underlying predictor variables to be included in the model. This is followed by the introduction of methodological tools to be used and the statistical model to be built.

3.1 Data collection and sample selection

As this paper aims to study the typical characteristics and potential predictability of Nordic takeover targets over the most recent decade, more specifically during the years 2011 to 2021, quantitative data reported by publicly listed companies will be employed. This specific period is chosen as it covers the most recent merger wave, ignores the era of the preceding financial crisis, and as there is yet a relatively low number of prior research covering that period. Typical target characteristics are to be identified and modeled with the help of selected set of explanatory variables, that are considered to be able to capture the most traditional and generally known merger theories around the takeover prediction and motives of such events. In addition to the most traditional ones, the set is complemented by some supplementary theories and related underlying variables, that have been introduced within the more recent corporate finance literature. The initial sample of the study comprises all the companies listed on the Nordic stock exchanges (i.e., Helsinki, Stockholm, Oslo, and Copenhagen) between 01/01/2010 and 31/12/2021, while requiring all the quantitative data being available for the selected predictor variables. All companies operating in the financial sector are excluded due to their drastically varying company profiles.

Among the total pool of companies being publicly listed during the period of 01/01/2010 - 31/12/2021, every target of a takeover attempt is separated to form a sample for target companies, considering bids from both financial and industrial buyers (review period for bids and takeovers being during the years 2011-2021, allowing one preceding year for predictor variable sourcing). For the control purposes, an additional sample is obtained and similarly comprising Nordic publicly listed companies with a trading history covering the whole referred review period (i.e., 01/01/2010 - 31/12/2021), but which have not been targeted during the period. All the companies are screened, and the transaction data is obtained from the FactSet database (FactSet Research Systems, 2022). The detailed criteria used for the sample screening is illustrated below in the Table 1.

Table 1. Transaction screening criteria and parameters set for estimation sample identification in FactSet Research Systems (2022).

Screening criteria used for target companies (given parameters)	
P1	Transaction Announcement Date: 01/01/2011 to 31/12/2021
P2	Transaction Value (MM): 0.00 to 999,999,999,999.00; Including undisclosed values
P3	Target Sector/Industry (Primary): Excluded: Finance/Rental/Leasing; Financial Conglomerates; Investment Banks/Brokers; Investment Managers; Investment Trusts/Mutual Funds; Multi-line Insurance; Regional Banks
P4	Transaction Status: Included: Canceled; Complete; Pending
P5	Deal Type: Included: Acquisition / Merger; Majority Stake
P6	Target Ownership Type (Target): Included: Public Company
P7	Target Stock Exchange (Target): Included: OMX Nordic Helsinki; NASDAQ OMX Stockholm; First North Sweden; First North Finland; First North Denmark; OMX Nordic Copenhagen; Oslo Bors

Screening criteria used for non-target companies (given parameters)	
P1	Exchange Listings: Oslo, Stockholm, Helsinki, Copenhagen
P2	Is Stock: Share/Common/Ordinary
P3	FactSet Industry: Excluded: Finance [4800] sector
P4	Simple Total Return data available for the whole period of 01/01/2010 to 31/12/2021
P5	Number of M&A Deals as a Seller (Target) is equal to 0

After exercising the sample screening and cleaning for overlapping transactions, the resulting preliminary sample consists of 329 targets and 345 non-targets. As few targets have received several bids around the first attempt, the subsequent ones are excluded as the company is thus already being identified as a target. Also, all the companies with

insufficient data points are removed from the sample at this point, resulting in the final sample consisting of 179 target companies. This target sample is further divided into two separate sub-samples based on whether the bidder could be classified as a strategic buyer or a financial buyer, the final distinction being 138 and 41 targets respectively. Correspondingly, the sample of non-target companies is cleaned from companies with insufficient data, resulting a control sample of 206 companies. The final, total estimation sample thus includes 385 companies in total.

The data for sample variables (i.e., different economic, accounting, financial and corporate governance related data) is collected from S&P Capital IQ database (S&P Capital IQ, 2022) for the preceding last twelve months' period before the reported takeover attempt announcement date. Respectively, companies in the control group are using the same set of transaction dates appointed on a random basis, and similarly a last twelve months' observation period what comes to the collection of financial information. Based on the gathered financial data, a varying set of independent variables is comprised and thereafter used to build a fitted statistical model, which could presumably be used for the prediction of potential takeover targets approximately one year prior to the announcement. More detailed introduction and rationalization of the selected variables are presented in the following chapter, after which the methodological framework for the study is introduced.

3.2 Hypotheses about takeover targets and selected model variables

As the findings within the prior research strongly suggest, certain company characteristics and financial profiles are proved to be able to provide a reasonable ex ante indication of a potential merger or takeover attempt towards the company. Thus, a broad set of different explanatory variables will be included into the mathematical model within this study based on their hypothetical ability to classify and predict potential target companies. The initial examination of the potentially relevant explanatory variables is to be

conducted based on the theoretical support of previous literature around takeover theories and concluded hypotheses. This set of hypotheses is mainly grounded upon the six most commonly used and largely anchored theoretical conceptions originally popularized by Palepu (Doumpos et al., 2004), complemented by several additional theories presented within the later literature. The hypothesized theories together with their underlying variables, which are assigned to proxy those theories, are briefly introduced below.

A. Inefficient Management hypothesis

Within the prior finance literature, takeovers are traditionally seen as an efficient mechanism for the replacement of inefficient management, as initially presented by Manne (1965), who proposed the concept of market for the corporate control. By executing a takeover transaction, valuable resources are transferred into the hands of more efficient managers from the less competent ones, who have failed to maximize the company- and shareholder value. Therefore, companies with inefficient management in place would intuitively have a higher probability to become takeover targets.

Majority of related studies have used different accounting rates of returns as a proxy for the management efficiency, such as ROA, ROCE, ROE, ROC (e.g., Kim and Arbel, 1998; Barnes, 1999; Cudd and Duggal, 2000; Cornett et al., 2011; Powell, 2004; Brar et al, 2009; and Meghouar and Ibrahimi, 2021). Other proxies being used are asset turnover (e.g., Doumpos et al., 2004; Meghouar and Ibrahimi, 2021; and Brar et al., 2009), different profit margins (e.g., Barnes, 1999; Brar et al., 2009; and Meghouar and Ibrahimi, 2021) and sales growth (e.g., Brar et al., 2009). Based on this evidence, a similar set of variables is to be used within this study as well, in order to capture the managerial performance within the sample firms. The set is initially to be including ROA, ROE, ROC, ROCE, asset turnover, operating profit margin, pre-tax profit margin and sales growth (3 years' CAGR) for the inefficient management hypothesis.

H_1*: Companies led and managed inefficiently have an increased likelihood to become a takeover target.*

B. Growth-Resource Imbalance hypothesis

The theory based on the growth-resource imbalance hypothesis is grounded on the financing and investment-related decisions of companies under asymmetric information, initially proposed by Palepu (Meghouar and Ibrahimi, 2021). It is suggested that firms with either *i.)* high growth prospects but low financial resources available, or *ii.)* low growth prospects but high resources, are more likely to become takeover targets. By utilizing this imbalance, acquiring companies are thus able either to gain excess cash flows or excess growth opportunities, but which the target company has not been able to fully exploit. Financial resources are typically captured by liquidity and leverage-related ratios, and prior studies suggest that high sales growth firms with low liquidity and high leverage are more likely being targeted (e.g., in Palepu's study, as mentioned in Powell, 1997; Ambrose and Megginson, 1992; Powell, 1997; Powell, 2004; Kim and Arbel, 1998; Cudd and Duggal, 2000; Cornett et al., 2011; Meghouar and Ibrahimi, 2021). The ratios being used within the prior research are typically yearly sales growth rates to capture growth prospects, quick ratio to proxy the level of liquidity, and debt-to-assets ratio indicating the level of leverage. These single ratios are then used to form a dummy variable based on two above mentioned profiles *i.)* and *ii.)*, and in this particular study, the formation of the explanatory variable is performed by following the design used in Meghouar and Ibrahimi (2021) while also replicating the well-known Palepu's entrenched research design; a dummy variable of value 1 is set for firms with high debt, low liquidity and high growth, OR low debt, high liquidity and low growth. Otherwise, a value of 0 is set. A value is considered as high (low) if it is above (below) the median value of the total sample group.

H_2*: Companies showing an imbalance between growth opportunities and available financial resources have higher probability to become a takeover target.*

C. Industry Disturbance hypothesis

Industry disturbance is hypothesized to affect the likelihood of a company becoming a takeover target as initially proposed by a study by Palepu (Powell, 1997) and used by several later studies as well, such as Cudd and Duggal (2000), Cremers et al. (2009), Brar

et al. (2009), and Meghouar and Ibrahimi (2021). Numerous theories about economic disturbances and merger waves suggest that different economic shocks such as regulations, disruptive technologies or other industry-wide structural changes may affect the attractiveness of a company operating in a certain industry in the eyes of an acquirer, either through a mis-valuation or an ownership of some desired capabilities. This is typically proxied with an industry-related dummy variable taking the value of 1 if the company's primary industry is seen as an attractive one and has thus already experienced another takeover transaction during the last twelve months. Otherwise, the value of 0 is given.

H_3*: Companies operating in attractive industries, that have recently experienced another M&A transaction(s), have higher probability to become a takeover target.*

D. Size hypothesis

As already concluded by Monroe and Simkowitz (Stevens, 1973), typical takeover targets tend to be smaller in size and the takeover likelihood thus is inverse with the size of the firm. Consistent with the theory, the size hypothesis is typically grounded on the argument that the costs of effecting a takeover transaction are clearly a subject to the target size, as the execution costs are lower, funding requirements for the acquisition are smaller, and the defensive actions by the target are more unpretentious when the target company is smaller in size. Along those lines, the size hypothesis is consistently featured in numerous takeover prediction studies such as Palepu as mentioned in several studies such as in Powell's (1997), Jensen (1986), Ambrose and Megginson (1992), Powell (1997, 2004), Kim and Arbel, 1998; Cudd and Duggal (2000), Brar et al. (2009), Cremers et al. (2009), and Meghouar and Ibrahimi (2021). Previous research has suggested the most typical proxies being the log of total assets (e.g., Powell, 1997 & 2004; Cudd and Duggal, 2000; and Meghouar and Ibrahimi, 2021), log of total revenues (e.g., Brar et al., 2009; and Meghouar and Ibrahimi, 2021), and log of market capitalization (e.g., Cremers et al., 2009; Brar et al., 2009), which will be tested within this study as well.

H_4*: Company size has an inverse relationship with the likelihood of becoming a takeover target.*

E. Asset Undervaluation hypothesis

According to prior evidence, undervalued companies or more specifically, under-utilized assets tend to have an increased probability of becoming a takeover target as such assets could be seen as highly attractive opportunities in the eyes of an acquiring company due to their "cheap" price. Mis-valuation of company's assets is typically captured by using price-to-book (P/B) ratio, and low P/B ratio tends to be a strong signal of an undervaluation (e.g., Ambrose and Megginson, 1992; Kim and Arbel, 1998; Cudd and Duggal, 2000; Powell, 2004; Meghouar and Ibrahimi, 2021; and Brar et al., 2009).

H_5*: Undervalued companies with low price-to-book ratio have higher probability of becoming a takeover target.*

F. Price-to-Earnings hypothesis

The price-to-earnings (P/E) hypothesis implies that low P/E-ratio firms are more likely to become targeted and acquired, especially by the companies with high P/E-ratio. The rationale behind that is that the acquirer would thus obtain an immediate and arbitrage-like significant capital gain through the acquisition of such target. This traditional view is initially suggested by Monroe and Simkowitz as mentioned in Stevens (1973), and widely used in subsequent studies such as Stevens (1973), Palepu, as mentioned in Parungao et al. (2022), Ambrose and Megginson (1992), Meador et al. (1996), and Cudd and Duggal (2000). Either the price-to-earnings ratio, earnings yield, or dividend yield are typically being used to measure a potential mis-valuation of a company by benchmarking its current valuation towards its capabilities to generate earnings.

H_6*: Misvalued companies with low price-to-earnings ratio have higher probability of becoming a takeover target.*

G. Liquidity hypothesis

It is widely suggested that the probability of a company becoming a takeover target increases also along with an increase in its liquidity-profile as high cash reserves might indicate a company's inability to efficiently allocate its resources, its ability to generate or raise cash, or a lack of tax-efficient ways to distribute the excess cash out to its shareholders. These scenarios would thus make a company seen as highly attractive target, especially from the viewpoint of a financial buyer which typically appreciates cash generative businesses to finance the transaction-related debt. Several ratios are typically used within the prior literature to capture liquidity related characteristics of a company, such as quick ratio (e.g., Barnes, 1999; and Kim and Arbel, 1998), current ratio (e.g., Meador et al., 1996; Kim and Arbel, 1998; Barnes, 1999; and Doumpos et al., 2004), and working capital related ratios (e.g., Stevens, 1973; Ambrose and Megginson, 1992; and Meador et al., 1996).

H_7: Companies with higher liquidity-profile have increased likelihood of becoming a takeover target.

H. Leverage hypothesis

According to the optimal capital structure theory, proposed by Jensen and Meckling (1976), low leverage can in some cases be a sign of incompetent management who vainly might aim to lower a company's level of financial leverage to minimize risks related to the solvency and bankruptcy, and thus leave some debt capacity unutilized and thereby the firm value maximization principle neglected. Accordingly, companies with unused debt capacity might be viewed as attractive takeover targets, as proposed by Stulz as mentioned in Kim and Arbel (1998), and especially for the financial buyers utilizing high levels of leverage when acquiring platform companies into their portfolios. Thus, it is well justified to hypothesize there occurring an inverse relationship between the level of leverage and the takeover likelihood, or the other way around, a positive relationship between the level of solvency and the takeover likelihood. Within prior literature, financial leverage is typically captured with different gearing and solvency ratios describing the company's capital structure and level of indebtedness, such as debt to equity, debt to assets, equity to assets (see e.g., Stevens, 1973; Meador et al., 1996; Kim and Arbel,

1998; Cudd and Duggal, 2000; Doumpos et al., 2004; Brar et al., 2009; and Cremers et al., 2009).

H_8*: Companies with unused debt capacity and low level of leverage have higher probability of becoming a takeover target.*

I. Profitability and Free Cash Flow hypothesis

The profitability hypothesis could be intuitively integrated into the free cash flow hypothesis since the excessive cash flows produced by highly profitable firms tend to attract acquirers and thus indicate increased probability of a company being targeted (e.g., Meghouar and Ibrahimi, 2021). However, the interpretation seems to be two-folding since on the other hand, low profitability and inefficient operation due to e.g., incompetent management may also be an indication of an increased likelihood to become taken over by another company, in accordance with the theory of market for corporate control proposed by Manne (1965) and later supported by Palepu as mentioned in Powell's work (1997).

Nevertheless, the theory behind the free cash flow hypothesis, suggested by Jensen and Meckling (1976) and supported later by Jensen (1986), is grounded on the agency problem as the conflicting interests and incentives between the firm's management and shareholders might lead to value-destroying investment decisions instead of paying excess cash flows out to shareholders as dividends. This especially concerns companies with large free cash flows, which Jensen (1986) defines as cash flows that are left after the firm has invested in all available positive net present value projects, and that have more cash than profitable investment opportunities. The rationale is lying within the capital markets' universal tendency to transfer financial funds towards the most efficient investments, thus indicating that the companies producing large free cash flows could be considered as highly attractive targets for takeovers. Also, as financial buyers tend to typically acquire companies with strong cash generation capabilities to fully exploit the debt financing possibilities to lever up their returns, companies with high free cash flow profiles are more likely to be targeted.

Supporting evidence for the free cash flow hypothesis is provided by numerous studies such as Lehn and Poulsen (1989), who presented free cash flow as a percentage of equity being significantly higher in target companies, and Powell (1997) who showed free cash flow being an important determinant of takeover likelihood. Also, profitability is considered as an important variable to distinguish between target and non-target companies as concluded by Stevens (1973). Within prior literature, financial ratios such as FCF to total assets, operating cash flow to total assets, and FCF to equity are used as proxies for companies' cash flow profiles (e.g., in Lehn and Poulsen, 1989; Powell, 1997 & 2004; and Meghouar and Ibrahimi, 2021). Similarly, different profitability margins are used for capturing the level of profitability together with the cash flow related ratios (e.g., Stevens, 1973).

H_9*: Profitable companies with high free cash flows have increased likelihood of becoming a takeover target.*

J. Ownership Structure hypothesis

Based on theories about the role of an ownership and corporate governance in takeovers, the concentration of ownership structure is deemed to affect the likelihood of takeover as the main shareholders thus hold more control and power to vote in case of an acquisition negotiations (Grossman and Hart, 1980). There is also existing evidence provided within the prior research showing that the level of insider shareholdings influences the likelihood of a company being acquired. For example, Partch and Mikkelson (1989) provided initial evidence about the inverse relationship between the management shareholdings and the likelihood of receiving a takeover bid, as respectively proposed by few other related studies as well e.g., by Song and Walkling (1993) and Shivdasani (1993). This also goes in line with the agency theory as the increased ownership of managers helps to ease the agency conflicts between the managing body and the shareholders, as suggested by Ambrose and Megginson (1992).

Ownership related hypothesis could be seen highly relevant for this research as the focus is solely on Nordic markets, where the ownership and control in public companies tend to be relatively concentrated towards the founder families or large state-owned institutions as blockholders (Khalfan and Wendt, 2020). In such situations, the control of the main owners is typically protected by issuing different share classes and holding shares with superior voting power. However, some prior literature is still proposing opposite thoughts on the effect of such large blockholders on takeover probability. As proposed by Shleifer and Vishny (1986), large shareholders tend to increase the likelihood of a company to become a takeover target as it is then sufficient to only convince the main owner to sell, but on the other hand, large ownership by e.g., family trust may eject the potential bidders due to the superior voting power and control over the firm, if there is no willingness to sell. Nonetheless, it would still be well justified to include the level of institutional shareholdings as well as the possible dual class share existence into the model to see whether it affects the likelihood of a company being taken over.

In order to proxy for the ownership concentration, the proportional share of the total shares outstanding held by a single shareholder is typically being used within the prior literature, as e.g., in Meghouar and Ibrahimi (2021). For capturing the effect of potential insider shareholdings, the percentage of management shareholdings is used, following e.g., Partch and Mikkelson (1989) and Song and Walkling (1993). Similarly, the same design is to be applied to test the effect of the level of institutional shareholdings on takeover probability, as presented in Shleifer and Vishny (1986). In regard to all above-mentioned stakeholders, by following the design of the study by Cremers et al. (2009), a blockholder dummy variable will be also included and the value of 1 thus given for the companies holding more than 5 percentage's ownership stake in their capitalization table, and 0 otherwise. To account for the potential existence of different share classes and potentially varying voting power across the ownership base, a dummy variable will be used in case the company has a dual-class share structure - a value of 1 will be given to such companies and 0 otherwise. As majority of the prior findings are arguing for the inverse relationship for the takeover likelihood, same will be hypothesized here since no

significant objections against the view can be drawn within the recent literature and research.

H_{10}*: Companies with higher ownership concentration and more than one share class have a lower probability of becoming a takeover target.*

K. Growth Prospects hypothesis

As some takeovers are motivated by the new, lucrative growth opportunities enabled by the target, it can be hypothesized that a company with good growth prospects would be highly attractive in the eyes of an acquirer, who is seeking additional growth options. However, it is not unambiguous how to measure such growth prospects, but several prior studies have still successfully managed to use related proxies in their predictive models. For example, Meghouar and Ibrahimi (2021) used the level of R&D expenditure in relation to total assets to proxy the value of future growth prospects, as R&D activity can be seen as a clear investment into future growth. Touching on the topic, Kim and Arbel (1998) have similarly suggested the relative capex hypothesis to capture commitments into the company's future growth through adequate maintenance expenditures and capital investments into physical assets. This is proxied with the ratio of capital expenditure to total assets. Also, historical growth rate could intuitively indicate a current ongoing momentum and continuation in growth in the near future as well. Accordingly, past compounded sales growth could be used as one of the explanatory factors to capture possible growth potential, which is supported by prior research as well. For example, Wansley et al. (1983) concludes that high growth companies are more likely to become targets while using three years' historical compounded annual sales growth rate as a measure in their predictive model.

H_{11}*: Companies with higher growth prospects have increased likelihood of becoming a takeover target.*

L. Stock Market Characteristics hypothesis

As hypothesized by Kim and Arbel (1998), firms with high stock market trading volume are more likely to become targeted due to the higher marketability of the shares and thus lower transaction related costs. In order to test the effect of trading volumes, the relative portion of average trading volume to total shares outstanding is calculated and included in the predictive model. Similar measure was also used in the study by Meador et al (1996) to proxy a firm's stock market characteristics. Also Brar et al. (2009) included trading related predicting variables into their model and concluded that short-term price momentum and trading volume were significantly influencing the likelihood of a company to become a target. Needless to say, the trading related data should thus be also included in the predictive model of this study, while following the design presented within those above-mentioned studies.

H_{12}*: Companies with higher stock market trading volumes and enjoying stronger share price momentum have higher probability of becoming a takeover target.*

Based on all those above-mentioned theories on takeover prediction and corporate finance presented within the prior literature and research, a broad set of explanatory variables are collected and employed in a predictive model of this study. However, before applying those hypothesized variables into the regression analysis, potential multicollinearity is tested by using correlation coefficient matrix, and only the variables showing a moderate coefficient (i.e., at or below the magnitude of 0.70) are kept in the sample. This procedure is carried out to prevent a high correlation among the sample variables and thus potential resulting biases. As a result of testing for multicollinearity, the most appropriate variables are being included into the regression analysis based on their expected ability to classify and predict potential target companies. A summary of all the presented hypotheses, related independent predictor variables, and the expected effect of each variable hypothesis on the takeover likelihood is presented in the Table 2 below. Also, the descriptive statistics of the model variables are presented in the Appendix 1.

Table 2. Hypotheses, independent predictor variables and expected effect on takeover likelihood.

Hypothesis		**Independent predictor variables**	**Expected effect[1]**
H_1	***Inefficient Management hypothesis*** *- Companies led and managed inefficiently have an increased likelihood to become a takeover target*	ROA ROCE Asset turnover	*negative*
H_2	***Growth-Resource Imbalance hypothesis*** *- Companies showing an imbalance between growth opportunities and available financial resources have higher probability to become a takeover target*	Growth-resource imbalance – Dummy[2]	*positive*
H_3	***Industry Disturbance hypothesis*** *- Companies operating in attractive industries, that have recently experienced another M&A transaction(s), have a higher probability to become a takeover target*	Industry – Dummy[3]	*positive*
H_4	***Size hypothesis*** *- Company size has an inverse relationship with the likelihood of becoming a takeover target*	Ln total revenue	*negative*
H_5	***Asset Undervaluation hypothesis*** *- Undervalued companies with low price-to-book ratio have higher probability of becoming a takeover target*	P/B	*negative*
H_6	***Price-to-Earnings hypothesis*** *- Misvalued companies with low price-to-earnings ratio have higher probability of becoming a takeover target*	P/E Earnings yield Dividend yield	*negative*
H_7	***Liquidity hypothesis*** *- Companies with higher liquidity-profile have increased likelihood of becoming a takeover target*	NWC / Total assets NWC / Sales Cash & equiv. / Total capital employed Quick ratio	*positive*
H_8	***Leverage hypothesis*** *- Companies with unused debt capacity and low level of leverage have higher probability of becoming a takeover target*	Total debt / Equity	*negative*
H_9	***Profitability and Free Cash Flow hypothesis*** *- Profitable companies with high free cash flows have increased likelihood of becoming a takeover target*	EBIT margin EBT margin Free cash flow / Total assets	*positive*
H_{10}	***Ownership Structure hypothesis*** *- Companies with higher ownership concentration and more*	Ownership concentration (%)	*negative*

[1] A positive (negative) sign indicates that the certain variable increases (decreases) the likelihood of takeover

[2] Dummy value of 1 is set for the firms with high debt, low liquidity and high growth, OR low debt, high liquidity, and low growth. Otherwise, a value of 0 is set. A value is considered as high (low) if it is above (below) the median value of the total sample group.

[3] Dummy value of 1 if the company's primary industry has experienced another M&A transaction during the last twelve months, otherwise value of 0.

Hypothesis		Independent predictor variables	Expected effect[1]
	than one share class have a lower probability of becoming a takeover target	Insider shareholdings (%) Institutional shareholdings (%) Dual-class shares – Dummy[4]	
H_{11}	***Growth Prospects hypothesis*** *- Companies with higher growth prospects have increased likelihood of becoming a takeover target*	R&D / Total assets Capex / Total assets 3Y Sales CAGR	*positive*
H_{12}	***Stock Market Characteristics hypothesis*** *- Companies with higher stock market trading volumes and enjoying stronger share price momentum have higher probability of becoming a takeover target*	Avg. trading Vol. / Shares outstanding Three months' price momentum	*positive*

3.3 Methodology

Among the early literature, a statistical technique of discriminant analysis has been commonly used to find a suitable linear model, which is then employed for the predictive purposes (see e.g., Altman, 1968; Stevens, 1973; Wansley et al., 1983; Bartley and Boardman, 1990; Barnes, 1999; and Slowinski, 1997). However, probit and logit models of regression analysis have since then been more widely employed and preferred within the later studies, as they *i)* allow the testing of significance of individual variable when modeling the categorical outcomes, *ii)* holds the ability to incorporate nonlinear effects, and *iii)* impose less restrictive statistical assumptions. Such models have been used for example by Ambrose and Megginson, 1992; Walter, 1994; Powell, 1997; Kim & Arbel, 1998; Sorensen, 2000; Powell, 2004; Ali-Yrkkö et al., 2005; Cremers et al., 2009; Brar et al., 2009; Polemis & Gounopoulos, 2012; De Jong and Fliers, 2020; and Mendes, 2021). The difference between logit and probit models in turn lies within the underlying distribution, as the former one uses a cumulative logistic function to transform the model while the latter uses a cumulative normal distribution (Brooks, 2008: p. 562-565). Most recent papers within this field of research seem to be employing logit model more often rather

[4] Dummy value of 1 will be given for companies with a dual class share structure, otherwise value of 0.

than probit model, and its dominance is deemed heavily rely on the fact that it has more relaxed assumptions (i.e., no requirements related to normal distribution, linearity, or homoscedasticity) compared to many other methods used for similar purposes, such as the previously mentioned discriminant analysis. Naturally, logit models do have some limitations as well, such as related to the mentioned assumption of linearity between the dependent and independent variables and its inability to capture those multi-faceted relations among the variables, but it is still seen as most appropriate approach for predictive studies like this.

3.3.1 Prediction model specification

As mentioned, a multinomial logistic regression analysis will be employed within this study to find appropriate model parameters, that could be able to correctly predict and estimate the likelihood of a company being targeted, by determining the categorical outcomes of the dependent variables given the selected set of explanatory variables. As a limited dependent variable, a target dummy will be used and regressed against a selected set of independent variables, that have been either widely accepted and exploited within the past literature or are by any means theoretically able to be rationalized for being suitable for predicting purposes. As stated, logistic regression is well proven to be a suitable method for predictive purposes as it has been successfully applied within the prior literature. However, in a typical prediction model setting, in which takeover targets are treated as belonging to one homogenous group (i.e., in a binomial framework classified as either targets or non-targets), differences between strategic and financial buyer motives and rationales are thus ignored. This may result in biased probabilities and poor predictability within the obtained models and should thus be taken into account. A fortiori, as learned from the academic literature, target characteristics have typically had some tendency to be dependent on the underlying motives of the transaction and should therefore to some extent be subject to the type of the bidder as well. The distinction between the buyer types, financial and strategic buyers, is thus carried out as a part

of the analysis as it could intuitively be justified to assume there being differing objectives and thus views about the ideal target characteristics between the buyer types. This rationalization has been supported by some prior studies as well, such as Gemson (2021), who found significant differences between the target characteristics depending on whether it was acquired by either financial or industrial buyer. Consequently, our target company sample was thus divided into two separate sub-groups based on the type of their ultimate buyers for the further review and more accurate model building purposes.

All things being considered, the multinomial model of logistic regression is applied within this study as it allows one to distinguish between the number of different buyer types and is thus expected to provide higher significance and explanatory power when compared to the pure binomial model. Accordingly, the dependent dummy variable in the model is to be defined as *0* if the company is considered as a non-target, *1* if considered as a target and is merged with or acquired by the *strategic buyer*, and *2* if targeted and acquired by the *financial buyer*. The logistic function is specified as follows (Brooks, 2008: p. 562):

$$F_{(z_i)} = \frac{exp(z_i)}{1 + exp(z_i)} = \frac{1}{1 + exp(-z_i)} \tag{1}$$

where F is the logistic function of any random variable z of the firm i, and exp is the exponential under the logit approach. The estimated multinomial logistic classification model, also called softmax model, that is being used for calculating the probabilities of different categorical outcomes for each company in the prediction sample, is specified as follows (Maddala, 1983):

$$P_{ij} = \frac{\exp\left(\beta_j' X_i\right)}{1 + \sum_j exp\left(\beta_j' X_i\right)} \tag{2}$$

where the model aims to specify the probability P_{ij} of the company i belonging to the outcome of j (i.e., being a non-target if $j = 0$, a strategic target if $j = 1$, or a financial

target if $j = 2$) as a function of a vector of target-specific explanatory variables X_i of the firm i. In turn, β_j is a vector of parameters of a logistic model to be estimated, and in order to identify those model parameters, the normalization $\beta_0 = 0$ is imposed. Given the normalization, the mathematical specification of each logit model can be interpreted as follows (Powell, 1997):

$$ln\left(\frac{P_{ij}}{P_{i0}}\right) = \beta_j' X_i \quad (3)$$

Unlike the traditional regressions, the estimated model parameters (i.e., $\beta_1, \beta_2, \ldots, \beta_n$) are determined by applying maximum likelihood method, instead of e.g., ordinary least squares, as in linear regression. As an output, the logistic regression analysis produces the logit model, which is then to be applied for predictive purposes by calculating the probabilities of alternative outcomes. The explanatory power of the produced models can be tested by using McFadden's R^2, which corresponds to the R^2 being used in the ordinary regression analysis.

After delivering the logistic function, a full run-through for the total sample is carried out by applying the equation 2, in order to test the prediction accuracy of the estimated model. In its simplicity, the predicted outcome is determined based on the calculated probabilities for P_0, P_1 and P_2 being calculated. Among the three different potential categorical outcomes (i.e., non-target, strategic target, or financial target) the one with the highest probability is set to be true. The relative proportion of correct outcomes out of the total predicted outcomes is set to measure the model accuracy.

In addition to multinomial model, a simple binomial model is also estimated for the comparison purposes beside the multinomial one. Binary logit is essentially quite the same, but carrying only two possible categorical outcomes (i.e., $j = 0$ if a non-target or $j = 1$ if a target) instead of three.

4 Results and discussion

The previous sections have provided theoretical background and rationale for the empirical part of the study, as well as presented the data and methodological framework being used. This chapter first presents and analyses the results obtained from the mathematical model built for takeover prediction purposes. This is followed by the prediction stage, in which the predictive ability and accuracy of the estimated model is being tested. After reviewing the results, the chapter of summarizing conclusion will follow.

4.1 Results from model estimations

As previously mentioned, the regression model used within the estimation stage of the study is the logit model, and the delivered estimation results, i.e., the independent variable coefficients, are presented in Table 3 for both multinomial and binomial model setup. Within this study, statistical software Stata was used to run the regression analysis on the data for the year preceding the takeover date. A positive sign on a parameter coefficient implies that an increase in the corresponding explanatory variable also increases the likelihood of a company becoming targeted, and the opposite applies to the negative sign. As the logistic regression is being used within this study, McFadden's Pseudo-R^2 is exploited as a measure of goodness-of-fit and explanatory power of the model, instead of R^2 that is used in ordinary regression analysis. The delivered Pseudo-R^2 values of 0.45 and 0.55 for multinomial and binary models respectively are indicating a high ability of the predictor variables to predict the outcome of the response variable. Further, as an additional observation, categorizing the target types into a one binary target group and modeling takeovers in a binomial framework improves the model's explanatory power as the binary model receives higher Pseudo-R^2 value.

Table 3. Results and parameter estimate of multinomial and binomial logit models.

	Multinomial model				Binomial model	
	Strategic Target		Financial Target		Binary Target	
Variable	**Coefficient**	**P-value**	**Coefficient**	**P-value**	**Coefficient**	**P-value**
A. ROA	2.558	0.133	3.508	0.079*	2.902	0.038**
A. ROCE	0.056	0.984	-4.803	0.267	-1.110	0.672
A. Asset Turnover	0.583	0.223	0.530	0.369	0.612	0.179
B. Growth-Resource Imbalance	0.522	0.352	0.289	0.699	0.452	0.396
C. Industry Disturbance	0.461	0.236	0.758	0.103	0.576	0.115
D. Ln Total Revenue	-0.540	0.000***	-0.272	0.065*	-0.479	0.000***
E. P/B	-0.266	0.015**	-0.235	0.096*	-0.253	0.013**
F. P/E	0.014	0.048**	0.002	0.840	0.011	0.086*
F. Earnings Yield	0.772	0.531	-1.970	0.495	0.502	0.666
F. Dividend Yield	-0.244	0.773	-0.758	0.509	-0.349	0.664
G. NWC / Total Assets	0.422	0.738	1.346	0.430	0.591	0.622
G. NWC / Sales	0.135	0.600	-0.276	0.581	0.100	0.685
G. Cash / Capital	0.742	0.469	1.595	0.269	0.970	0.302
G. Quick Ratio	-0.389	0.044**	-0.377	0.211	-0.403	0.029**
H. Total Debt / Equity	0.712	0.033**	1.032	0.004***	0.798	0.013**
I. EBIT margin	5.759	0.039**	4.020	0.190	6.030	0.019**
I. EBT margin	-0.401	0.654	-1.889	0.085*	-0.887	0.112
I. FCF / Total Assets	-3.418	0.262	-0.385	0.925	-3.191	0.267
J. Ownership Concentration	-4.897	0.000***	-5.108	0.000***	-4.861	0.000***
J. Insider Shareholdings	-7.085	0.000***	-4.266	0.025**	-6.340	0.000***
J. Institutional Shareholdings	-2.931	0.029**	-3.240	0.060*	-2.926	0.019**
J. Dual Class Shares	-3.012	0.000***	-1.821	0.006***	-2.566	0.000***
K. R&D / Total Assets	-7.314	0.272	2.287	0.706	-4.025	0.416
K. Capex / Total Assets	4.327	0.357	1.498	0.813	3.321	0.456
K. Sales CAGR-% 3Y	0.254	0.748	0.635	0.452	0.263	0.721
L. Trading Vol. / Shares Outstanding	-0.216	0.163	-0.203	0.276	-0.214	0.102
L. Price Momentum (3 Months)	6.903	0.000***	6.237	0.000***	6.965	0.000***
Intercept	2.511	0.019**	0.568	0.680	2.507	0.013**
Number of observations				385		385
LR chi2 (54/27)				325.43		291.22
Prob > chi2				0.0000		0.0000
Pseudo R^2				0.4492		0.5476

* 10 % significance
** 5 % significance
*** 1 % significance

Along those lines, the estimated model proposes several significant prediction parameters to hold the ability to predict a potential takeover target. In terms of strategic target characteristics, the multinomial setting implies that smaller companies with fragmented

ownership base, less insider shareholdings, no dual class share structure and high recent price momentum have higher likelihood of being taken over. These findings are statistically significant at the 1% level of significance. Furthermore, at the 5% level, the model also implies that undervalued companies with lower financial liquidity position, higher leverage, higher profitability, and lower share of institutional shareholders have an increased probability of becoming a takeover target. Further, the model suggest that the characteristics of strategic and financial targets are generally quite similar but not entirely, one difference being that financial buyers might more likely target companies with efficient management generating higher accounting rates of return on the company's assets (significant at the 10% level), which is somewhat contrary to what is hypothesized based on the prior literature. However, this specific finding could intuitively be explained by the nature of the buyer's investment strategy, since not every financial sponsor is necessary looking for inefficiently led companies and aiming to make radical changes to the target's governance but may instead want to invest in well-led companies and support the current management in accelerating the growth and developing the company further. Furthermore, the model suggests that unlike strategic targets, financial ones cannot be identified by their liquidity position or relative valuation, as their respective variables cannot be considered as statistically significant at the level of 10% or less.

As could be anticipated based on the above-mentioned similarities among the target types, there are very little differences between the multinomial and binomial models in terms of the implied target characteristics. The binary model setting similarly supports the proposed hypotheses of size, asset undervaluation, profitability, ownership structure and price momentum, while indicating opposite to some of the other hypothesized characteristics; companies with higher accounting rate of return on asset, high relative valuation to its earnings capability, lower liquidity and higher leverage are implied to have higher probability of becoming a takeover target, which is opposite than initially proposed. The summary of the hypothesized and actual outcomes is presented in the Table 4. Typically, the multinomial models have had higher ability to explain target characteristics, as seen in Powell (2004), who successfully exploited multinomial logit model to

separately predict both hostile and friendly targets and found clear differences between the prediction ability of binary and multinomial settings. Also Gemson (2021) provided evidence about differences between strategic and financial target characteristics. These are controversial to the output of the empirical test of this paper, which further indicates that the characteristics of financial and strategic targets are relatively congruent, and the multinomial setting is not able to provide any added explanatory value.

Table 4. Summary of the hypotheses and both expected and actual outcomes.

Hypothesis		**Independent predictor variables**	**Expected effect[5]**	**Actual effect (strategic/ financial/ binary)[6]**
H_1	***Inefficient Management hypothesis -*** *Companies led and managed inefficiently have an increased likelihood to become a takeover target*	ROA ROCE Asset turnover	*negative*	*n.a. /* *positive /* *positive*
H_2	***Growth-Resource Imbalance hypothesis*** *- Companies showing an imbalance between growth opportunities and available financial resources have higher probability to become a takeover target*	Growth-resource imbalance – Dummy[7]	*positive*	*n.a. /* *n.a. /* *n.a.*
H_3	***Industry Disturbance hypothesis -*** *Companies operating in attractive industries, that have recently experienced another M&A transaction(s), have a higher probability to become a takeover target*	Industry – Dummy[8]	*positive*	*n.a. /* *n.a. /* *n.a.*
H_4	***Size hypothesis -*** *Company size has an inverse relationship with the likelihood of becoming a takeover target*	ln total revenue	*negative*	*negative /* *negative /* *negative*
H_5	***Asset Undervaluation hypothesis -*** *Undervalued companies with low price-to-book ratio have higher probability of becoming a takeover target*	P/B	*negative*	*negative /* *negative /* *negative*

[5] A positive (negative) sign indicates that the certain variable increases (decreases) the likelihood of takeover

[6] Same applies as presented in note 5. The proposed outcome of the multinomial model setup for both strategic and financial targets, as well as for the binary targets are presented, in case of significance. The term "n.a." denotes that the variable is insignificant and has no ability to explain target characteristics

[7] Dummy value of 1 is set for the firms with high debt, low liquidity and high growth, OR low debt, high liquidity, and low growth. Otherwise, a value of 0 is set. A value is considered as high (low) if it is above (below) the median value of the total sample group.

[8] Dummy value of 1 if the company's primary industry has experienced another M&A transaction during the last twelve months, otherwise value of 0.

Hypothesis		Independent predictor variables	Expected effect[5]	Actual effect (strategic/ financial/ binary)[6]
H_6	***Price-to-Earnings hypothesis -*** *Misvalued companies with low price-to-earnings ratio have higher probability of becoming a takeover target*	P/E Earnings yield Dividend yield	*negative*	*positive / n.a. / positive*
H_7	***Liquidity hypothesis -*** *Companies with higher liquidity-profile have increased likelihood of becoming a takeover target*	NWC / Total assets NWC / Sales Cash & equiv. / Total capital employed Quick ratio	*positive*	*negative / n.a. / negative*
H_8	***Leverage hypothesis -*** *Companies with unused debt capacity and low level of leverage have higher probability of becoming a takeover target*	Total debt / Equity	*negative*	*positive / positive / positive*
H_9	***Profitability and Free Cash Flow hypothesis -*** *Profitable companies with high free cash flows have increased likelihood of becoming a takeover target*	EBIT margin EBT margin Free cash flow / Total assets	*positive*	*positive / negative / positive*
H_{10}	***Ownership Structure hypothesis -*** *Companies with higher ownership concentration and more than one share class have a lower probability of becoming a takeover target*	Ownership concentration (%) Insider shareholdings (%) Institutional shareholdings (%) Dual-class shares – Dummy[9]	*negative*	*negative / negative / negative*
H_{11}	***Growth Prospects hypothesis -*** *Companies with higher growth prospects have increased likelihood of becoming a takeover target*	R&D / Total assets Capex / Total assets 3Y Sales CAGR	*positive*	*n.a. / n.a. / n.a.*
H_{12}	***Stock Market Characteristics hypothesis -*** *Companies with higher stock market trading volumes and enjoying stronger share price momentum have higher probability of becoming a takeover target*	Avg. trading Vol. / Shares outstanding Three months' price momentum	*positive*	*positive / positive / positive*

As mentioned, by looking at the outcome of binomial model, the obtained empirical evidence of this study generally supports the suggested hypotheses of size, asset undervaluation, profitability, ownership structure and stock market characteristics, which is to some extent in line with previous findings. Compared to an analogous binomial setting

[9] Dummy value of 1 will be given for companies with a dual class share structure, otherwise value of 0.

introduced by Powell (2004), the findings are similar in terms of size and liquidity hypotheses, as the obtained model also implies a negative effect of these characteristics on takeover probability. Moreover, whereas the outcome of this paper's study also casts significance on the variables presented within the hypotheses of inefficient management (positive effect), asset undervaluation (negative), leverage (positive), and profitability & free cash flow (positive), Powell's model indicates them to be insignificant while having no explanatory power over typical target characteristics. What Powell in turn finds different compared to the outcome of this study is the significant positive effect of Growth-Resource Imbalance on takeover likelihood. The size hypothesis is similarly supported by Meghouar and Ibrahimi (2021), who in addition showed similar effects of liquidity and leverage but also delivered significance within the growth prospects and resource availability, i.e., the growth-resource imbalance, which is controversial to the results of this paper. Similarly, Harris et al. (1982) supported the size hypothesis within his probit framework, but also the price-to-earnings hypothesis by indicating there being a negative effect on takeover likelihood. On the contrary, their model implies that higher liquidity increases the probability of acquisition. Furthermore, the size and asset undervaluation hypothesis were also supported by Walter (1994), while showing insignificance within the variables proxying the hypotheses of price-to-earnings, liquidity, leverage, and profitability. In turn, Walter showed significant negative effect of asset turnover on takeover likelihood, which could be used to proxy management inefficiency. This is controversial to the output of the model produced within this paper, which indicates there being a significant positive effect on takeover probability, i.e., stating that efficient management increases the risk of being taken over (when proxied with ROA). When comparing the obtained results to the ones presented by Brar et al. (2009), size is again perceived as an important determinant for takeover targets, like proposed many other additional studies as well such as Song and Walkling (1993), Cudd and Duggal (2000), and Bartley and Boardman (1990). Brar et al. are not supporting either the inefficient management or leverage hypotheses, but claims that companies with lower historic sales growth, being less liquid, being affected by industry disturbance, and enjoying higher price and trading volume momentum indicate higher likelihood to become targeted.

4.2 Results from the model predictions

The results from the prediction stage are promising as they support the idea of predicting acquisition targets. This was tested by using maximum likelihood estimation method in order to evaluate the probability of categorical classification within the obtained models, both multinomial and binomial setting. In this method, the estimated model was applied on the total sample of companies to form predicted outcomes, i.e., a classification for each company in the sample, based on calculated probabilities per possible outcome. Based on the obtained probabilities, the outcome with the highest probability is selected and the company is classified accordingly. When comparing those predicted classifications to the actual categorical outcomes, it can be concluded that a high prediction accuracy was obtained as the prediction models generated an average of 83.51% correct predictions. However, and opposite as initially hypothesized, the multinomial model was not able to provide higher accuracy than binomial one. This is not surprising as the multinomial setting couldn't provide any added value in terms of target characterization in the model estimation stage either. The accuracy for the multinomial model was at 79.22%, whereas the binomial model produced a rate as high as 87.79%. The results from the predictions are presented below in the Table 5 and Table 6.

Table 5. Predictions based on the estimated multinomial model.

Multinomial model				
		Predictions		
		Non-target	*Strategic target*	*Financial target*
Actual	*Non-target*	190	16	0
	Strategic target	23	110	5
	Financial target	10	26	5
	Correct predictions	**79.22%**		

Table 6. Predictions based on the estimated binomial model.

Binomial model			
		Predictions	
		Non-target	*Target*
Actual	*Non-target*	185	21
	Target	26	153
	Correct predictions	**87.79%**	

But why isn't the multinomial model better in characterizing and classifying targets, hence opposite as hypothesized? Especially as the model has received significant support within the prior literature, for example by Powell (2004) who concluded that the use of a binomial model specification to model takeover prediction on different target types is likely to be incorrect, and his results give strong support for the use of multinomial framework instead. However, one reason for poorer performance might lie within the unequal distribution of target types and thus a clear lack of financial targets in the sample (only 11% out of the total sample and 23% of total targets are classified as financial targets). Hence, since there is a relatively weak representation of financial targets within the sample it can be that the estimation variables are not deviating enough between the target types and thus showing a somewhat similar characteristics profile and classificatory output. Nonetheless, a natural explanation for the lack of financial targets within the sample might to some extent lie within the observation made by Geranio and Zanotti (2012), who concluded that the takeovers of publicly listed companies are not that typical for financial buyers in Europe, opposite to what they tend to be within the major markets such as in US.

Compared to the obtained accuracies of other predictive models within the prior research, the predictive success of this study is somewhat higher despite the poor performance of the multinomial model and its inability to create additional explanatory value. In 1970s and 1980s, the predictive success of similar studies typically ranged from 65% to 75%, as seen e.g., in Stevens, 1973; Wansley et al, 1983; and Bartley and Boardman in Barnes (1999), whereas slightly higher accuracy rates were subsequently provided in

the 1990s and 2000s, the level ranging mostly from 70% to 80% (see e.g., Bartley and Boardman, 1990; Meador et al, 1996; Slowinski et al, 1997; Kim and Arbel, 1998; Barnes, 1999; Cudd and Duggal, 2000; and Brar et al, 2009). As an exception to the previously mentioned outcomes, one of the highest disclosed rates seem to be provided by Powell (2004), who presented one of his models to hold an ability to classify targets correctly at a rate as high as 96%. Overall, and as become quite clear, the accuracy and prediction ability within the models has come quite far from the evidence presented within the first studies around the takeover prediction. For example, otherwise so pioneering related study by Palepu in Kim and Arbel (1998) reported a prediction accuracy as low as 46%, indicating that investors nowadays should not only have highly advanced and robust tools, but also hold an elevated likelihood to achieve superior returns, as shown within this study as well.

5 Concluding remarks

This study attempts to investigate differentiating characteristics of publicly listed takeover targets in the Nordics, both financial and strategic ones, while building a predictive model to be used as a supportive tool for decision making by either investors or corporate management. As the prior research is lacking such evidence on the Nordic markets, this study contributes to the literature by demonstrating the predictability of takeover targets in the Nordic context, while using financial data of publicly listed companies determined by several theoretical hypotheses. In respect to methodological matters, logistic regression is found to be useful for identifying company-related characteristics and provide high classification accuracy in predictive use. The results of the study give strong support for the hypothesized ability to model takeover likelihood and predict future takeover targets in the Nordics.

Based on twelve hypotheses grounded on previous financial literature around takeover prediction, logistic model is being built to identify differentiating target attributes that could be able to classify companies accordingly into either targets or non-targets well before the takeover attempt. Both multinomial and binomial frameworks are tested, and twelve different explanatory variables are found to be significant while affecting to the likelihood of a company being targeted. However, the results also suggest that there are no meaningful differences between the characteristics of financial and strategic targets as the multinomial model fails to provide additional explanatory power over binomial one.

The results obtained from the binomial analysis support the hypotheses of size, asset undervaluation, profitability & free cash flow, ownership, and stock market characteristics. Additionally, the opposite as hypothesized is implied for the hypotheses of inefficient management, price-to-earnings, liquidity, and leverage. A profile of a Nordic company having the highest likelihood to become targeted is summarized as follows: 1) smaller in size in terms of total revenues, 2) lower ownership concentration and no dual

class share structure in place, and 3) experiencing a positive stock market price momentum within the last three months. In addition, attributes that also significantly increase the likelihood are higher return on assets, mis-valuation in terms of lower price-to-book ratio, higher price-to-earnings ratio, lower liquidity in terms of quick ratio, and lower level of leverage.

The findings are not unique to those presented within the prior literature and many of the commonly tested hypotheses seem to apply in the Nordics as well. What particularly was hypothesized to be special about Nordic stock exchange listed companies was the high concentration of ownership and usage of dual class shares to protect the control of e.g., founder families, and this seemed to be one of the strongest attributes affecting to the targetability. However, what was unexpected and opposite to prior findings was the poor performance of the multinomial model and its inability to create additional explanatory value when distinguishing between the financial and strategic target characteristics.

All things considered, what can be concluded from the results is that the classification ability of the obtained models was slightly higher than many of those presented within the prior literature, the binomial model alone being able to classify with an accuracy of as high as 88%. Hence, it is evident that the obtained predictive model would provide a highly useful tool for an investor who is willing to capitalize on those superior takeover premiums, that are typically paid for publicly listed targets. Also, as stated in connection with the takeover premiums and efficient market hypothesis, those premiums seem to be very sustainable due to the general inefficiency within the market making the exploitation of this anomaly even more attractive. However, and what could be considered as a limitation of this study is that a separate test sample was not used in the prediction stage. Rather, the same sample of companies was used both in the model estimation and prediction stage of the study, which may cause overfitting of the results and thus a biased accuracy rate that is to some extent tilted upwards. Another, a Nordic-specific limitation related to the sample was the lack of financial targets, that are quite rare in

the Nordics, which might explain the poor performance of the multinomial framework within this study. In the future research, these deficiencies should be considered in order to provide more accurate results and findings.

References

Ali-Yrkkö, J.;Hyytinen, A.;& Pajarinen, M. (2005). Does patenting increase the probability of being acquired? Evidence from cross-border and domestic acquisitions. *Applied financial economics, 15*(14), 1007-1017. doi:10.1080/09603100500186978

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of finance, 23*(4), 589-609. doi:10.1111/j.1540-6261.1968.tb00843.x

Ambrose, B. W.;& Megginson, W. L. (1992). The Role of Asset Structure, Ownership Structure, and Takeover Defenses in Determining Acquisition Likelihood. *Journal of financial and quantitative analysis, 27*(4), 575-589. doi:10.2307/2331141

Andrade, G.;Mitchell, M.;& Stafford, E. (2001). New Evidence and Perspectives on Mergers. *The Journal of economic perspectives, 15*(2), 103-120. doi:10.1257/jep.15.2.103

Armour, J., & Cheffins, B. (2014). The Origins of the Market for Corporate Control. *University of Illinois law review, 2014*(5), 1835-1866. Retrieved March 31, 2023, from https://web-p-ebscohost-com.proxy.uwasa.fi/ehost/pdfviewer/pdfviewer?vid=0&sid=4e5611c1-8bb8-47e2-9a97-53d61797bf58%40redis

Barnes, P. (1990). The Prediction of Takeover Targets in the U.K. by Means of Multiple Discriminant Analysis. *Journal of business finance & accounting, 17*(1), 73-84. doi:10.1111/j.1468-5957.1990.tb00550.x

Bartley, J. W.;& Boardman, C. M. (1990). The Relevance of Inflation Adjusted Accounting Data to the Prediction of Corporate Takeovers'. *Journal of business finance & accounting, 17*(1), 53-72. doi:10.1111/j.1468-5957.1990.tb00549.x

Baziki, S. B.;Norbäck, P.-J.;Persson, L.;& Tåg, J. (2017). Cross-border acquisitions and restructuring: Multinational enterprises and private equity-firms. *European economic review, 94*, 166-184. doi:10.1016/j.euroecorev.2017.02.012

BCG. (2021). *Mastering the Art of Breaking Up.* Retrieved March 31, 2023, from BCG: https://web-assets.bcg.com/22/ad/5f1b42634600b8cedf5bf93c9dcb/bcg-2021-m-and-a-report-mastering-the-art-of-breaking-up-oct-2021.pdf

Belkaoui, A. (1978). Financial Ratios as Predictors of Canadian Takeovers. *Journal of business finance & accounting, 5*(1), 93-107. doi:10.1111/j.1468-5957.1978.tb00177.x

Berk, J., & DeMarzo, P. (2017). *Corporate Finance* (4th ed.). Harlow: Pearson. Retrieved March 31, 2023

Betton, S., Eckbo, B., & Thorburn, K. (2008). Corporate Takeovers. In B. Eckbo, & B. Eckbo (Ed.), *Handbook of Corporate Finance: Empirical Corporate Finance* (Vol. 2, pp. 289-427). Amsterdam: Elsevier North Holland. doi:10.1016/S1873-1503(06)01003-8

Bhide, A. (1990). Reversing Corporate Diversification. *The Bank of America journal of applied corporate finance, 3*(2), 70-81. doi:10.1111/j.1745-6622.1990.tb00201.x

Block, S. B. (1968). The Effect of Mergers and Acquisitions on the Market Value of Common Stock. *The Journal of finance, 23*(5), 889-890. doi:10.1111/j.1540-6261.1968.tb00330.x

Brar, G.;Giamouridis, D.;& Liodakis, M. (2009). Predicting European Takeover Targets. *European financial management : the journal of the European Financial Management Association, 15*(2), 430-450. doi:10.1111/j.1468-036X.2007.00423.x

Brooks, C. (2014). *Introductory Econometrics for Finance* (3rd ed.). Cambridge: Cambridge University Press. Retrieved May 6, 2023

Chamberlain, T.;& Fabre, M. (2016). Management Control and Takeover Premiums. *International advances in economic research, 22*(4), 471-473. doi:10.1007/s11294-016-9606-8

Cornett, M. M.;Tanyeri, B.;& Tehranian, H. (2011). The Effect of Merger Anticipation on Bidder and Target Firm Announcement Period Returns. *Journal of corporate finance, 17*(3), 595-611. doi:10.1016/j.jcorpfin.2010.10.004

Craninckx, K.;& Huyghebaert, N. (2011). Can Stock Markets Predict M&A Failure? A Study of European Transactions in the Fifth Takeover Wave. *European Financial Management, 17*(1), 9-45. doi:10.1111/j.1468-036X.2010.00541.x

Cremers, K. J.;Nair, V. B.;& John, K. (2009). Takeovers and the Cross-Section of Returns. *The Review of financial studies, 22*(4), 1409-1445. doi:10.1093/rfs/hhn032

Croft, E.;& Donker, H. (2006). Why bidders like creeping takeovers? *The Journal of Corporate Accounting & Finance, 17*(2), 45-51. doi:10.1002/jcaf.20182

Cudd, M.;& Duggal, R. (2000). Industry Distributional Characteristics of Financial Ratios: An Acquisition Theory Application. *The Financial review (Buffalo, N.Y.), 35*(1), 105-120. doi:10.1111/j.1540-6288.2000.tb01409.x

Damodaran, A. (2011). *The Little Book of Valuation: How to Value a Company, Pick a Stock and Profit.* John Wiley & Sons. Retrieved March 31, 2023, from https://books.google.fi/books?id=28XbN1XG-fQC&dq=The+Little+Book+of+Valuation:+How+to+Value+a+Company,+Pick+a+Stock+and+Profit&hl=fi&lr=

Davis, F.;Khadivar, H.;Pukthuanthong, K.;& Walker, T. J. (2021). Insider trading in rumored takeover targets. *European financial management : the journal of the European Financial Management Association, 27*(3), 490-527. doi:10.1111/eufm.12283

De Jong, A.;& Fliers, P. T. (2020). Predicting Takeover Targets: Long-Run Evidence from the Netherlands. *De Economist (Netherlands), 168*(3), 343-368. doi:10.1007/s10645-020-09364-z

Doumpos, M.;Kosmidou, K.;& Pasiouras, F. (2004). Prediction of Acquisition Targets in the UK: A Multicriteria Approach. *Operational research, 4*(2), 191-211. doi:10.1007/BF02943609

Eis, C. (1969). The 1919-1930 Merger Movement in American Industry. *Journal of Law and Economics, 12*(2), 267-96. doi:http://dx.doi.org/10.1086/466669

Erdogan, A. I. (2012). The Determinants of Mergers and Acquisitions: Evidence from Turkey. *International Journal of Economics and Finance, 4*(4), 72-77. doi:10.5539/ijef.v4n4p72

FactSet Research Systems. (2022, July 26). Dataset for screening target and non-target companies and source for related data. Retrieved July 26, 2022, from https://login.factset.com/login/xoM4jTODNt1DQZiEFfv2epjgwEy_90OY4PMHmCT4nVWBNoOUq5l1gngk-6goz21COdbrZuVD15k0pCIYD-6Iucp8o8wZ2KRMX8YMq9xq_3_4HnMLvSWXbLXmOnxU-psIiBDYpfOqHwk/xoM55/COd37

Fama, E. F. (1965). The Behavior of Stock-Market Prices. *The Journal of Business, 38*(1), 34-105. Retrieved May 1, 2023, from http://www.e-m-h.org/Fama65.pdf

Frydman, H.;Frydman, R.;& Trimbath, S. (2002). Financial buyers in Takeovers: focus on cost efficiency. *Managerial finance, 28*(12), 1-13. doi:10.1108/03074350210768176

Fulghieri, P.;& Sevilir, M. (2009). Organization and Financing of Innovation, and the Choice between Corporate and Independent Venture Capital. *Journal of financial and quantitative analysis, 44*(6), 1291-1321. doi:10.1017/S0022109009990391

Gemson, J. (2021). Private company acquisitions in the market for corporate control: A comparison between private equity and corporate acquirers. *The Quarterly review of economics and finance, 81*, 342-357. doi:10.1016/j.qref.2021.06.014

Geranio, M.;& Zanotti, G. (2012). Equity Markets Do Not Fit All: an Analysis of Public-to-Private Deals in Continental Europe. *European financial management : the journal of the European Financial Management Association, 18*(5), 867-895. doi:10.1111/j.1468-036X.2010.00556.x

Golbe, D. L.;& White, L. J. (1993). Catch a Wave: The Time Series Behavior of Mergers. *The review of economics and statistics, 75*(3), 493-499. doi:10.2307/2109463

Gorbenko, A. S. (2014). Strategic and Financial Bidders in Takeover Auctions. *The Journal of finance , 69*(6), 2513-2555. doi:10.1111/jofi.12194

Gort, M. (1969). An Economic Disturbance Theory of Mergers. *The Quarterly journal of economics, 83*(4), 624-642. doi:10.2307/1885453

Graebner, M. E. (2004). Momentum and serendipity: how acquired leaders create value in the integration of technology firms. *Strategic management journal, 25*(8-9), 751-777. doi:10.1002/smj.419

Greene, D. (2016). The wealth of private firm owners following reverse mergers. *Journal of corporate finance, 37*, 56-75. doi:10.1016/j.jcorpfin.2015.12.002

Grossman, S. J.;& Hart, O. D. (1980). Takeover Bids, The Free-Rider Problem, and the Theory of the Corporation. *The Bell journal of economics, 11*(1), 42-64. doi:10.2307/3003400

Harris, R. S.;Stewart, J. F.;Guilkey, D. K.;& Carleton, W. T. (1982). Characteristics of Acquired Firms: Fixed and Random Coefficients Probit Analyses. *Southern economic journal, 49*(1), 164-184. doi:10.2307/1058550

Hayward, M. L.;& Hambrick, D. C. (1997). Explaining the Premiums Paid for Large Acquisitions: Evidence of CEO Hubris. *Administrative Science Quarterly, 42*(1), 103-127. doi:10.2307/2393810

Herrmann, A. L. (1973). A discriminant analysis and evaluation of corporate acquisition criteria. *University of Massachusetts Amherst: Doctoral Dissertations 1896 - February 2014*, 1-156. Haettu 31. March 2023 osoitteesta https://scholarworks.umass.edu/dissertations_1/5907/

Institute for Mergers, Acquisitions and Alliances. (2023). *M&A Statistics*. Retrieved March 31, 2023, from Institute for Mergers, Acquisitions and Alliances: https://imaa-institute.org/mergers-and-acquisitions-statistics/

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review, 76*(2), 323-329. Retrieved March 31, 2023, from https://www-jstor-org.proxy.uwasa.fi/stable/1818789

Jensen, M. C.;& Ruback, R. S. (1983). The market for corporate control. The scientific evidence. *Journal of financial economics, 11*(1-4), 5-50. doi:10.1016/0304-405X(83)90004-1

Kaulkin, M. (1995). Selling to a Financial Buyer. *The Journal of business strategy, 16*(2), 58-61. Retrieved March 31, 2023, from https://www.proquest.com/docview/202693473/fulltextPDF/956375CB596B484FPQ/1?accountid=14797

Khalfan, T. M.;& Wendt, S. (2020). The impact of ownership concentration on payout across Nordic firms. *Journal of multinational financial management, 56*, 100640. doi:10.1016/j.mulfin.2020.100640

Kim, W. G.;& Arbel, A. (1998). Predicting merger targets of hospitality firms (a Logit model). *International journal of hospitality management, 17*(3), 303-318. doi:10.1016/S0278-4319(98)00023-1

Lehn, K.;& Poulsen, A. (1989). Free Cash Flow and Stockholder Gains in Going Private Transactions. *The Journal of finance, 44*(3), 771-787. doi:10.1111/j.1540-6261.1989.tb04390.x

Maddala, G. S. (1983). *Limited-Dependent and Qualitative Variables in Econometrics.* Cambridge: Cambridge University Press. Retrieved March 31, 2023, from https://books.google.no/books?id=qjTzAgAAQBAJ&dq=Limited-Dependent+and+Qualitative+Variables+in+Econometrics&hl=fi&lr=

Manne, H. G. (1965). Mergers and the Market for Corporate Control. *The Journal of political economy, 73*(2), 110-120. doi:10.1086/259000

Markham, J. W. (1955). Survey of the Evidence and Findings on Mergers. In National, *Business Concentration and Price Policy* (pp. 141-212). Princeton: Princeton University Press. Retrieved March 31, 2023, from https://www.nber.org/system/files/chapters/c0959/c0959.pdf

Martynova, M.;& Renneboog, L. (2008). A century of corporate takeovers: what have we learned and where do we stand? *Journal of Banking & Finance, 32*(10), 2148-2177. doi:10.1016/j.jbankfin.2007.12.038

Meador, A. L., Church, P., & Rayburn, L. (1996). Development of Prediction Models for Horizontal and Vertical Mergers. *Journal Of Financial And Strategic Decisions, 9*(1), 11-23. Retrieved March 31, 2023, from https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=2347adede5322e4e4b65728250788ba07d6d1fd6

Meckling, W. H.;& Jensen, M. C. (1976). Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership Structure. *Journal of financial economics, 3*(4), 305-360. doi:10.1016/0304-405X(76)90026-X

Meghouar, H.;& Ibrahimi, M. (2021). Financial characteristics of takeover targets: a French empirical evidence. *EuroMed journal of business, 16*(1), 69-85. doi:10.1108/EMJB-06-2019-0088

Mendes, P. M. (2021). Takeover likelihood and incentive systems. *Universidade do Porto: Master Dissertation*, 1-60. Retrieved March 31, 2023, from https://repositorio-aberto.up.pt/bitstream/10216/138262/2/519065.pdf

Mockevičius, P. (2014). The Effects of FDI on Economic Growth in Central and Eastern Europe: Mergers and Acquisitions, and Greenfield Investment. *Lund University: Master's Thesis*. Retrieved March 31, 2023, from https://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=4461410&fileOId=4461429

Moeller, S. B.;Schlingemann, F. P.;& Stulz, R. M. (2004). Firm Size and the Gains from Acquisitions. *Journal of financial economics, 73*(2), 201-228. doi:10.1016/j.jfineco.2003.07.002

Moeller, S. B.;Schlingemann, F. P.;& Stulz, R. M. (2005). Wealth Destruction on a Massive Scale? A Study of Acquiring-Firm Returns in the Recent Merger Wave. *The Journal of finance , 60*(2), 757-782. doi:10.1111/j.1540-6261.2005.00745.x

Nelson, R. L. (1959). *Merger Movements in American Industry, 1895-1956.* Princeton: Princeton University Press. Retrieved March 31, 2023, from https://econpapers.repec.org/bookchap/nbrnberbk/nels59-1.htm

Nielsen, J. F.;& Melicher, R. W. (1973). A Financial Analysis of Acquisition and Merger Premiums. *Journal of Financial and Quantitative Analysis, 8*(2), 139-148. doi:https://doi.org/10.2307/2330006

Offenberg, D.;& Pirinsky, C. (2015). How do acquirers choose between mergers and tender offers? *Journal of financial economics, 116*(2), 331-348. doi:10.1016/j.jfineco.2015.02.006

Partch, M. M.;& Mikkelson, W. H. (1989). Managers' Voting Rights and Corporate Control. *Journal of financial economics, 25*(2), 263-290. doi:10.1016/0304-405X(89)90084-6

Parungao, M. E.;Galido, A.;Suazo, M. L.;& Parungao, L. A. (2022). Exploring qualitative data as predictors for M&A: Empirical analysis of target firms' letters to shareholders. *Cogent business & management, 9*(1), 1-33. doi:10.1080/23311975.2022.2084970

Polemis, D.;& Gounopoulos, D. (2012). Prediction of distress and identification of potential M&As targets in UK. *Managerial finance, 38*(11), 1085-1104. doi:10.1108/03074351211266801

Powell, R. G. (1997). Modelling Takeover Likelihood. *Journal of business finance & accounting, 24*(7-8), 1009-1030. doi:10.1111/1468-5957.00148

Powell, R. G. (2004). Takeover Prediction Models and Portfolio Strategies: A Multinomial Approach. *Multinational finance journal, 8*(1/2), 35-72. doi:10.17578/8-1/2-2

Puranam, P.;Singh, H.;& Zollo, M. (2006). Organizing for Innovation: Managing the Coordination-Autonomy Dilemma in Technology Acquisitions. *Academy of Management journal, 49*(2), 263-280. doi:10.5465/AMJ.2006.20786062

PwC. (2021). *M&A Industry Trends: 2021 Mid-year Update*. Retrieved March 31, 2023, from PwC Global: https://pwc.to/3znSPXY

PwC. (2023). *Global M&A Industry Trends: 2023 Outlook*. Retrieved March 31, 2023, from PwC Global: https://pwc.to/3mWE2xL

PwC Annual Global CEO Survey. (2021). *PwC 24th Annual Global CEO Survey.* Retrieved March 31, 2023, from PwC: https://www.pwc.fi/fi/julkaisut/CEO-survey/pwc-24th-annual-global-ceo-survey-key-findings-finland.pdf

Ranft, A. L.;& Lord, M. D. (2002). Acquiring New Technologies and Capabilities: A Grounded Model of Acquisition Implementation. *Organization science (Providence, R.I.), 13*(4), 420-441. doi:10.1287/orsc.13.4.420.2952

Reuters. (2021). *Global M&A activity smashes all-time records to top $5 trillion in 2021*. Retrieved March 31, 2023, from Reuters: https://www.reuters.com/markets/europe/global-ma-activity-smashes-all-time-records-top-5-trillion-2021-2021-12-20/

Rhodes-Kropf, M.;& Viswanathan, S. (2004). Market Valuation and Merger Waves. *The Journal of finance, 59*(6), 2685-2718. doi:10.1111/j.1540-6261.2004.00713.x

Ross, S. A. (1973). The Economic Theory of Agency: The Principal's Problem. *The American economic review, 63*(2), 134-139. Retrieved March 31, 2023, from https://www-jstor-org.proxy.uwasa.fi/stable/1817064

S&P Capital IQ. (2022, July 26). Dataset: Parameters for estimation sample through S&P CIQ Excel add-in tool. Retrieved July 26, 2022, from https://www.capitaliq.com/CIQDotNet/my/dashboard.aspx

Shad, J. S. (1969). The Financial Realities of Mergers. *Harvard business review, 47*(6), 133. Retrieved March 31, 2023, from https://web-p-ebscohost-com.proxy.uwasa.fi/ehost/pdfviewer/pdfviewer?vid=0&sid=4e4e38b7-f5d3-4cff-9582-b45b12b43ac9%40redis

Shivdasani, A. (1993). Board composition, ownership structure, and hostile takeovers. *Journal of accounting & economics, 16*(1), 167-198. doi:10.1016/0165-4101(93)90009-5

Shleifer, A., & Vishny, R. W. (1991). Reversing the Soviet economic collapse. *Brookings papers on economic activity, 2*, 341-367. Retrieved March 31, 2023, from https://www.proquest.com/docview/217122721/fulltextPDF/38BF73A0468C4755PQ/1?accountid=14797

Shleifer, A.;& Vishny, R. W. (1986). Large Shareholders and Corporate Control. *The Journal of political economy, 94*(3), 461-488. doi:10.1086/261385

Sirower, M. L.;& Sahni, S. (2006). Avoiding the "Synergy Trap": Practical Guidance on M&A Decisions for CEOs and Boards. *The Bank of America journal of applied corporate finance, 18*(3), 83-95. doi:10.1111/j.1745-6622.2006.00101.x

Slowínski, R.;Zopounidis, C.;& Dimitras, A. (1997). Prediction of company acquisition in Greece by means of the rough set approach. *European journal of operational research, 100*(1), 1-15. doi:10.1016/S0377-2217(96)00110-5

Song, M. H.;& Walkling, R. A. (1993). The Impact of Managerial Ownership on Acquisition Attempts and Target Shareholder Wealth. *Journal of financial and quantitative analysis, 28*(4), 439-457. doi:10.2307/2331159

Sorensen, D. E. (2000). Characteristics of Merging Firms. *Journal of Economics and Business, 52*(5), 423-433. doi:10.1016/S0148-6195(00)00028-X

StataCorp. (2023). Statistical software. Retrieved April 7, 2023, from https://vdi.uwasa.fi/portal/webclient/#/home

Stevens, D. L. (1973). Financial Characteristics of Merged Firms: A Multivariate Analysis. Journal of Financial and Quantitative Analysis. *Journal of Financial and Quantitative Analysis, 8*(2), 149-158. doi:https://doi.org/10.2307/2330007

Stigler, G. J. (1950). Monopoly and Oligopoly by Merger. *The American economic review, 40*(2), 23-34. Retrieved March 31, 2023, from https://www-jstor-org.proxy.uwasa.fi/stable/1818020

Stigler, G. J. (1966). The Economic Effects of the Antitrust Laws. *The Journal of Law & Economics, 9*(1), 225-258. Retrieved March 31, 2023, from https://www.jstor.org/stable/725000

Teerikangas, S. (2015). Private equity buyouts vs. M&A: What's the difference? Retrieved March 31, 2023, from https://www.linkedin.com/pulse/private-equity-buyouts-vs-ma-whats-difference-satu-teerikangas/

Tunyi, A. (2021). Fifty years of research on takeover target prediction: a historical perspective. *Qualitative research in financial markets, 13*(4), 482-502. doi:10.1108/QRFM-08-2020-0169

Varaiya, N. P.;& Ferris, K. R. (1987). Overpaying in corporate takeovers: the winner’s curse. *Financial analysts journal, 43*(3), 64-70. doi:10.2469/faj.v43.n3.64

Venzin, M., Vizzaccaro, M., & Rutschmann, F. (2018). *Making Mergers and Acquisitions Work : From Strategy and Target Selection to Post Merger Integration.* Emerald Publishing Limited. Retrieved March 31, 2023, from https://ebookcentral-proquest-com.proxy.uwasa.fi/lib/tritonia-ebooks/detail.action?docID=4947196

Walter, R. M. (1994). The Usefulness of Current Cost Information for Identifying Takeover Targets and Earning Above-Average Stock Returns. *Journal of accounting, auditing & finance, 9*(2), 349-377. doi:10.1177/0148558X9400900214

Wang, D., & Moini, H. (2012). Motives for Cross-border Mergers and Acquisitions: Some Evidence from Danish Firms. *Revisiting Internationalisation - Dynamics, Diversity And Sustainability.* Aalborg: Aalborg University. Retrieved March 31, 2023, from

https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=5dbd5fdaa016818a8b2eca04964ad23d0814052c

Wansley, J. W.;Roenfeldt, R. L.;& Cooley, P. L. (1983). Abnormal Returns from Merger Profiles. *Journal of financial and quantitative analysis, 18*(2), 149-162. doi:10.2307/2330914

Wruck, K. H. (2008). Private Equity, Corporate Governance, and the Reinvention of the Market for Corporate Control. *The Bank of America journal of applied corporate finance, 20*(3), 8-21. doi:10.1111/j.1745-6622.2008.00190.x

Wu, S.-Y.;& Chung, K. H. (2019). Corporate innovation, likelihood to be acquired, and takeover premiums. *Journal of banking & finance, 108*, 105634. doi:10.1016/j.jbankfin.2019.105634

Appendices

Appendix 1. Descriptive statistics of the estimation variables

Table 7. Descriptive statistics of the estimation variables.

Descriptive Statistics									
		Multinomial				Binomial			
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
A. ROA	385	0.08	0.21	-0.87	3.67	0.08	0.21	-0.87	3.67
A. ROCE	385	0.15	0.13	-0.04	1.26	0.15	0.13	-0.04	1.26
A. Asset Turnover	385	1.03	0.66	0.02	4.55	1.03	0.66	0.02	4.55
B. Growth-Resource Imbalance	385	0.14	0.35	0.00	1.00	0.14	0.35	0.00	1.00
C. Industry Disturbance	385	0.45	0.50	0.00	1.00	0.45	0.50	0.00	1.00
D. Ln Total Revenue	385	5.46	1.95	0.67	10.59	5.46	1.95	0.67	10.59
E. P/B	385	3.47	5.13	0.09	81.38	3.47	5.13	0.09	81.38
F. P/E	385	53.60	222.30	0.52	3,340.13	53.60	222.30	0.52	3,340.13
F. Earnings Yield	385	0.06	0.14	0.00	1.91	0.06	0.14	0.00	1.91
F. Dividend Yield	385	0.18	0.24	0.00	1.87	0.18	0.24	0.00	1.87
G. NWC / Total Assets	385	0.14	0.22	-0.67	0.95	0.14	0.22	-0.67	0.95
G. NWC / Sales	385	0.15	1.05	-7.25	11.18	0.15	1.05	-7.25	11.18
G. Cash / Capital	385	0.17	0.20	0.00	1.73	0.17	0.20	0.00	1.73
G. Quick Ratio	385	1.45	4.66	0.00	82.18	1.45	4.66	0.00	82.18
H. Total Debt / Equity	385	0.68	0.86	0.00	9.42	0.68	0.86	0.00	9.42
I. EBIT margin	385	0.15	0.22	-0.07	3.23	0.15	0.22	-0.07	3.23
I. EBT margin	385	0.14	0.75	-7.57	9.43	0.14	0.75	-7.57	9.43
I. FCF / Total Assets	385	0.07	0.09	-0.45	0.44	0.07	0.09	-0.45	0.44
J. Ownership Concentration	385	0.14	0.19	0.00	0.90	0.14	0.19	0.00	0.90
J. Insider Shareholdings	385	0.09	0.16	0.00	0.99	0.09	0.16	0.00	0.99
J. Institutional Shareholdings	385	0.17	0.17	0.00	1.48	0.17	0.17	0.00	1.48
J. Dual Class Shares	385	0.24	0.43	0.00	1.00	0.24	0.43	0.00	1.00
K. R&D / Total Assets	385	0.01	0.03	0.00	0.41	0.01	0.03	0.00	0.41
K. Capex / Total Assets	385	0.04	0.05	-0.06	0.49	0.04	0.05	-0.06	0.49
K. Sales CAGR-% 3Y	385	0.11	0.34	-0.39	3.97	0.11	0.34	-0.39	3.97
L. Trading Vol. / Shares Outstanding	385	1.71	17.97	0.00	341.96	1.71	17.97	0.00	341.96
L. Price Momentum (3 Months)	385	0.14	0.30	-0.87	2.75	0.14	0.30	-0.87	2.75