Index fund and ETF ownership and the German market for corporate control

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Abstract

If a bidder launches a takeover offer for a listed company being part of a stock market index, then index funds and exchange traded funds (ETF) as shareholders of this company cannot easily tender their shares without losing track of the index. This paper analyzes the impact of index fund and ETF ownership on the success of takeover offers in Germany. Based on a sample of 323 takeover offers of publicly listed German companies between 2006 and 2018, we document a significant negative impact of index fund and ETF ownership on takeover success. The fraction of outstanding shares eventually being tendered is decreasing with an increase in the stake of index funds and ETF: a one standard deviation increase in pre-offer index fund and ETF ownership reduces the fraction of outstanding shares gained by the bidder by 4.5 percentage points. For control-taking takeover bids with a bidder's toehold below 30% this value increases to 9.9 percentage points. Thus, our results suggest the increasing importance of index funds and ETF to weaken the German market for corporate control.

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1. Introduction

Since the mid 90's, index funds and exchange traded funds (ETF) have gained popularity as investment vehicles. Index funds can be defined as financial vehicles that aim to replicate the performance of a stock market index, such as the German blue-chip stock market index DAX. As index funds, ETF track indices but are listed on and traded on the secondary market, e.g., on stock exchanges. ETF providers issue securities traded on a major stock exchange and aim to track the performance of a particular market index.[1] In 2016, ETFs represented approximately 10% of the market capitalization of US securities traded on stock exchanges and accounted for more than 30% of the trading volume (Ben-David et al., 2017). In Europe, ETF had approximately EUR 524 bn assets under management (AuM) in 2018 and accounted for a trading volume of approximately EUR 2,000 bn (Deutsche Börse, 2019; Glow, 2019).

The benefits of ETF, such as providing indirect access to well diversified asset portfolios at low transaction cost and high liquidity, have been recognized early. However, a growing number of academic publications has provided evidence for some negative side effects of the popularity of ETF recently: As ETF attract short-term noise traders they cause an increase in volatility on stock prices of the stocks constituting the index (Ben-David et al., 2018). The increased noisiness of underlying stock prices reduces the reliability of information contained in these prices. As a consequence, management of firms, in which ETF have a large ownership stake, is less likely to trust and rely on pricing signals from its own stock when making investment decisions (Antoniou et al., 2019). ETF ownership also increases the liquidity commonality of stocks constituting the index they track (Agarwal et al., 2018). Bebchuk and Hirst (2018) point to negative side effects of ETF ownership on the corporate governance of the companies being part of a tracked index: Being deprived from the threat to sell the stock and tracking a portfolio with many different stocks, ETF managers have only low incentives to monitor and actively influence the corporate policy of their stock holdings. The authors show the potential agency costs arising from this constellation.

In this paper we provide evidence for another negative side effect of index funds and ETF related to corporate governance: Increasing index fund and ETF ownership reduces the effectiveness of the market for corporate control as a device for disciplining management. By construction, index funds and ETF cannot easily sell their shares in a company without losing

[1] Fund manager BlackRock tracks the performance of the German blue-chip stock market index DAX (listing the 30 largest companies in Germany) and the index MDAX (listing the 60 largest companies in Germany excluding DAX members) with its iShares Core DAX UCITS ETF and iShares Core MDAX UCITS ETF.

track of the stock market index in which the company is listed. Thus, funds may not able to tender shares when a bidder launches a takeover offer on a company being part of a tracked index. As a consequence, significant index fund and ETF ownership might reduce the number of shares available for a bidder and might lower the probability for a successful completion of a takeover attempt. Based on a sample of 323 takeover attempts in Germany between 2006 and 2018 we find a significant negative impact of ETF ownership on the success of a takeover attempt, measured by the percentage of outstanding shares gained by the offer.

The German market for corporate control is particularly exposed to this negative effect due to German corporate and takeover law: Owning more than 50% of shares and voting rights of a company does not allow majority shareholders to directly influence corporate policy by e.g., giving orders to the management board. Direct influence requires the signing of a domination and profit and loss transfer agreement (DPLA) between majority shareholder and company; such a contract has to be approved by a 75% vote on a shareholder meeting. As bidders regularly aim to directly influence corporate strategy after the takeover, the vast majority of control-taking takeover attempts in Germany aims to exceed the 75% ownership threshold. Consequently, the high hurdle for direct corporate control additionally strongly exposes takeover offers under German corporate law to the "crowding out" effect of index fund and ETF ownership. The potential reduction of the number of available shares has a stronger impact than in legislations where which a simple majority is sufficient to exercise direct influence on the target corporation.

As an example, in April 2017 private equity firms Bain Capital and Cinven jointly launched a takeover offer for STADA Arzneimittel AG (STADA), a pharmaceutical company listed on the German stock exchange in Frankfurt. Starting with a minimum acceptance threshold of the takeover offer of 75% the bidder reduced the threshold conditional for the bid to 67.5% over the course of the offer period. Eventually, the offer failed to reach this threshold and the bidder had to launch a renewed offer with increased premium and a further reduced threshold of 63%. As STADA was part of the German MDAX index by the time of the bid, index funds and ETF had a 7.6% ownership stake in STADA (Thomson Reuters ownership data). In the German press the ETF ownership stake in STADA was identified as one major reason for the bidder's difficulties to gain control in this takeover offer.[2]

[2] See "Das Drama um Stada: Warum ETF Übernahmen immer schwieriger machen" (Lindner, 2017). The other reason for the difficulties of the bidder were hedge funds exploiting the situation caused by the reduced number of available shares and acquiring shares after the takeover offer. This made it harder for the bidder to cross the threshold communicated.

In a first step we analyze the propensity of index funds and ETF as owners to tender their shares to the bidder. We find a 25% decrease in ETF average ownership stake during the acceptance period of the takeover bid. Some index funds are obviously willing to sell their shares and are able to replace it by other financial instruments aiming still to keep track of the index.

In the second step of our analysis the results still point towards a significantly negative effect of index fund and ETF ownership on takeover success, despite the limited propensity to tender. A one unit increase in standard deviation of the index fund and ETF ownership stake in the target company reduces the fraction of outstanding shares gained by a takeover offer by 4.5 percentage points. According to our results this negative effect of index fund ownership is roughly the size of the positive effect of the premium offered by the bidder: Here a one unit increase in standard deviation yields an increase of our success measure of 4.2 percentage points. For our sub-sample of control-taking bids with a bidder's toehold below 30% we find an even stronger effect: A one unit increase in standard deviation of index fund and ETF ownership reduces outstanding shares gained by a takeover offer by 9.9 percentage points. Notably we find the negative effect on takeover success to be larger than the ETF shareholding itself: An ETF stake of 1% of the shares not owned by the bidder reduces the success rate, also relating to the shares not owned by the bidder, by significantly more than 1%. We conclude from this result that ETF shareholdings also affect the tendering decision of other shareholders and/or the decisions of outside investors, esp. hedge funds, to acquire target shares after the offer announcement.

Furthermore, we identify a set of other variables having a significant impact on completion and success of takeover attempts in Germany for the full sample and the sub sample of control-taking bids: In line with evidence from studies in other countries we find the offer premium as well as target management support for the offer to have a positive effect on the success of the takeover bid. We also find the stake of strategic shareholders on the target company (full sample) and bidders' toehold (sub sample) to have a significant negative impact on takeover success.

Finally we carry out additional analyses as robustness checks. First, in order to address potential endogeneity concerns, we run a two-stage endogenous treatment regression analysis incorporating the exogenous variation in the index membership as an instrument. Second, we run a fractional response regression analysis to allow for a non-linear relationship between our

independent variables and the success of a takeover offer. Our main result stays intact: Index fund/ETF ownership significantly reduces the success of takeover offers.

Our result has important implications: The German market for corporate control is less developed compared to market-based economies like the UK and the US. Despite some important steps towards stronger shareholder rights hostile takeovers are still an exception.[3] Additionally, public perception of financial investors like private equity funds is still suffering from the perception as "locusts" in the early 2000's. The results provided here point towards a further reduction of the importance of takeovers as a device of disciplining corporate managers. Finally, the negative impact on the German market for corporate control may be even stronger than suggested by our results: We document a negative impact on the success of offers that have been made. Another potential effect of increased index fund and ETF ownership on the German takeover market is that the propensity of potential bidders to make an offer will be significantly reduced. Thus, the combined effect on the German takeover market may be even stronger than our results suggest.

This paper makes several contributions to existing research: First, it provides evidence on the negative impact of index fund ownership on takeover success. To the best of our knowledge, this is the first study that documents the negative role of index fund and ETF ownership in takeovers. Second, our research adds to existing results on the impact of offer-related takeover success factors such as offer premium and management recommendation (e.g., Walkling, 1985; Branch et al., 2008; Caiazza & Pozzolo, 2016). Third, we offer further insights on the impact of ownership structure on takeover success, such as the bidder's initial toehold (e.g., Jennings & Mazzeo, 1993; Bris, 2002), target ownership concentration (e.g., Köke, 1999), and different target shareholder types (e.g., O'Sullivan & Wong, 2001; Ferreira & Matos, 2008; Achleitner et al., 2013).

The remainder of this paper is structured as following: Section 2 provides an overview of index fund and ETF ownership, as well as corporate governance in Germany. Section 3 offers the theoretical background to success factors in corporate takeovers. Section 4 presents data and describes dependent and independent variables. Section 5 provides baseline results and extensions of the baseline model. Section 6 concludes.

[3] Throughout the entire sample only 17% of control-taking takeover attempts of publicly listed companies are being considered as hostile. Hostility is defined as target management or supervisory board explicitly providing a negative recommendation (Stellungnahme) to their shareholders whether to accept the offer or not.

2. Index fund/ETF ownership and corporate governance in Germany

2.1. The market for corporate control in Germany

The term "market for corporate control" coins the possibility of suboptimally managed companies becoming a target of a takeover attempt. The bidder aims to get control over the company, potentially replace incumbent management and reap the benefits from improving the performance of the company (e.g., Scharfstein, 1988; Walsh & Kosnik, 1993; Denis & Kruse, 2000; Franks et al., 2001). Thus, a vivid takeover market with investors and managers systematically looking for undermanaged assets may serve as a tool to discipline management by imposing a takeover threat in case of low performance.

Compared to other countries the market for corporate control in Germany is still underdeveloped. Historically being described as a bank-based economy, Germany has long served as a role model for an "insider-based" corporate governance system with powerful banks (Hopt, 2015): A high degree of ownership concentration coupled with significant ownership stakes of banks and insurance companies have insulated German stock-listed companies from the threat of a hostile takeover offer until the early 2000's (Bessler et al., 2015). Since then, several factors have moved the German governance regime closer to a market-based economy like the US and UK: Most importantly, power and influence of German banks have been reduced significantly. First, a tax break introduced in 2001 allowed them to sell their equity stakes in other companies without paying capital gains tax. After 2001, German banks and insurance companies started to sell their holdings in industry companies and the web of cross-holdings labelled as "Deutschland AG" started to dissolve. During the same period international investors entered the German market and replaced banks as shareholders. Second, the decline of debt financing provided by banks as the most important funding source for German companies was further propelled by the financial crisis. Due to increased regulatory requirements after the financial crisis German banks lost further ground. Finally, the decline of the influence of German banks and the rise of influence of international investors was further supported by several legal initiatives aiming to strengthen the rights of minority shareholders under German corporate law: Most notable for our analysis is the introduction of the German Securities Acquisition and Takeover Act (WpÜG) in 2002 providing a legal frame for takeover offers in Germany. As a result, the German takeover market has become more active since the 2000's and has seen some hostile takeover offers since then. Yet, compared to other countries the number and volume of takeover offers relative to the size of the German economy is still

low: While the takeover volume in the US in 2018 amounted to 8.2% of GDP, takeover volume in Germany was just 3.8% of GDP.[4]

When investigating reasons for the low level of takeover activity in Germany one major obstacle named by market participants is the German two tier board system with co-determination, which grants labor unions 50% of the votes in the supervisory board (Hopt, 2015). For our analysis, there is another important feature of German Stock Corporation Act (AktG) that relates to takeover offers: Under German corporate law management board (Vorstand) has a strong position; being elected by the supervisory board it cannot be replaced by a simple shareholder vote. Additionally, even with a majority of votes a shareholder cannot directly influence corporate policy e.g., by giving orders to the management board. Directly controlling management board requires the signing of a domination and profit and loss sharing agreement (DPLA) between the corporation and the majority shareholder. The signing of a DPLA has to be approved by a 75% vote in a shareholder meeting (§ 291 AktG). It creates a "contractual group" allowing the major shareholder to fully integrate the business of the "dominated" corporation. After singing a DPLA the remaining minority shareholders have two options:

- Leave the company and sell their shares to the majority shareholder. The majority shareholder is required to make an offer to minority shareholders to purchase their shares and offer an appropriate compensation (§305 AktG). The minority has the right to file a court procedure to verify the compensation.
- Stay in the company and receive a guaranteed dividend payment. Shareholders not accepting the offer may still remain invested in the company; they are entitled to receive a constant and guaranteed annual dividend payment from the company (§304 AktG).[5]

It is important to note here that even after exceeding the 75% ownership threshold and signing a DPLA the majority shareholder is not able to squeeze out minority shareholders. Under German corporate law a minority squeeze out requires a 90% or 95% vote on a shareholder

[4] In the United States, takeover volume in 2018 was USD 1,680.7 bn and GDP was USD 20,500.6 bn. In Germany, takeover volume in 2018 was EUR 128.4 bn and GDP was EUR 3,386 bn (Statista, 2019).

[5] The level of the guaranteed dividend is also subject to the verification by a court.

meeting, depending on the legal type of squeeze out (§ 62 Abs. 5 UmwG or § 327a AktG, respectively).[6]

For our study these regulations have two important consequences:

1. The majority of control-taking takeover offers in Germany seeks to achieve an ownership stake of at least 75% of the target's equity, which would allow the bidder to sign a DPLA and directly influence corporate policy. Additionally, the combination of minority shareholders either leaving the company, or remaining invested, but receiving a fixed dividend ensures that future projected synergies and other financial benefits from controlling the corporation fully accrue to the bidder.
2. A simple majority of votes does not allow majority shareholders to directly control corporate policy. Even having exceeded the 75% threshold allowing to sign a DPLA does not yet give majority shareholders the option to squeeze out the minority shareholders. Thus, defining a "successful" takeover offer as having reached the majority of votes and measuring "takeover success" by a binary indicator variable marking the passing of the 50% threshold of ownership is not appropriate under the German legal environment. For this study we chose a different variable measuring takeover "success":

$$Success\ \% = \frac{\#\ of\ shares\ tendered\ during\ acceptance\ period}{\#\ of\ shares\ not\ under\ bidder's\ control\ at\ the\ offer}$$

We use the percentage of shares gained by the takeover offer as success measure. This measure has several benefits. First, it does not rely on a particular threshold that may be subject to disputes when discussing and interpreting the findings: a 50% threshold giving the bidder majority of votes in shareholder meeting, a 75% stake allowing to sign a DPLA, and finally a 90% to 95% stake giving the opportunity to squeeze out minority shareholders. Second, as it relates to the number of outstanding shares not yet under the bidder's control, our success measure is restricted to the range between 0% and 100% and independent from the toehold of the acquirer when making the bid.[7] Finally, this measure is a continuous variable allowing our

[6] This represents the predominant reason for the large number of takeover offers being made with the bidder already owning a stake of more than 75% of the company's shares. See section 4 for details.

[7] Measuring the bid's success by the fraction of shares gained related to all shares outstanding this figure would be distorted by the toehold of the bidder when making the takeover bid.

analysis to be performed with standard regression analysis and providing easily interpretable results.[8]

Note that our continuous success variable does not necessarily relate to the bidder's perception of the success of his offer. Our sample contains in total 14 (conditional) offers with positive success rates that have finally been withdrawn by the bidder.

2.2. Index fund and ETF ownership

While replicating market indices, index funds and ETF are dependent on stock exchanges which define the general composition of an index and regularly review and adjust index composition (e.g., composition of S&P500 is defined and reviewed by the New York Stock Exchange and NASDAQ). Stock exchange groups provide quantitative rules (e.g., with regards to free float, market capitalization, order book volume and stock price volatility) that need to be fulfilled to be included in an index. Index composition is reviewed by stock exchanges at least quarterly and potentially adjusted, if listed companies do not comply with quantitative index requirements (Deutsche Börse Group, 2018). Index funds have to incorporate reviews and potential adjustments of index composition when tracking those indices. Thus, the composition of the index tracked is outside the fund's discretion. Being dependent on index composition by stock exchanges has a direct implication: Index funds and ETF are special institutional investors, usually labeled as "passive investors". By construction and as compared to other mutual funds, index funds and ETF do not have the option to exit from their positions as long as the underlying stock is part of the tracked index. As a consequence, they cannot use the exit or the threat of it as an important tool to influence corporate managers (Bebchuk & Hirst, 2018, p.9). In his 2017 letter to investors Larry Fink, CEO of BlackRock Inc., the largest provider of index funds and ETF stated that "BlackRock cannot express its disapproval by selling a company's securities as long as that company remains in the relevant index. As a result, our responsibility to engage and vote is more important than ever".[9] Thus, as long as a stock exchange does not adjust the composition of an index and excludes a target company from the index, index funds and ETF are on first glance not able to tender their shares during a takeover attempt, as this would result in deviations from the underlying index.

[8] Studies for US takeovers are measuring takeover success by an indicator variable set equal to one if the bidder gains the simple majority of shares. The analysis then rests on a probit/logit regression (e.g., Duggal & Millar, 1994; D'Mello et al., 2011).

[9] Letter from Larry Fink, Annual letter to CEOs (Jan. 16, 2018)

Index funds and ETF employ different methods to replicate an index. On the one hand, funds use physical replication, i.e., directly owning shares in companies that are included in an index. This replication method provides transparency on the composition of an index fund/ETF and low tracking error. On the other hand, funds also use synthetic replication: Instead of physically holding securities in its index, a synthetic replication relies on derivatives (e.g., swaps, forwards, futures) to execute an investment strategy. This allows funds to reduce transaction costs and keep close track of an index without having to own all shares, as well as providing potential investors with the opportunity to invest in less liquid indices. However, synthetic replication comes along with counterparty risk. (The VanGuard Group, 2019). The funds also employ different replication strategies for the composition of individual index funds and ETF: They either use a full replication of an index (fund portfolio fully replicates target index by purchasing securities according to their relative weight in the index), a sampling method (fund holds a representative sample of securities that aim to match fundamental characteristics of the index), or an optimization method (use of quantitative multifactor models to track the exposure in the index). The majority of European index funds and ETF rely on synthetic replication of indices, as opposed to funds in the United States which predominantly use physical sampling techniques (Deutsche Bundesbank, 2018).

These different replication strategies have some technical implications for our analysis:

- A fund tracking a stock market index does not necessarily own the stock of the company being subject to a takeover offer and thus may not even be able to tender its shares. Funds relying on synthetical replication strategy thus may not have any impact on the success of a takeover offer. In our study this case is ruled out by using ownership data from Thomson Reuters EIKON; we thus only consider physical ownership of index funds.
- Index funds physically holding the stock may accept the takeover offer, tender their shares and replace it by a new, presumably synthetic position of securities and/or derivatives aiming to still keep track of the index without directly owning the stock.

As tendering is at least technically possible, we will also analyze the empirical propensity of index funds to tender their stake in the equity of a target. If the majority of index funds as corporate owners is not willing or able to tender their shares, then index fund ownership in target companies might negatively affect the success of a takeover bid and thus reduce the effectiveness of the market for corporate control.

To the best of our knowledge, there is no research that documents the impact of ETF and index funds ownership on takeover success so far. We hypothesize that index fund and ETF ownership work as a detriment to any takeover offer. If the funds are not able or willing to tender shares, then this directly reduces the number of available shares a bidder is able to target during a takeover attempt. This eventually results in a lower takeover success probability and reduces the effectiveness of the market for corporate control as a means to discipline corporate managers. We expect this effect to be particularly strong in Germany: as shown above, the hurdle for majority shareholders to directly influence corporate policy is higher than in other countries: Signing a DPLA requires a 75% vote in the shareholder meeting. Thus, a significant stake of an index fund (e.g., 10%) not being available will have a stronger detrimental effect on the success of a takeover compared to a legal environment where a 50% ownership stake is sufficient to exercise direct control.

3. Success factors in corporate takeovers: theoretical and empirical background

In this section, we provide a literature overview of additional determinants of takeover success probability and is differentiated into target-related (Sect. 3.1.), offer-related (Sect. 3.2.), bidder-related (Sect. 3.3.) and macroeconomic determinants (Sect. 3.4.).

3.1. Target-related determinants of takeover success

3.1.1. Initial toehold of bidder

The initial toehold should have a positive impact on takeover success, as it improves bidders' negotiation position and reduces uncertainty about the takeover outcome. Existing research provides evidence that an initial toehold indeed increases takeover success probability (Walkling, 1985; Jennings & Mazzeo, 1993; Bris, 2002). It reduces the number of total obtainable shares bidders must target during a takeover attempt and mitigates the problem of target shareholders free-riding on target value appreciation (Shleifer & Vishny, 1986; Stulz, 1988; Singh, 1998). On the negative side failed takeover attempts negatively impact the value of initial toehold shares. Acquiring a toehold is also associated with certain costly legal obligations for the bidder: In Germany investors have to notify the corporation and the BaFin when crossing significant ownership thresholds starting at 3.0% (§21 WpHG). Additionally, the German takeover code (WpÜG) requires investors to make a mandatory and unconditional takeover bid for all remaining outstanding shares if they have crossed the threshold of 30% ownership (§35 (1), and §29 (2) WpÜG). Including this negative effect, the overall empirical

evidence for the impact of toeholds on takeover success is inconclusive (Betton & Eckbo, 2000; Betton, et al., 2009).

3.1.2. Shareholder structure

Ownership concentration: Existing literature has shown that large shareholders exert effective monitoring activities to ensure that management acts in shareholders' best interest (e.g., Shleifer & Vishny, 1986; Sudarsanam, 1995; Demsetz & Villalonga, 2001; Sudarsanam, 1995). The success rate for a given takeover bid is hypothesized to be negatively related to shareholder concentration. In many cases (e.g., family owned businesses), blockholders have multiple economic and non-economic relationships to the firm they own and reap significant non-pecuniary benefits out of it. Their reservation price may be higher and thus their willingness to accept a given offer lower than for dispersed shareholders, resulting in higher takeover costs (Kobayashi, 2007).

Individual shareholders: Individual shareholders are defined as single persons or families holding a company stake. Dyer (1988) and Flanagan et al. (2011) demonstrate that family owners show a decreased willingness to tender their shares in takeover offers. Achleitner et al. (2013) provide similar evidence, indicating that large (individual) shareholders value the private benefits of control over financial advantages of tendering shares. Moreover, unaffiliated large shareholders negatively affect hostile takeover attempts by supporting target management (O'Sullivan & Wong, 1999).

Strategic shareholders: Strategic shareholders are defined as companies that operate within the same (or affiliated) industry as the company they are invested in. Investments mostly serve a strategic purpose, such as operational interest in the target. Thus, the presence of strategic shareholders might have a negative impact on takeover success, as tendering decisions are linked to a strategic assessment of the investment. In fact, strategic shareholders that have been invested in a company for a long time could even serve as a white knight to prevent takeover attempts (Sudarsanam, 1995).

Foreign shareholders: Existing research shows no clear picture on the impact of foreign shareholder stakes on firm value. Ferreira and Matos (2008) document that foreign shareholders show more engagement in monitoring activities and have a stronger focus on shareholder value compared to local investors. Al-Thuneibat (2018) shows a negative impact of foreign ownership

on firm performance, which makes companies more vulnerable to outside takeover attempts. To the best of our knowledge, there is no dedicated study having analyzed this relationship with respect to the success of a given takeover offer.

Institutional shareholders: Institutional ownership and its effects on firm value and on takeover success have been featured extensively in existing research. Institutional ownership has been shown to be positively related to firm value (Jones et al., 1997; Al-Thuneibat, 2018). There is evidence of an indirect positive effect of institutional ownership on takeover success probability (Duggal & Millar, 1994) as it reduces the probability of successful defense mechanisms during bids (Sudarsanam, 1995). Hamdani and Yafeh (2012) however show that institutional owners usually use their voting rights in favor of target management which suggests a negative impact of institutional ownership on takeover success. Index funds and ETF are special institutional investors. In order to analyze their impact on takeover success, we separate these funds from the remaining institutional shareholders.

3.2. Offer-related determinants of takeover success

Offer premium: Offer premium has attracted significant attention in the literature on takeover success determinants. While some empirical studies are inconclusive with respect to the impact of offer premium on takeover success (e.g., Hoffmeister & Dyl, 1981; Flanagan et al., 2011), the vast majority of research provides evidence for a positive relationship between the two variables (e.g., Walkling, 1985; Giammarino & Heinkel, 1986; Fishman, 1988; Hirshleifer & Titman, 1990; Sudarsanam, 1995; Hirshleifer & Png, 1989).

Target management attitude towards the offers: German takeover act requires target management to publish a statement about the adequacy of a takeover offer (§27 WpÜG). This statement should include a recommendation for target shareholders on the acceptance or rejection of a given bidder's takeover offer and must disclose any incentive offered by the bidder that might cause a conflict of interest with regards to the transaction (Arnold & Schwetzler, 2011). The recommendation allows target management to express its opinion on the offer and is an integral part in German takeover law settings potentially influencing the success of the offer.

While there is no directly documented effect of management recommendation on the success of takeover attempts, existing research demonstrates a negative impact of target (management) hostility on takeover success probability (e.g., Hoffmeister & Dyl, 1981; Walkling, 1985; Branch, Wang, & Yang, 2008; Flanagan et al., 2011; Caiazza & Pozzolo, 2016).

Irrevocable undertakings and pre-negotiated stake: Bidders frequently approach important target shareholders before making an official takeover offer in order to close an agreement with key shareholders on transfer of shares and voting rights or request shareholders to provide undertakings to accept the bid (Allen & Overy LLP, 2017). Thus, the role of previously negotiated transfers of shareholder stakes (pre-negotiated stakes) and irrevocable undertakings needs to be considered when assessing takeover success probability. In our study throughout the entire sample, 65 bidders have closed irrevocable undertakings with existing shareholders with an average volume of 45.8% (median: 50.0%) of outstanding shares. The majority of irrevocable undertakings was closed in the sub-sample of bidders with a toehold below 30%, in which bidders closed undertakings in 57 cases, with an average amount of 50.4% (median: 51.6%) of outstanding shares.

Irrevocable undertakings and pre-negotiated stakes are closely related to initial bidder toeholds. Shareholders having signed such a contract are required to tender their shares at given conditions. We adjust our success variable from above to reflect the fact that these shares are already under control of the bidder: We increase the bidder's toehold by adding the shares of the pre-negotiated stakes and reduce the number of outstanding shares not yet under bidder's control by subtracting the pre-negotiated stakes. Under German takeover law the bidder has to publish all irrevocable undertakings and pre-negotiated stakes as well as respective conditions within the takeover offer document. Additionally, the offer price for the respective bid must not be lower than the price paid for the pre-negotiated stakes (§ 4 WpÜGAV).

These agreements reduce the number of shares targeted within the offer acceptance period. Existing literature shows that irrevocable undertakings have a positive impact on takeover success (Wright et al., 2007).

Competing offer: Competing offers for the same target leave bidders with additional uncertainty regarding takeover outcome and decrease success probability (Flanagan et al., 2011). Rival bidders even have a higher chance of winning a bidding contest originating from competing offers (Betton et al., 2008). Bidding contests drive up total takeover costs, potentially resulting in the successful bidder suffering the winner's curse, by overpaying and overestimating target value (Varaiya & Ferris, 1987). Bidding contests also increase the probability of no one winning the bidding contest (Caiazza & Pozzolo, 2016). Thus, we hypothesize a negative impact of competing bids on takeover success.

Method of payment: Method of payment may also affect takeover success. Cash offers do not carry any risk for the target shareholders but may reveal more information about the true

value of the target and the expected synergies than stock offers. On the other hand, all potential synergies fully accrue to the bidder in a cash offer (Sudarsanam, 1995; Chang & Suk, 1998; Hansen, 1987). In contrast, stock offers provide target shareholders with the opportunity of participating in expected synergy gains. As a downside in a stock offer, target shareholders have to bear the risk of getting paid with an inflated currency in case of an overvaluation of the bidder by the capital market (Shleifer & Vishny, 2003).

Number of bidding rounds: German takeover law allows some particular changes/improvements of takeover offer conditions e.g., by increasing the premium offered or reducing the minimum threshold of acceptance before the end of the acceptance period (§ 21 WpÜG). Our sample contains 8 cases (sub-sample of bidders with a toehold below 30%: 6 cases) with three bidding rounds (two changes of conditions) and 45 cases (sub-sample below 30%: 29) with two bidding rounds (one change of conditions). Treating each bidding round as a separate offer systematically underestimates the success rate of earlier bidding rounds: as the acceptance period was not yet fully expired when the renewed offer was published the number of shares potentially tendered until the end of the acceptance period is neglected in this case. Thus, for our analysis we aggregate all bidding rounds into one round and adjust all relevant variables accordingly. A dummy variable set equal to one indicates an offer with more than one bidding round.

Offer type: German takeover law allows for different types of takeover offers. The most important differentiation is between voluntary and mandatory takeover offers: whereas a voluntary takeover offer may be combined with certain conditions for the offer eventually becoming valid (e.g., setting a minimum acceptance rate), the mandatory takeover offer may not contain any restriction. According to German takeover law, mandatory offers have to be made if a shareholder (the bidder) crosses the threshold of a 30% stake in the corporation's equity. (§29 (2) WpÜG).

3.3. Bidder-related determinants

Literature on M&A distinguishes two different types of bidders in corporate takeovers: Financial bidders are financial investors or private equity funds aiming for acquiring sub optimally managed assets and earning returns by improving their operating business. Strategic bidders are bidding for corporations offering potential synergies by combining their operating business with the one of the target company. Both types of bidders have been shown to be

different with respect to the properties of the takeover bid, the companies targeted and success rates of the bid. (Fidrmuc et al., 2012; Gorbenko & Malenko, 2014).

3.4. Macroeconomic determinants

Macroeconomic factors have a significant impact on the activity of M&A markets: During the financial crisis the global volume of M&A transactions has declined from USD 4,920 bn in 2007 to USD 2,187 bn in 2009 (Institute for Mergers, Acquisitions and Alliances, 2019). Less clear is however the impact of the financial crisis on the success rate of the lower number of offers that have been made in this period. In our analysis, we address this question by introducing an indicator variable set equal to one if the takeover offer has been made in the years of the financial crisis 2008 and 2009 and the European crisis 2012.

4. Data

4.1. Sample construction and distribution

We use a unique data set of takeover attempts of publicly listed companies in Germany for the time span between 2006 and 2018 to construct our sample. First, we extract all takeover attempts of publicly listed companies registered on the website of the German Federal Financial Supervisory Authority (BaFin). This limits our available time frame to the time span between 1 January 2006 and 31 December 2018, as no earlier takeover data is available. In a first step, we obtain 386 takeover attempts on 303 distinct target companies. We hand-collect deal-specific data from official takeover offer documents published on the BaFin website at registration of a takeover attempt. As the offer document also contains information about irrevocable undertakings and pre-negotiated transactions we use this information to calculate the adjusted ownership stake of the bidder (toehold) at the beginning and end of the takeover offer acceptance period. Second, we match the original takeover attempt with official statements of board of directors and supervisory board, available fairness opinions, and information related to the offer-outcome published on the official federal publication website (Bundesanzeiger). Finally, we complement our takeover offer data with ownership information on target companies from Thomson Reuters Eikon. We gather month-end ownership data for the date closest before official registration of a takeover attempt. As ownership data is not

available for all targeted companies on Thomson Reuters Eikon, our final sample used for our baseline regression model includes 323 takeover attempts and 293 distinct target companies.

Table 4.1 provides an overview of the takeover distribution over time for the full sample. We split the sample into four different toehold clusters according to the bidders' initial toehold at offer announcement date.[10] The first cluster contains offers made from a toehold below 30%; it represents the threshold that the German takeover code assumes as having control over the corporation (§ 29 Abs. 2 WpÜG). The cluster between 30% and 50% captures takeover cases having crossed the control taking threshold according to WpÜG but have not yet secured majority in voting rights. As direct control of shareholders under German corporate law requires signing a DPLA with a 75% vote the third section covers toeholds with stakes between 50% and 75% ownership. Finally, the last cluster contains offers with a toehold above 75%.

Table 4.1: Sample Distribution

Panel A: Distribution by year of offer announcement

	Takeover attempts					
Year	Toehold below 30%	Toehold between 30% - 50%	Toehold between 50% - 75%	Toehold above 75%	Total	%
2006	11	3	10	10	34	10.5
2007	17	6	8	14	45	13.9
2008	11	9	8	8	36	11.1
2009	6	4	3	5	18	5.6
2010	8	4	3	5	20	6.2
2011	13	4	5	6	28	8.7
2012	14	3	4	6	27	8.4
2013	8	5	3	5	21	6.5
2014	10	2	5	7	24	7.4
2015	7	3	4	2	16	5.0
2016	11	4	5	3	23	7.1
2017	13	3	2	2	20	6.2
2018	5	1	2	3	11	3.4
Total	134	51	62	76	323	100.0

Panel A in this table presents the sample distribution by year of the offer announcement, differentiated into four toehold clusters according to the bidder's initial toehold by the time of the offer announcement.

Panel B: Distribution by target industry

	Takeover attempts					
Industry	Toehold below 30%	Toehold between 30% - 50%	Toehold between 50% - 75%	Toehold above 75%	Total	%
Basic Materials	1	0	0	0	1	0.3
Chemicals	1	0	3	4	8	2.5
Consumer Goods	16	4	8	18	46	14.2
Consumer Services	11	9	8	9	37	11.5

[10] These figures do not contain the adjustment by irrevocable undertakings or pre-negotiated stakes and only include the initial toehold of the bidder. For regression analyses, irrevocable undertakings and pre-negotiated stakes are added to the initial toehold.

Financial Services	31	7	9	27	74	22.9
Health Care	11	9	3	1	24	7.4
Industrials	28	12	14	8	62	19.2
Oil & Gas	5	1	1	2	9	2.8
Technology	26	8	16	6	56	17.3
Telecommunications	0	1	0	0	1	0.3
Utilities	4	0	0	1	5	1.5
Others	0	0	0	0	0	0
Total	134	51	62	76	323	100.0

Panel B in this table presents the sample distribution by industry of target companies, classified according to Thomson Reuters industry classification and Cleary Gottlieb Steen & Hamilton LLP (2017), differentiated into four toehold clusters according to the bidder's initial toehold by the time of the offer announcement.

Panel A shows takeover attempts by year of offer announcement for all offers and split into the four toehold clusters. The majority of offers took place in the toehold cluster below 30% (41.5%). Compared to other countries an unusually high number of takeover offers is made by a shareholder already having a majority position (42.7%). Especially the toehold cluster with a toehold above 75% ownership shows the second highest number of takeover offers (23.5%) of the four cluster; despite already having full control over the target company and potentially already having signed a DPLA, the majority owner still launches an offer to minority shareholders to take over their shares.[11] Again, the reason for this unusual constellation is the high threshold for a squeeze out of the minority shareholders even after a DPLA has been signed: a squeeze out of the remaining minority requires a vote of 90% or 95%, respectively. Thus, under German corporate law takeover offers are also an important part of strategies in "endgames" of gaining corporate control. In our subsequent analysis we will especially focus on the cluster below 30% toehold: As the bidder does not yet have but aims to get control over the target corporation this situation relates closest to the "market for corporate control" as the subject to be analyzed in this paper.

Combining all toehold clusters, the number of takeover attempts was higher in and before the year of the financial crisis in 2008. This would support the view that acquisition activity is closely and positively linked to business cycles (Becketti, 1986). Takeover-activity in the post-crisis period averages around 23 takeover attempts per year but fell to a post-crisis low in 2018.

Table 4.1, Panel B presents takeover attempts across target industry. While the sample covers all industries, it is most noteworthy that Financial Services has had the highest takeover activity with 22.9% of takeovers. The high number of takeover attempts could be explained by industry consolidation after the financial crisis (Rao-Nicholson & Salaber, 2015). Finally,

[11] E.g., Skion GmbH launched a takeover offer to the minority shareholders of Altana AG while already owning a 91.7% stake in the target company.

takeover attempts in Technology and Industrials are on a high level with a combined share of 36.5%, which is in line with documented high takeover activity levels in these two industries within existing literature (Schoenberg & Reeves, 1999; Campa & Moschieri, 2008).

4.2. Variables and summary statistics

4.2.1. Variable definitions

In Table 4.2 we present definitions of the variables we use in our regression models, including sources and description.

Table 4.2: Variable definitions

Dependent variable

Variable	Source	Description
Success rate	Own construction, takeover offer document published on BaFin website	Number of shares tendered during acceptance period divided by number of shares not under bidder's control at the offer.

Explanatory variables

Variable	Source	Description
Stake index funds	Thomson Reuters Eikon	Number of shares index funds and ETF own in target company divided by number of shares not under bidder's control at the offer.
Stake individual shareholder	Thomson Reuters Eikon	Number of shares individual shareholders (i.e., individual persons and families) own in target company divided by number of shares not under bidder's control at the offer.
Stake strategic shareholder	Thomson Reuters Eikon	Number of shares strategic shareholders own in target company divided by number of shares not under bidder's control at the offer.
Stake foreign shareholder	Thomson Reuters Eikon	Number of shares foreign shareholders (i.e., cross-border shareholder without presence in German-speaking countries) own in target company divided by number of shares not under bidder's control at the offer.
Stake institutional shareholder	Thomson Reuters Eikon	Number of shares other institutional shareholders besides index funds/ETF own in target company divided by number of shares not under bidder's control at the offer.
Toehold	Thomson Reuters Eikon, takeover offer document published on BaFin website	Number of shares bidder owns in the target company (including number of shares secured through irrevocable undertakings and pre-negotiated share transfers) divided by total number of outstanding shares prior to the offer.
Ownership concentration	Thomson Reuters Eikon, own calculation	Accumulated sum of individual shareholders' number of shares divided by squared number of shares not under bidder's control at the offer. (calculation based on Herfindahl-Hirschman Index methodology, see appendix 8.1 for further details).

Offer premium	Takeover offer document published on BaFin website	Percentage takeover premium on 3-month weighted average target share price.
Management recommendation	Statement of board of directors, Bundesanzeiger	Indicator variable set equal to one if target management provides a positive recommendation (i.e., recommends accepting the offer), zero otherwise.

Control variables

Variable	Source	Description
Competing offer	Takeover offer document published on BaFin website	Indicator variable set equal to one if a competing bid exists, zero otherwise.
Method of payment	Takeover offer document published on BaFin website	Indicator variable set equal to one if the offer consideration is made in cash, zero otherwise.
Multiple round	Takeover offer document published on BaFin website	Indicator variable set equal to one if bidder has made changes to the original bid thus extending the acceptance period of the offer.
Mandatory offer	Takeover offer document published on BaFin website	Indicator variable set equal to one if bidder had to make a mandatory offer, zero otherwise.
Minimum acceptance rate	Takeover offer document published on BaFin website	Indicator variable set equal to one if takeover attempt is conditional on a minimum rate of shareholders accepting the takeover offer.
Bidder largest shareholder	Thomson Reuters Eikon	Indicator variable set equal to one if bidder is the largest shareholder before the official takeover announcement, zero otherwise.
Financial investor	Thomson Reuters Eikon	Indicator variable set equal to one if bidder is a financial investor (incl. private equity) according to Thomson Reuters Eikon classification and zero otherwise.
Foreign bidder	Thomson Reuters Eikon	Indicator variable set equal to one if bidder is foreign and operates from non-German-speaking country and zero if bidder is from German-speaking country (Germany, Austria, Switzerland).
Strategic investor	Cleary Gottlieb Steen & Hamilton LLP, Thomson Reuters Eikon	Indicator variable set equal to one if target and bidder operate in same industry according to Cleary Gottlieb Steen & Hamilton LLP industry classification.
Size	Takeover offer document published on BaFin website	Natural logarithm of equity market value (in EUR mn), calculated as total shares outstanding multiplied with offered share price.
Crisis	Takeover offer document published on BaFin website	Indicator variable set equal to one if takeover offer was made in financial crisis years 2008 and 2009 or European crisis year 2012.

The table describes the dependent, independent and control variables used in this analysis, including used sources.

4.2.2. Dependent variable and major explanatory variable

Throughout this paper, our major dependent variable is success rate. Success rate is a continuous variable that relates to the number of shares gained by the bidder divided by the number of outstanding shares not owned by the bidder at the offer date.

Table 4.3 depicts summary statistics for the dependent and explanatory variables. Statistics for the entire sample can be depicted from panel A. Due to the special German regulation many offers (40.4%) are made from a bidder already having the majority of the target company. As we aim to analyze the impact of index fund ownership on the market for corporate control we are especially interested in control-taking takeover offers made by bidders with a low ownership stake in the target. The threshold for "control-taking" is set in accordance to the definition of the German takeover code at 30% ownership. Thus, panel B shows the statistics for a sub-sample of bidders with an original toehold below 30%. The mean (median) success rate throughout the entire sample is 0.346 (0.257) showing that bidders can secure just slightly more than one third of targeted shares on average. With an average value of 0.432 (0.391) success rate in the sub-sample below 30% is higher compared to the full sample. This suggests that takeover attempts, in which bidders seek to obtain control are more successful compared to takeover attempts, in which bidders seek to expand control.

Stake of index funds and ETF is the key explanatory variable in our analysis. Across the entire sample the average relative stake is 0.009, demonstrating only low index fund and ETF ownership despite the increasing popularity of these funds. Panel B shows average index fund and ETF ownership is higher by 0.6 percentage points for the subsample with control-taking offers and toeholds below 30% compared to the full sample (0.015).

Table 4.3: Summary statistics

Panel A: Full sample

	N	Mean	S.D.	Q1	Median	Q3
Dependent variable						
Success rate	323	0.346	0.309	0.062	0.257	0.623
Explanatory variables						
Stake index funds	323	0.009	0.027	0.000	0.000	0.000
Stake individual shareholder	323	0.064	0.160	0.000	0.000	0.044
Stake strategic shareholder	323	0.170	0.298	0.000	0.003	0.262
Stake foreign shareholder	323	0.195	0.253	0.001	0.083	0.323
Stake institutional shareholder	323	0.120	0.222	0.008	0.124	0.327
Toehold	323	0.422	0.324	0.087	0.393	0.716
Ownership concentration	323	0.127	0.271	0.001	0.022	0.111
Offer premium	323	0.188	0.247	0.002	0.108	0.293
Management recommendation	323	0.579	0.494	0	1	1
Control variables						
Competing offer	323	0.034	0.182	0	0	0
Method of payment	323	0.941	0.236	1	1	1
Multiple round	323	0.142	0.350	0	0	0

Mandatory offer	323	0.303	0.460	0	0	1
Minimum acceptance rate	323	0.220	0.415	0	0	0
Bidder largest shareholder	323	0.678	0.468	0	1	1
Financial investor	323	0.467	0.450	0	0	1
Foreign bidder	323	0.437	0.497	0	0	1
Strategic investor	323	0.443	0.497	0	0	1
Size	323	4.811	2.175	3.461	4.647	6.067
Crisis	323	0.084	0.277	0	0	0

Panel B: Toehold below 30%

	N	Mean	S.D.	Q1	Median	Q3
Dependent variable						
Success rate	134	0.432	0.344	0.069	0.391	0.795
Explanatory variables						
Stake index funds	134	0.015	0.032	0.000	0.000	0.014
Stake individual shareholder	134	0.076	0.140	0.000	0.000	0.113
Stake strategic shareholder	134	0.222	0.358	0.000	0.095	0.355
Stake foreign shareholder	134	0.253	0.244	0.037	0.196	0.418
Stake institutional shareholder	134	0.247	0.217	0.064	0.206	0.391
Toehold	134	0.098	0.117	0.000	0.034	0.200
Ownership concentration	134	0.175	0.258	0.019	0.064	0.179
Offer premium	134	0.238	0.250	0.052	0.172	0.353
Management recommendation	134	0.642	0.481	0	1	1
Control variables						
Competing offer	134	0.060	0.238	0	0	0
Method of payment	134	1	0	1	1	1
Multiple round	134	0.254	0.437	0	0	1
Mandatory offer	134	0.022	0.148	0	0	0
Minimum acceptance rate	134	0.440	0.498	0	0	1
Bidder largest shareholder	134	0.239	0.428	0	0	0
Financial investor	134	0.433	0.497	0	0	1
Foreign bidder	134	0.448	0.499	0	0	1
Strategic investor	134	0.485	0.502	0	0	1
Size	134	5.564	2.061	4.031	5.377	6.988
Crisis	134	0.104	0.307	0	0	0

This table shows summary statistics for dependent, independent and control variables used in the analyses of determinants of success for takeover attempts of publicly listed companies in Germany between 2006 and 2018. Panel A shows summary statistics for the full sample, panel B shows summary statistics for the sub-sample of bidders with a toehold below 30%.

4.3. Explanatory variables

4.3.1. Target -related variables

Individual shareholders have an average relative stake of 0.064 in the target company. As indicated by a median value of 0 individual shareholder stake is influenced by few target companies that have individual owners with significant large stakes. Relative stake of individual shareholders in the sub-sample of control-taking offers (toehold below 30%) is 0.076 on average and thus increased compared to the full sample. Relative stake of strategic shareholders throughout the full sample has a mean value of 0.170 (sub-sample below 30% 0.222). Like individual shareholder stake, mean value is influenced by comparatively high values in the 4th quartile of the sample, which provides an indication of a strong strategic shareholder influence in selected companies. Moreover, the increased value of the variable in the sub-sample below 30% suggests higher strategic involvement in targets where bidders do not yet have a controlling stake. With a mean (median) value of 0.195 (0.083), foreign shareholders represent the shareholder type with the largest stake across the entire sample. Foreign shareholder stake in the sub-sample with toeholds below 30% is even higher, as depicted by the average (median) value of 0.253 (0.196). Institutional shareholder stake has a mean (median) value of 0.120 (0.124) in the full sample and 0.247 (0.206) in the sub-sample below 30%, which indicates higher institutional involvement in companies in which bidders do not yet have significant influence.

Summary statistics for initial bidder toehold show a mean (median) value of 0.422 (0.393) for the full sample. Again, due to the strong minority protection in German corporate law many offers are seeking to expand control over the target with an offer. Initial toehold in the sub-sample of control-taking bids (toehold below 30%) is 0.098 on average (median 0.034).

Relative ownership concentration excluding bidder's stake has a mean (median) value of 0.127 (0.022) and is on a relatively low level throughout the entire sample. Ownership concentration in the sub-sample below 30% is higher than in the full sample, as shown by the mean (median) value of 0.175 (0.064).

Targets in the full sample had an average equity value of EUR 4.811 bn (median EUR 4.647 bn). Targets in the sub-sample of control-taking bids were larger with an equity value of EUR 5.564 bn on average (median EUR 5.377 bn).

4.3.2. Offer-related variables

Offer premium in the full sample has a mean (median) value of 0.188 (0.108), suggesting that bidders offer a significant premium in German takeover attempts.[12] As observed from panel B, offer premium in the sub-sample below 30% has a mean (median) value of 0.238 (0.172) and is higher than in the full sample. Management recommendation has a mean value of 0.579 in the entire sample and 0.642 in the sub-sample below 30%; in the majority of cases target management board recommends tendering the shares.

Summary statistics in table 4.3. suggest that only a minority of bidders had to face competition during a takeover attempt, as indicated by the mean value of 0.034 in the full sample and 0.060 in the sub-sample below 30%. In the full sample, the vast majority of offers was made in cash, as indicated by the mean value of the variable of 0.941 (median 1). For control-taking offers in the sub-sample below 30% all offers were made in cash, as indicated by the mean value of 1. For the full sample, as well as sub-sample below 30%, summary statistics show that the minority of offers included several bidding rounds or were mandatory. Moreover, less than 50% of the offers had a specified minimum acceptance rate. Yet, compared to the full sample, there is an increased number of specified minimum acceptance rates in the sub-sample below 30%, as depicted by the mean value of 0.440 in the sub-sample and 0.220 in the full sample.

4.3.3. Bidder-related variables

We employ additional bidder-related control variables and account for the influence of bidders that already are the largest shareholder in a target company by using an indicator variable. Summary statistics show a mean value of 0.678 (median 1.000) and indicate again for the full sample that most bidders already are the largest shareholder. In the control-taking sub-sample below 30% bidders were rarely already the largest shareholder in the target company, as indicated by the mean (median) value of 0.239 (0.000). Summary statistics also show for the full sample that the majority of bidders were financial investors or private equity investors. There is an equal split between non-financial bidders and financial bidders/private equity investors in the sub-sample below 30%, as depicted by the mean value of 0.500. Finally, we

[12] E.g., Campa and Moschieri (2008) document an offer premium of 20% in European M&As. Betton et al. (2008) document an even higher offer premium ranging between 25% and 45%.

control whether the bidder can be characterized as strategic investor. The mean values of 0.443 for the full sample and 0.485 for the sub-sample below 30% show that, despite being an important bidder, strategists did not make the majority of bids.

4.3.4. Macroeconomic control variables

8.4% and 10.4% of takeover attempts in the full sample and in the sub-sample below 30% respectively were made during crisis times.

5. Results

5.1. Tendering behavior of index funds

The description of tracking strategies (Sect. 2.2.) has shown that there are strategies for index funds to track indices without physically owning all stocks constituting the index. If funds synthetically replicate an index they might be able to tender shares and replace their positions synthetically, e.g., by a using a derivatives portfolio. Thus, an investigation of index funds' actual tendering behavior during German takeover offers provides further insights.

We do this by analyzing the change in index fund ownership over the course of the acceptance period after a takeover offer has been published for all 82 cases with index fund ownership in the target company. Table 5.1 depicts the tender behavior of index funds and ETF and shows the average number and ownership stake of index funds at the beginning and end of the acceptance period of the takeover offer.

Table 5.1: Tender behavior of index funds and ETF

	N	Mean	S.D.	Q1	Median	Q3
Number of invested index funds/ETF						
Before takeover offer acceptance period	82	11.208	9.288	3.000	8.000	18.000
After takeover offer acceptance period	82	9.364	8.698	2.000	6.000	16.000
Divestment of index funds/ETF						
Total number of divested funds	82	1.844	2.740	0.000	1.000	2.000
In % of initial fund number	82	0.211	0.298	0.000	0.083	0.294
Initial stake of index funds/ETF						
Before takeover offer acceptance period	82	0.024	0.031	0.003	0.012	0.031
After takeover offer acceptance period	82	0.018	0.027	0.002	0.007	0.021
Tendered stake of index funds/ETF						
Total percent of divested stakes	82	0.006	0.012	0.000	0.001	0.006
In % of initial stake	82	0.248	0.349	0.000	0.131	0.021

This table reports tendering statistics of index funds and ETF during takeover attempts of publicly listed companies in Germany. Throughout the entire sample, index funds and ETF have been invested in 82 target companies by the time of offer announcement of a bidding company. Monthly ownership data is used and obtained from Thomson Reuters Eikon.

The average number of index funds invested in the target, as well as the average stake of equity ownership decrease substantially during the acceptance period. Average number of index funds invested decreases by 21.1% from 11.21 to 9.36 and average equity stake decreases by 24.8% from 2.4% to 1.8%.[13] Thus, a significant part of index fund as owners obviously decided to tender their shares to the bidder.

5.2. Multivariate results

To examine the effect of index funds/ETF in the shareholder structure of a target company on the takeover success, we use an Ordinary Least Squares (OLS) regression approach. and construct a model with the following specification:

$$\begin{aligned} Success\ Rate_{ij} &= \beta_0 + \beta_1 \times Stake\ Index\ Funds_{ij} + \gamma \times Shareholder\ Types_{ij} + \beta_2 \\ &\times Toehold_{ij} + \beta_3 \times Ownership\ Concentration_{ij} \\ &+ \beta_4 \times Offer\ Premium_{ij} + \beta_5 \times Management\ Recommendation_{ij} + \lambda \\ &\times Controls_{ij} + \nu_j + \varepsilon_{ij} \end{aligned}$$

where *i* denotes target firms, *j* denotes target industries, ν_j represents industry fixed effects and ε_{ij} is an error term. *Stake Index Funds*$_{ij}$ is the relative proportion of index funds/ETF in targets' ownership structure, and the resulting β_1 estimate captures its impact on the acceptance rate of a takeover bid. The variables toehold, ownership concentration, offer premium and management recommendation extend the model and are considered to be central determinants of takeover success. The vector *Shareholder Types*$_{ij}$ contains four variables: accumulated relative ownership stakes of individual, strategic, foreign and institutional investors. Stake of institutional investors accounts for relative holdings of all other institutional investors excluding index funds/ETF. *Controls*$_{ij}$ is a vector of control variables that includes deal characteristics, macroeconomic, target-related and bidder-related controls. Standard errors are clustered by

[13] Note that our data mark an index fund still being invested and part of the target's ownership structure at the beginning of the acceptance period if it decides to sign an irrevocable commitment. We only adjust the toehold and our success measure for irrevocable undertakings.

offer announcement year to account for potential time-series dependence (e.g., Ferreira & Matos, 2008; Petersen, 2009).

5.2.1. Full sample

Results of the regression analysis are presented in Table 5.1. Specification model (1) only includes *Stake Index Funds*$_{ij}$ and *Controls*$_{ij}$ as independent variables, and depicts a negative relationship between index funds'/ETF' holdings and success rate of takeover. The coefficient for *Stake Index Funds*$_{ij}$ in this model is statistically insignificant; the significance level increases when accounting for other categories of shareholders in target company (model (2)). Consistent with the findings of Antoniou et al. (2019) we observe a high positive correlation between the stake of index funds and stake of other institutional investors.[14] The stakes of these types of shareholders in the target company are also highly correlated with the share of foreign investors in its ownership structure. This reinforces that other shareholder stakes need to be considered in our analysis to avoid potentially misleading results from omitted variables. Model (3) only considers *Toehold*$_{ij}$, *Ownership Concentration*$_{ij}$ and *Controls*$_{ij}$ as independent variables, while model (4) combines all target- and bidder-related variables. Model (5) describes the full model specification including all target-, offer- and bidder-related control variables. The results of the multivariate regression models (4) and (5) confirm our hypothesis that index funds have a significant and negative impact on the success rate of takeover offers: coefficient estimates are significant at a 5% and 10% confidence level, respectively. We interpret this finding as the result of the relatively low propensity of index funds/ETF to tender shares during a takeover attempt, as tendering shares would deter index replication.

Antoniou et al. (2019) find evidence that high ETF-ownership in firms yields less informative stock prices. The lower stock price informativeness in such companies may deprive management and market participants of a reliable assessment of the potential benefits of a takeover offer. We presume that the target shareholders in this case would rely stronger on the management recommendation. In addition, we hypothesize the offer premium to have a lower (positive) impact on the takeover success of such offers. In order to analyze the two hypotheses we extend the full model (5) at with an interaction term of *Stake Index Funds*$_{ij}$ and *Management Recommendation*$_{ij}$ (model (6)) and with an interaction term of *Stake Index Funds*$_{ij}$ and *Offer Premium*$_{ij}$ (model (7)).

[14] For brevity, correlations are only reported in Appendix 7.7.

Table 5.1: Multivariate linear regression results

	Dependent variable: Success rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stake index funds	-1.201	-1.805*		-1.859**	-1.664*	-2.964***	-0.233
	(0.794)	(0.870)		(0.851)	(0.910)	(0.839)	(1.409)
Stake individual shareholder		0.228*		0.223*	0.174	0.181	0.173
		(0.108)		(0.112)	(0.137)	(0.132)	(0.142)
Stake strategic shareholder		-0.164***		-0.146***	-0.109*	-0.113**	-0.102**
		(0.049)		(0.045)	(0.050)	(0.050)	(0.046)
Stake foreign shareholder		-0.048		-0.045	-0.043	-0.050	-0.036
		(0.079)		(0.079)	(0.076)	(0.075)	(0.080)
Stake institutional shareholder		0.177		0.163	0.106	0.099	0.124
		(0.163)		(0.161)	(0.159)	(0.160)	(0.159)
Toehold			-0.047	-0.054	-0.102*	-0.112**	-0.085
			(0.061)	(0.064)	(0.052)	(0.050)	(0.050)
Ownership concentration			-0.130**	-0.096	-0.062	-0.064	-0.059
			(0.058)	(0.058)	(0.063)	(0.063)	(0.063)
Offer premium					0.169**	0.170**	0.192**
					(0.071)	(0.074)	(0.073)
Management recommendation					0.147***	0.134***	0.149***
					(0.030)	(0.026)	(0.029)
Stake index funds x Management recommendation						1.749	
						(1.170)	
Stake index funds x Offer premium							-5.370
							(4.294)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.28	0.31	0.28	0.32	0.39	0.39	0.39
Adjusted R^2	0.23	0.25	0.23	0.25	0.32	0.33	0.33
N	323	323	323	323	323	323	323

This table presents estimates from a multivariate OLS regression. The dependent variable is success rate and indicates one bidder's ability to secure targeted shares in a takeover attempt. Explanatory variables are specified in table 4.2. Controls include c*risis, competing offer,* b*idder as largest shareholder*, *equity value of target company*, *method of payment*, *minimum acceptance rate*, *mandatory offer*, *multiple round*, *index fund ownership*, *same industry*, *bidder is financial investor*, *and bidder is private equity*. Standard errors are clustered by offer announcement year and are reported in parentheses. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

We find a negative effect of ETF ownership on takeover success in all our estimation models; in model (6) and (4) the coefficient estimate is significant on a 1% and 5% confidence level respectively. In the full model (5) still the negative impact is significant on the 10% level. Thus,

our results on all takeover offers already support our main hypothesis. Note that except for model (6) all coefficient estimates are above one. This implies that the negative impact of ETF ownership is even higher than the ETF stake itself. Throughout all models we find takeover success to be negatively affected by the accumulated relative of all strategic investors. The observed effect is statistically significant at the 1%-level in models (2) and (4), at 5%-level in models (6) and (7) and at 10%-level in model (5). This suggests that the presence and stakes of strategic shareholders may potentially distract bidders from a successful takeover, as their strategic objective of the investment may result in a decreased willingness to tender shares. The stakes of individuals have a positive impact and is significant at the 10%-level in models (2) and (4), while foreign shareholders and (remaining) institutional shareholder do not show to have a significant impact on takeover success. The results of our regression suggest a negative relation of ownership concentration in target's shareholder structure and takeover success; however, the effect is not statistically significant if the different shareholder types are included in the model (models (4) – (7)).

Our results also suggest a significant negative relationship between success rate and initial toehold of the bidder in the full model (5), with the coefficient being significant at the 10%-level. Large toehold implies that the number of obtainable shares during the bid is relatively small, which results in an acquisition of these shares in relative terms being rather challenging. The negative coefficient for the toehold also partially originates from the effect of irrevocable undertakings closed prior to a takeover offer on takeover success.[15]

In line with other empirical studies on takeover success, we find a strong positive effect of offer premium and (positive) management recommendation on the success rate of the bid, significant at the 5%-level and 1%-level, respectively. According to our findings, an increase in offer premium by 10 percentage points (c.p.) leads on average to 1.69 percentage points increase in takeover success rate. Our results in the full model (5) suggest that the bids with positive recommendation from the management have on average 14.7 percentage points higher success rate than other bids (c.p.).

With respect to the potential lower stock price informativeness and reliability of offers we find the signs of the two coefficients for the interaction terms in models (6) and (7) to corroborate our expectation: the positive impact of management recommendation is increasing

[15] When separating toehold and irrevocable undertakings, we find a negligible effect of toehold on success rate and a strong negative relation between irrevocable undertakings and success rate. Results are not reported here for brevity.

with the increase in stake held by index funds. The positive effect of the offer premium is decreasing with the increase of index funds/ETF holdings in target firm. While signs of the coefficients of the interaction terms are in line with our hypotheses, both conditional effects in our linear regression model are statistically insignificant, which does not provide additional support for the hypothesis of potentially unreliable price-based assessment of benefits from a takeover.

Overall, our regression results for the full sample demonstrate solid explanatory power, given an adjusted R-squared of 0.323 for model specification (5). Control variables appear to absorb all observable offer- and ownership-related characteristics. Since our dependent variable (success rate) is censored by construction in the lower level at value [0] and at the upper level at value [1], we additionally run a Tobit regression model with the same variables and check for the robustness of our findings. The results for Tobit estimations offer similar coefficients and significance levels for our models and reinforce our findings (see Appendix 7.2).

5.2.2. Sub-sample: control-taking bids

As we are interested in the impact of ETF ownership on the market for corporate control we now concentrate on the analysis of control-taking takeover bids made from a bidder not yet having control over the target company. Following the German takeover code, we define bids with a bidder toehold less than 30% as “control-taking” and rerun our OLS regression analysis on the 134 takeover offers meeting this requirement. Table 5.2 reports the results for the same specification models as discussed for the full sample.

Table 5.2: Multivariate sub-sample regression results – control-taking offers with toehold below 30%

	Dependent variable: Success rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stake index funds	-2.996***	-3.792***		-3.901***	-3.089***	-3.575**	-2.264
	(0.826)	(0.872)		(0.921)	(0.796)	(1.411)	(1.505)
Stake individual shareholder		0.680***		0.584***	0.603**	0.600**	0.619**
		(0.162)		(0.177)	(0.206)	(0.207)	(0.210)
Stake strategic shareholder		-0.136**		-0.038	0.027	0.023	0.031
		(0.050)		(0.054)	(0.048)	(0.046)	(0.045)
Stake foreign shareholder		0.049		0.057	-0.020	-0.021	-0.011
		(0.137)		(0.121)	(0.122)	(0.125)	(0.116)
Stake institutional shareholder		0.168		0.141	0.081	0.079	0.081
		(0.255)		(0.213)	(0.202)	(0.209)	(0.200)
Toehold			-0.192*	-0.180*	-0.247***	-0.243***	-0.243***
			(0.100)	(0.098)	(0.075)	(0.074)	(0.075)
Ownership concentration			-0.356***	-0.297*	-0.210	-0.207	-0.217
			(0.101)	(0.147)	(0.132)	(0.129)	(0.128)
Offer premium					0.187**	0.189**	0.212**
					(0.077)	(0.077)	(0.095)
Management recommendation					0.264***	0.251***	0.267***
					(0.035)	(0.047)	(0.034)
Stake index funds x Management recommendation						0.780	
						(1.672)	
Stake index funds x Offer premium							-3.418
							(4.554)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.425	0.504	0.440	0.531	0.657	0.658	0.659
Adjusted R^2	0.317	0.389	0.329	0.411	0.561	0.558	0.560
N	134	134	134	134	134	134	134

This table presents estimates from a multivariate OLS regression. The dependent variable is success rate. This table contains sub-sample regression using the sub-sample of bidders with a toehold below 30%. Explanatory variables are explained in table 4.2. Controls are the same as specified in regression model 5.1. Standard errors are clustered by offer announcement year and are reported in parentheses. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

The results of our analysis show even stronger support for our hypothesis for this sub-sample: The coefficient estimates for *Stake Index Funds*$_{ij}$ are negative and significant at the 1%-level of confidence. The full model (5) suggests that an increase of the relative stake of index

funds/ETF by one standard deviation will lead to a 9.91 percentage point drop in takeover success rate. In contrast, an increase of offer premium by one standard deviation will lead to only 4.68 percentage point increase in success rate. Again, the impact of ETF ownership is significantly larger than the ownership stake itself: In the full model (5) a 1% ETF ownership stake yields a 3% lower takeover success rate.

As the shareholder structure for targets in the sample of control-taking bids is significantly different compared to the full sample, we observe significant differences in the respective coefficient estimates: the stake of individual shareholders has a significantly positive effect on the success rate of takeovers by bidders with no controlling stake whereas the impact of strategic shareholders turns insignificant in the full model (5). The effects of stake held by foreign investors and of stake of institutional investors other than ETF are negligible for the takeover success in both statistical and economic significance. The bidder´s toehold has a significant and negative, the premium offered a significant and positive impact on the success rate of the bid.

Positive management recommendation increases the bid's success by 26.4 percentage points (significant at the 1% confidence level). As in the full-sample analysis we also investigate the effects of offer premium and management recommendation conditional to the relative stake of index funds in the shareholder structure of the target company. The findings for the sub-sample are similar to the full sample regression results and are reported by the corresponding models (6) and (7) in Table 5.2. Although the coefficients of the interaction terms have the hypothesized signs, the effects are statistically insignificant. The results from the corresponding Tobit regression analysis confirm the findings for the sub-sample of control-taking bids. Overall, our model (5) shows high explanatory power for the sub-sample analysis as depicted by an adjusted R-squared of 0.561.

5.3. Robustness checks

5.3.1. Endogeneity

First, to address potential endogeneity concerns we employ an instrumental variable approach (IV), similar to Aghion et al. (2013) and Antoniou et al. (2019) by using a firm's inclusion into a market index as an instrumental variable. For the sample of German takeovers, a suitable alternative is the German HDAX index (successor to the DAX100 index).[16] The

[16] HDAX consists of all member companies of the DAX, MDAX, and TecDAX indices.

constituents of DAX, MDAX and TecDAX indices are likely to have larger index fund/ETF presence in their shareholder structures. On the other hand, inclusion in HDAX is not driven by any performance considerations as membership depends on market capitalization and turnover of the particular stock. Thus, the relevance and exclusion requirements of a valid IV are met.

Table 5.3 reports results for the IV analysis for the full sample and sub-sample (Panel A and Panel B, respectively). First stage regressions reveal a positive effect of index inclusion on the Index fund/ETF stake at the target company (statistically significant at the 1%-level for both full sample and sub-sample). We perform the Cragg and Donald (1993) F-test for each IV regression to check for weak instruments; with reported F-statistics well above 10 and adjusted R^2 above 50%, we conclude that our instrument meets the requirement for a valid instrument. The second stage results of our IV approach confirm our findings from Section 5.2, indicating an even stronger negative effect of Index fund/ETF ownership on takeover success. Effects of index fund stake are statistically significant at 5%-level for the full sample and 1%-level for the control-taking sub-sample.

Table 5.3: Instrumental variable model results

	Panel A. Full sample		Panel B. Sub-sample (toehold < 30%)	
	First stage	Second stage	First stage	Second stage
Index inclusion (HDAX)	0.032***		0.025***	
	(0.006)		(0.005)	
Stake index funds		-2.034**		-5.555***
		(0.791)		(1.799)
Stake individual shareholder	0.001	0.174	0.011	0.624***
	(0.005)	(0.127)	(0.011)	(0.165)
Stake strategic shareholder	-0.008**	-0.112**	-0.009	0.016
	(0.003)	(0.044)	(0.006)	(0.039)
Stake foreign shareholder	0.020**	-0.034	0.018	0.017
	(0.008)	(0.072)	(0.020)	(0.114)
Stake institutional shareholder	0.019	0.114	0.013	0.128
	(0.012)	(0.148)	(0.014)	(0.180)
Toehold	0.009	-0.103**	0.009	-0.258***
	(0.006)	(0.046)	(0.007)	(0.069)
Ownership concentration	0.000	-0.063	0.002	-0.219*
	(0.003)	(0.056)	(0.010)	(0.112)
Offer premium	-0.004	0.167**	-0.000	0.179***
	(0.005)	(0.066)	(0.011)	(0.066)
Management recommendation	-0.002	0.146***	-0.010	0.248***
	(0.002)	(0.027)	(0.006)	(0.030)
Industry FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
R^2	0.569	0.385	0.638	0.636
Adjusted R^2	0.524	0.322	0.537	0.534
Weak Instrument Test (F-stat)	32.79		20.94	
N	323	323	134	134

This table presents estimates from 2SLS instrumental variable regression. The dependent variable in the first stage is Index fund stake, and in the second stage is success rate. Panel A presents regression results for the full sample. Panel B presents regression results for the sub-sample of bidders with a toehold below 30%. Explanatory variables are specified in Table 4.2. Controls include c*risis, competing offer,* b*idder as largest shareholder, equity value of target company, method of payment, minimum acceptance rate, mandatory offer, multiple round, index fund ownership, same industry, bidder is financial investor, and bidder is private equity*. Standard errors are clustered by offer announcement year and reported in parentheses. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

5.3.2. Fractional response regression

Second, our standard OLS regression analysis from above assumes a linear relationship between the success rate as dependent variable and the different independent variables. The values of the success rate in the full sample are confined to a [0,1] interval and display a high skewness towards the lower boundary.[17] Thus, the assumption of a linear relationship may not

[17] 22.9% of the observations have success rate values of below 0.05.

be appropriate. As a robustness check for our results we apply a fractional regression analysis as a non-linear alternative suitable for our success rate variable (Papke & Wooldridge, 1996). The method estimates a logistic regression function using quasi-maximum likelihood estimator (QLME). We follow the same structure of the analysis as described in Section 5.1. The results of fractional regression coefficients of the full sample are presented in Table 5.4. Marginal effects are calculated at mean values of covariates and listed below the coefficients.

Table 5.4: Fractional response regression – full sample

	Dependent variable: Success rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stake index funds	-6.255*	-9.790**		-10.136***	-9.098**	-15.384**	-2.608
	(3.583)	(3.922)		(3.850)	(3.803)	(6.371)	(6.201)
marginal effect	*-1.248**	*-1.919***		*-1.979****	*-1.717***	*-2.180****	*-1.073****
	(0.713)	*(0.760)*		*(0.743)*	*(0.712)*	*(0.801)*	*(0.317)*
Stake individual shareholder		1.525***		1.545***	1.285**	1.331**	1.255**
		(0.552)		(0.552)	(0.594)	(0.586)	(0.600)
marginal effect		*0.299****		*0.302****	*0.243***	*0.305****	*0.221***
		(0.107)		*(0.107)*	*(0.112)*	*(0.107)*	*(0.110)*
Stake strategic shareholder		-1.158***		-1.114**	-0.933**	-0.965**	-0.866**
		(0.414)		(0.434)	(0.441)	(0.442)	(0.438)
marginal effect		*-0.227****		*-0.218****	*-0.176***	*-0.221****	*-0.146**
		(0.0801)		*(0.0841)*	*(0.0829)*	*(0.0838)*	*(0.0793)*
Stake foreign shareholder		-0.228		-0.214	-0.148	-0.195	-0.120
		(0.419)		(0.420)	(0.438)	(0.435)	(0.442)
marginal effect		*-0.0447*		*-0.0418*	*-0.0280*	*-0.0490*	*-0.0368*
		(0.0822)		*(0.0820)*	*(0.0827)*	*(0.0805)*	*(0.0826)*
Stake institutional shareholder		0.827		0.753	0.477	0.440	0.573
		(0.507)		(0.509)	(0.526)	(0.525)	(0.532)
marginal effect		*0.162*		*0.147*	*0.0900*	*0.0938*	*0.127*
		(0.0989)		*(0.0991)*	*(0.0993)*	*(0.0979)*	*(0.101)*
Toehold			-0.252	-0.345	-0.565*	-0.614*	-0.472
			(0.316)	(0.316)	(0.312)	(0.315)	(0.317)
marginal effect			-0.0502	*-0.0673*	*-0.107**	*-0.0842*	*-0.101**
			(0.0628)	*(0.0616)*	*(0.0584)*	*(0.0598)*	*(0.0594)*
Ownership concentration			-0.778	-0.550	-0.349	-0.362	-0.328
			(0.496)	(0.426)	(0.397)	(0.395)	(0.400)
marginal effect			*-0.155*	*-0.107*	*-0.0658*	*-0.0852*	*-0.0743*
			(0.0973)	*(0.0825)*	*(0.0746)*	*(0.0773)*	*(0.0775)*
Offer premium					0.800**	0.810**	0.914***
					(0.319)	(0.319)	(0.342)
marginal effect					*0.151***	*0.216****	*-0.048****
					(0.0596)	*(0.0590)*	*(0.0139)*

Management recommendation					0.721***	0.650***	0.737***
					(0.176)	(0.180)	(0.175)
marginal effect					*0.136****	*0.0256***	*0.165****
					(0.0324)	*(0.0119)*	*(0.0315)*
Stake index funds x Management recommendation						8.514	
						(7.048)	
Stake index funds x Offer premium							-25.090*
							(14.944)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.094	0.107	0.095	0.110	0.133	0.135	0.135
N	323	323	323	323	323	323	323

This table presents estimates from a fractional logistic regression. Panel A present regression results for the full sample. Panel B (see Appendix) presents regression results for the sub-sample of bidders with a toehold below 30%. The dependent variable is success rate. Explanatory variables are specified in table 4.2. Controls are the same as specified in regression analysis in table 5.1. The numbers in italics are the marginal effects and corresponding standard error. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

As the results in Table 5.4. suggest, the marginal effect of index funds/ETF holdings on takeover success is negative and highly statistically significant for all model specifications and similar in magnitude to the linear regression results. To illustrate the economic significance of this effect based on the full model (5), a one standard deviation increase in the stake of index funds yields a decrease of the takeover success rate by 4.65 percentage points, compared to a one standard deviation increase in the offer premium causing a 3.73% percentage points success rate increase. In general, all reported marginal effects of other determining factors are in line with the results of the OLS model from above. The marginal effects of strategic and individual stakes on takeover success increase in their statistical significance level.

Similar to the OLS analysis, models (6) and (7) estimate the effects of management recommendation and offer premium (respectively) conditional to the stake of index funds by including interaction terms in regressions. However, the interpretation of the coefficient estimates requires additional care: The coefficient of the interaction effect in a non-linear model, does not equal the marginal effect of the interaction term (Ai & Norton, 2003). In a non-linear model the marginal effect can only be investigated by observing the specific values of the model covariates. We thus calculate the average marginal effects of offer premium and management recommendation on success rate at the various values for the *Stake Index Funds*$_{ij}$

variable. The marginal effects are calculated at mean values of all other covariates and are presented in Table 5.5.

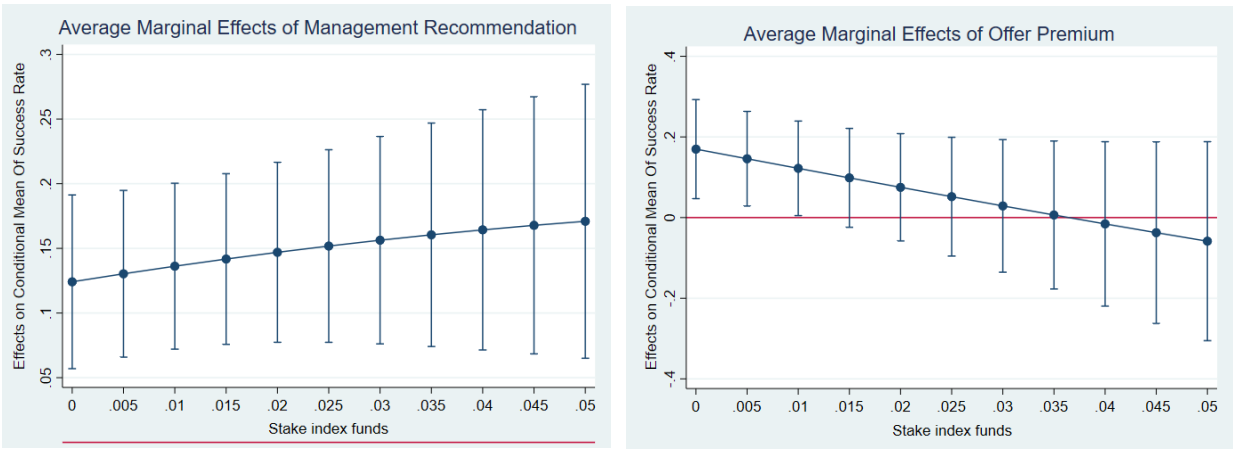
Table 5.5: Conditional marginal effects on success rate

	Panel A. Full sample		**Panel B. Sub-sample (toehold < 30%)**	
$Stake\ Index\ Funds_{ij}$	Management recommendation	Offer premium	Management recommendation	Offer premium
= 0.0%	0.124***	0.170***	0.210***	0.195***
= 0.5%	0.130***	0.146**	0.211***	0.176***
= 1.0%	0.136***	0.122**	0.212***	0.158***
= 1.5%	0.142***	0.099	0.213***	0.139**
= 2.0%	0.147***	0.075	0.214***	0.121*
= 2.5%	0.152***	0.052	0.214***	0.102
= 3.0%	0.156***	0.029	0.213***	0.084
= 3.5%	0.160***	0.006	0.212***	0.066
= 4.0%	0.164***	-0.016	0.211***	0.048
= 4.5%	0.168***	-0.037	0.210***	0.031
= 5.0%	0.171***	-0.059	0.208***	0.014
= 5.5%	0.174***	-0.079	0.206***	-0.003
= 6.0%	0.176***	-0.099	0.204***	-0.018
= 6.5%	0.178***	-0.119	0.201***	-0.034
= 7.0%	0.180***	-0.138	0.198***	-0.048
= 7.5%	0.182***	-0.156	0.194***	-0.062
= 8.0%	0.183**	-0.174	0.191***	-0.074
N	323	323	134	134

This table presents marginal effects from a fractional logistic regression in Table 5.4 (models (6)-(7)) at different values of $Stake\ Index\ Funds_{ij}$ and at mean values of other covariates. Panel A presents regression results for the full sample. Panel B presents regression results for the sub-sample of bidders with a toehold below 30%. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

For the full sample, the marginal effect of management recommendation is positive and increasing with the increase of relative stake of index funds; it remains highly significant at each level of the conditional variable. On the contrary, the average marginal effect of offer premium is positive and statistically significant at the 1%-level only for offers with low levels of ETF ownership. The positive effect of the offer premium is rapidly decreasing with the increase of relative stake of index funds in targets' shareholder structure. It loses statistical significance already at the 1.5%-value of *Stake Index Funds*$_{ij}$. Figure 1 graphically illustrates the marginal effects of offer premium and management recommendation on success rate for increasing index fund/ETF stakes in target companies.

Figure 1: Marginal effects on success rate conditional to index funds share stake



For the sub-sample with control-taking takeover bids we obtain similar conditional effects (Table 5.5, Panel B): Positive management recommendation has a positive, slightly declining marginal impact at increasing index fund/ETF ownership stake; marginal effect of offer premium turns insignificant at an index fund/ETF stake of 2%.

Overall, based on coefficient signs and directions of the independent variables, results from applying fractional regression methodology support our findings. Additionally, the results of our marginal analysis based on the logistic model suggest that the index/fund ETF stake in one target's ownership structure positively affects the (positive) impact of the management recommendation on the success rate of the takeover offer.

6. Conclusion

This study analyses the impact of index fund and ETF ownership on the success rate of takeover attempts of publicly listed companies in Germany between 2006 and 2018. As index funds and ETF are required to track a particular index they will find it difficult to tender their shares if a firm being part of this index becomes target of a takeover offer. We thus hypothesize a negative relationship between index fund and ETF ownership and takeover offer success.

By analyzing the tendering behavior of index funds and ETF we find a significant fraction of funds accepting the offer and tendering shares: Tracking ownership data along the acceptance period of the offer for the 82 cases with index fund and ETF ownership, we find index funds' and ETF' average ownership stake to decrease from 2.4% by one quarter to 1.8%, presumably by tendering their shares to the bidder. Yet, approximately 75% of index funds and ETFs do not tender their shares during a takeover attempt.

Despite the ability and obvious willingness of some funds to tender, our main result still supports our hypothesis: There is a negative relationship between index fund and ETF

ownership and takeover success in Germany. By performing an OLS regression analysis, we find that the coefficient estimate of index fund and ETF ownership is negative and significant at a 5% and a 1% confidence level in the full regression model of the full sample and the sub-sample of control-taking bids (with bidder's toehold below 30%), respectively. Besides our main result we find the remaining independent variables to have the expected impact on the dependent variable.

Although some funds tender their shares we estimate coefficients for the impact of ETF ownership that are well above one. This means the effect of ETF ownership on takeover success is even higher than the ETF ownership itself. Obviously ETF ownership also affects the decision to tender of other shareholders and/or the decision of outside investors to step in and acquire target shares on the market place after the offer is announced. The latter case especially relates to hedge funds: The reduction of the number of obtainable shares due to index fund and ETF ownership may make merger arbitrage strategies from hedge funds more attractive. In the case of the takeover offer for STADA, hedge funds acquired significant stakes of the target company after the offer was made public and successfully bid up the offer price. Thus, by increasing the probability to attract merger arbitrageurs index fund and ETF ownership potentially further increases the takeover costs for the bidder.

This negative effect of ETF ownership may even be amplified by the following observation: Our results document a negative effect of index fund and ETF ownership on takeover offers that have been made. Given the general increase of index fund and ETF ownership stakes over time in recent years and its negative impact on takeover success we hypothesize that the propensity of a potential bidder to launch a takeover offer will be lower if the target is member of an index and has several index funds/ETF invested.

Overall the lower efficiency of the market for corporate control may weaken shareholder influence in German corporations; significant index fund and ETF ownership may even work as a takeover deterrent supporting management entrenchment. Can this negative effect be compensated by stronger monitoring effort from index funds and ETF? Despite the "voice instead exit" quote from Larry Fink, CEO of BlackRock, there is no clear evidence for this, at least in the US: Bebchuk and Hirst (2018) analyze voting behavior of index funds and do not find evidence for a stronger propensity to support proposals in opposition to management. For Germany, index fund and ETF ownership stakes are still relatively low; thus, the direct impact of ownership of these funds on corporate governance is still to be investigated.

7. Appendix

Appendix 7.1: Calculation of relative ownership concentration

$$Relative\ ownership\ concentration = \\ = \frac{\sum(Ownership\ stake_i)^2}{(1 - Stake\ under\ bidder's control\ at\ the\ offer)^2}$$

with $Ownership\ stake_i = \frac{\#\ shares\ owned\ by\ shareholder_i}{\#\ total\ shares\ outstanding}$

and $Stake\ under\ bidder's control\ at\ the\ offer = \frac{\#\ shares\ under\ bidder's\ control\ at\ the\ offer}{\#\ total\ shares\ outstanding}$

Appendix 7.2: Tobit regression results

Panel A: Full sample

	Dependent variable: Success rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stake index funds	-1.224*	-1.814**		-1.864**	-1.659**	-2.908***	-0.260
	(0.734)	(0.814)		(0.786)	(0.842)	(0.756)	(1.269)
Stake individual shareholder		0.237**		0.231**	0.176	0.183	0.176
		(0.097)		(0.101)	(0.128)	(0.123)	(0.132)
Stake strategic shareholder		-0.170***		-0.152***	-0.110**	-0.114**	-0.103**
		(0.049)		(0.045)	(0.050)	(0.050)	(0.047)
Stake foreign shareholder		-0.062		-0.057	-0.056	-0.064	-0.050
		(0.063)		(0.065)	(0.062)	(0.061)	(0.065)
Stake institutional shareholder		0.185		0.168	0.109	0.103	0.128
		(0.149)		(0.147)	(0.145)	(0.145)	(0.144)
Toehold			-0.047	-0.055	-0.107**	-0.115**	-0.090*
			(0.062)	(0.061)	(0.050)	(0.048)	(0.048)
Ownership concentration			-0.132**	-0.093*	-0.060	-0.063	-0.057
			(0.057)	(0.055)	(0.058)	(0.058)	(0.058)
Offer premium					0.172**	0.174**	0.195***
					(0.068)	(0.070)	(0.070)
Management recommendation					0.153***	0.140***	0.155***
					(0.030)	(0.025)	(0.028)
Stake index funds x Management recommendation						1.686	
						(1.085)	
Stake index funds x Offer premium							-5.293
							(3.987)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	323	323	323	323	323	323	323

Panel B: Control-taking offers with toehold below 30%

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stake index funds	-2.950***	-3.669***		-3.768***	-2.973***	-3.366***	-2.111*
	(0.738)	(0.716)		(0.751)	(0.651)	(1.251)	(1.219)
Stake individual shareholder		0.678***		0.581***	0.590***	0.588***	0.607***
		(0.152)		(0.165)	(0.189)	(0.189)	(0.190)
Stake strategic shareholder		-0.136***		-0.036	0.043	0.039	0.048
		(0.045)		(0.046)	(0.044)	(0.042)	(0.042)
Stake foreign shareholder		0.031		0.044	-0.030	-0.031	-0.021
		(0.103)		(0.100)	(0.108)	(0.107)	(0.102)
Stake institutional shareholder		0.178		0.144	0.084	0.083	0.087
		(0.202)		(0.171)	(0.171)	(0.175)	(0.170)
Toehold			-0.201**	-0.184**	-0.257***	-0.254***	-0.255***
			(0.090)	(0.092)	(0.068)	(0.067)	(0.068)
Ownership concentration			-0.363***	-0.300**	-0.211*	-0.209*	-0.219*
			(0.092)	(0.137)	(0.120)	(0.117)	(0.115)
Offer premium					0.193***	0.194***	0.219***
					(0.069)	(0.068)	(0.084)
Management recommendation					0.272***	0.262***	0.277***
					(0.035)	(0.046)	(0.035)
Stake index funds x Management recommendation						0.636	
						(1.498)	
Stake index funds x Offer premium							-3.662
							(3.873)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	134	134	134	134	134	134	134

This table presents estimates from a multivariate tobit regression. Panel A presents regression estimates for the full sample. Panel B presents regression estimates for the sub-sample of bidders with a toehold below 30%. The dependent variable is success rate. Explanatory variables are explained in table 4.2. Controls are the same as specified in regression model 5.1. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

Appendix 7.3: Fractional response regression

Table 7.3: Fractional response regression – sub-sample below 30%

	Dependent variable: Success rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stake index funds	-15.083**	-21.265***		-22.429***	-17.684***	-19.931**	-12.664
	(6.149)	(5.603)		(5.575)	(4.489)	(8.089)	(8.132)
marginal effect	-2.937**	-3.896***		-4.021***	-2.938***	-2.854***	-3.074***
	(1.170)	(0.991)		(0.958)	(0.698)	(0.608)	(0.651)
Stake individual shareholder		4.352***		3.975***	4.241***	4.193***	4.410***
		(0.806)		(0.825)	(0.889)	(0.865)	(0.892)
marginal effect		0.797***		0.713***	0.705***	0.696***	0.731***
		(0.144)		(0.149)	(0.147)	(0.144)	(0.149)
Stake strategic shareholder		-1.430***		-1.048*	-0.550	-0.571	-0.523
		(0.527)		(0.610)	(0.549)	(0.550)	(0.554)
marginal effect		-0.262***		-0.188*	-0.0914	-0.0948	-0.0868
		(0.0943)		(0.109)	(0.0913)	(0.0913)	(0.0919)
Stake foreign shareholder		0.107		-0.040	-0.145	-0.154	-0.086
		(0.793)		(0.743)	(0.789)	(0.778)	(0.795)
marginal effect		0.0196		-0.00720	-0.0240	-0.0256	-0.0142
		(0.145)		(0.133)	(0.131)	(0.129)	(0.132)
Stake institutional shareholder		0.750		0.772	0.364	0.357	0.382
		(0.873)		(0.812)	(0.924)	(0.924)	(0.927)
marginal effect		0.137		0.138	0.0605	0.0593	0.0634
		(0.160)		(0.146)	(0.153)	(0.153)	(0.154)
Toehold			-0.993**	-1.114**	-1.340***	-1.318***	-1.310***
			(0.449)	(0.468)	(0.440)	(0.439)	(0.445)
marginal effect			-0.191**	-0.200**	-0.223***	-0.219***	-0.217***
			(0.0852)	(0.0832)	(0.0705)	(0.0707)	(0.0712)
Ownership concentration			-2.011***	-1.658**	-1.047*	-1.044*	-1.087**
			(0.638)	(0.684)	(0.554)	(0.552)	(0.553)
marginal effect			-0.387***	-0.297**	-0.174*	-0.173*	-0.180**
			(0.119)	(0.120)	(0.0916)	(0.0912)	(0.0914)
Offer premium					1.059***	1.073***	1.251***
					(0.376)	(0.384)	(0.416)
marginal effect					0.176***	0.178***	0.147**
					(0.0632)	(0.0642)	(0.0669)
Management recommendation					1.299***	1.225***	1.332***
					(0.324)	(0.343)	(0.325)
marginal effect					0.216***	0.231***	0.221***
					(0.0494)	(0.0549)	(0.0498)
Stake index funds x Management recommendation						3.898	

						(8.531)	
Stake index funds x Offer premium							-23.081 (20.444)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.165	0.206	0.173	0.219	0.264	0.265	0.266
N	134	134	134	134	134	134	134

This table presents estimates from a fractional logistic regression. Panel A present regression results for the full sample. Panel B presents regression results for the sub-sample of bidders with a toehold below 30%. The dependent variable is success rate. Explanatory variables are specified in table 4.2. Controls are the same as specified in regression model 5.1. The numbers in italics are the marginal effects and corresponding standard error. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

Table A: Predictive margins – full sample

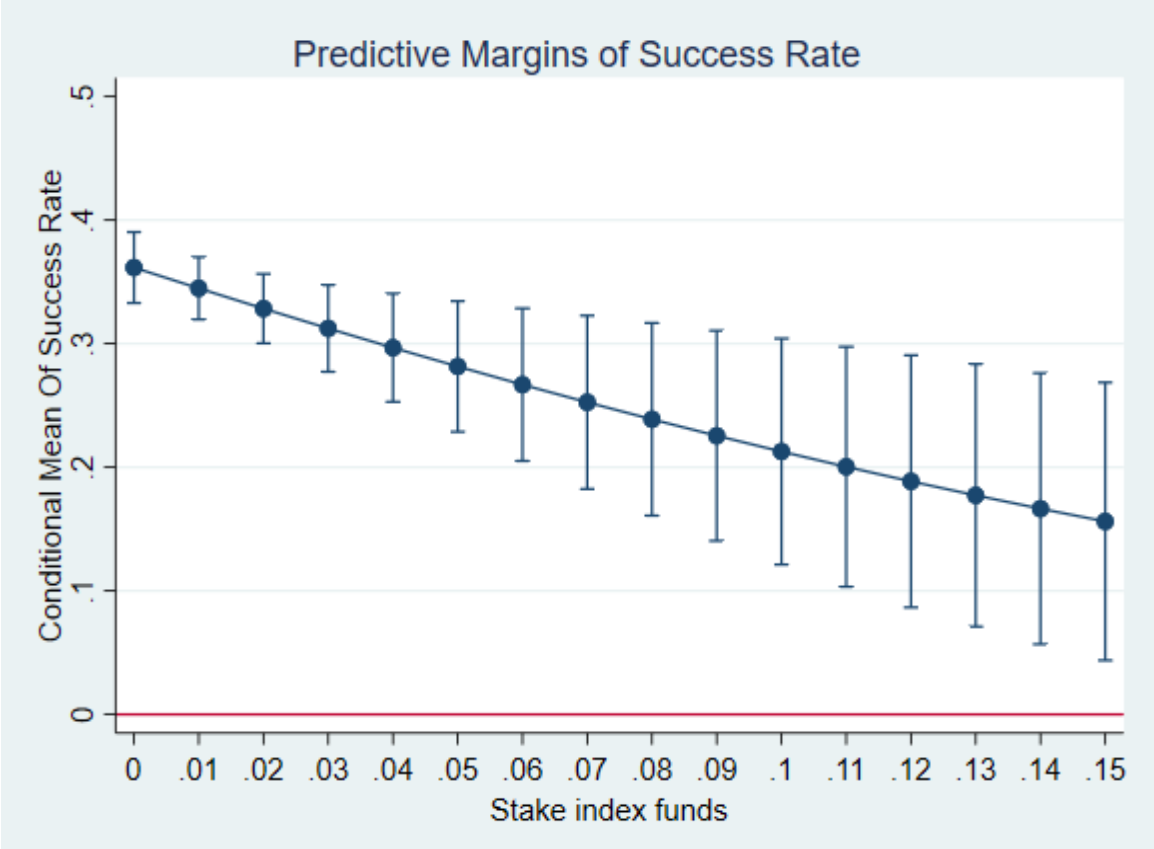
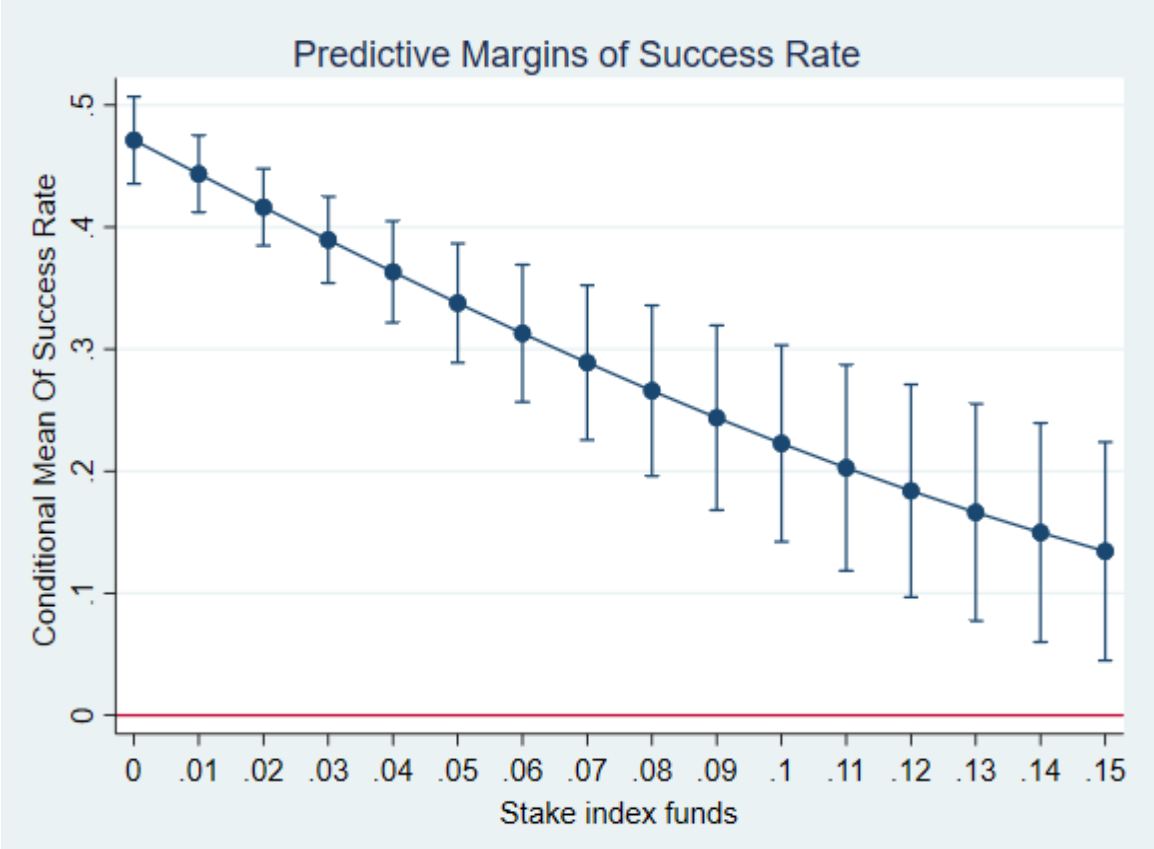


Table B: Predictive margins – sub-sample below 30%



Appendix 7.4: Multivariate sub-sample linear regression results

	Dependent variable: Success rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Stake index funds	0.831	1.009	2.623	5.012*	-5.215**	126.672
	(2.471)	(2.670)	(2.201)	(2.593)	(1.760)	(245.207)
Stake individual shareholder	0.257	0.344	0.112	0.094	0.438	0.576
	(0.333)	(0.412)	(0.297)	(0.293)	(0.398)	(0.584)
Stake strategic shareholder	0.071	0.039	-0.254	-0.231	-0.201	-0.358
	(0.386)	(0.383)	(0.226)	(0.224)	(0.262)	(0.492)
Stake foreign shareholder	0.093	0.110	0.010	-0.005	0.213	0.337
	(0.403)	(0.442)	(0.322)	(0.308)	(0.324)	(0.451)
Stake institutional shareholder	0.013	-0.017	0.153	0.143	0.411	0.318
	(0.392)	(0.409)	(0.370)	(0.378)	(0.446)	(0.497)
Toehold	-1.112	-1.295	-0.108	-0.060	0.781*	0.756
	(0.807)	(1.154)	(0.417)	(0.412)	(0.413)	(0.435)
Ownership concentration	0.654	0.696	0.036	0.038	-0.141	-0.146
	(0.596)	(0.628)	(0.056)	(0.056)	(0.092)	(0.092)
Offer premium	-0.403	-0.460	0.124	0.132	0.401	0.402
	(0.392)	(0.423)	(0.172)	(0.182)	(0.254)	(0.259)
Management recommendation	0.262*	0.260	0.099	0.111	0.087	0.089
	(0.145)	(0.150)	(0.087)	(0.092)	(0.064)	(0.062)
Stake index funds x Management recommendation		78.170		-2.800		-132.108
		(203.969)		(2.837)		(245.677)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.547	0.551	0.455	0.458	0.486	0.489
Adjusted R^2	0.0567	0.0231	0.0494	0.0273	0.197	0.184
N	51	51	62	62	76	76

This table presents estimates from a multivariate OLS regression and contains sub-sample regression estimates using the sub-sample of bidders with a toehold above 30%. Specifications (1) and (2) present regression estimates for the sub-sample of bidders with a toehold between 30% and 50%. Specifications (3) and (4) present regression estimates for the sub-sample of bidders with a toehold between 50% and 75%. Specifications (5) and (6) present regression estimates for the sub-sample of bidders with a toehold above 75%, the interaction term is omitted. The dependent variable is success rate. Explanatory variables are specified in table 4.2. Controls are the same as specified in regression model 5.1. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

Appendix 7.5: Multivariate sub-sample tobit regression results

	Dependent variable: Success rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Stake index funds	0.831	1.009	2.623	5.012**	-5.215***	126.672
	(1.712)	(1.811)	(1.667)	(1.936)	(1.408)	(194.111)
Stake individual shareholder	0.257	0.344	0.112	0.094	0.438	0.576
	(0.230)	(0.279)	(0.225)	(0.219)	(0.318)	(0.462)
Stake strategic shareholder	0.071	0.039	-0.254	-0.231	-0.201	-0.358
	(0.267)	(0.260)	(0.171)	(0.167)	(0.210)	(0.390)
Stake foreign shareholder	0.093	0.110	0.010	-0.005	0.213	0.337
	(0.279)	(0.299)	(0.244)	(0.230)	(0.259)	(0.357)
Stake institutional shareholder	0.013	-0.017	0.153	0.143	0.411	0.318
	(0.272)	(0.278)	(0.281)	(0.282)	(0.357)	(0.393)
Toehold	-1.112*	-1.295	-0.108	-0.060	0.781**	0.756**
	(0.559)	(0.783)	(0.316)	(0.308)	(0.331)	(0.344)
Ownership concentration	0.654	0.696	0.036	0.038	-0.141*	-0.146**
	(0.413)	(0.426)	(0.043)	(0.042)	(0.074)	(0.073)
Offer premium	-0.403	-0.460	0.124	0.132	0.401*	0.402*
	(0.271)	(0.287)	(0.130)	(0.136)	(0.203)	(0.205)
Management recommendation	0.262**	0.260**	0.099	0.111	0.087*	0.089*
	(0.101)	(0.102)	(0.066)	(0.069)	(0.051)	(0.049)
Stake index funds x Management recommendation		78.170		-2.800		-132.108
		(138.339)		(2.118)		(194.484)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
N	51	51	62	62	76	76

This table presents estimates from a multivariate tobit regression and contains sub-sample regression estimates using the sub-sample of bidders with a toehold above 30%. Specifications (1) and (2) present regression estimates for the sub-sample of bidders with a toehold between 30% and 50%. Specifications (3) and (4) present regression estimates for the sub-sample of bidders with a toehold between 50% and 75%. Specifications (5) and (6) present regression estimates for the sub-sample of bidders with a toehold above 75%, the interaction term is omitted. The dependent variable is success rate. Explanatory variables are specified in table 4.2. Controls are the same as specified in regression model 5.1. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

Appendix 7.6: Fractional response sub-sample regression results

	Dependent variable: Success rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Stake index funds	6.362	8.630	10.720	20.602	-30.029***	623.127
	(13.378)	(14.491)	(10.427)	(15.850)	(6.918)	(1,142.722)
Stake individual shareholder	3.028	4.568	0.070	-0.061	2.359	3.193
	(2.616)	(3.753)	(1.463)	(1.488)	(2.662)	(3.416)
Stake strategic shareholder	0.984	0.727	-1.580	-1.447	-1.086	-2.006
	(1.401)	(1.375)	(1.059)	(1.095)	(1.195)	(2.362)
Stake foreign shareholder	0.908	0.861	-0.382	-0.438	1.184	1.901
	(1.797)	(1.836)	(1.077)	(1.069)	(1.178)	(1.946)
Stake institutional shareholder	-0.087	-0.171	1.314	1.273	1.996	1.480
	(1.906)	(1.923)	(0.977)	(0.977)	(1.471)	(1.797)
Toehold	-7.008*	-9.329*	-1.604	-1.291	4.257	4.061
	(3.626)	(5.186)	(3.131)	(3.173)	(2.706)	(2.638)
Ownership concentration	4.005*	4.294*	0.370	0.384	-0.868	-0.949
	(2.256)	(2.390)	(0.458)	(0.460)	(0.767)	(0.774)
Offer premium	-2.455*	-3.030**	0.590	0.630	2.247*	2.271*
	(1.340)	(1.543)	(0.651)	(0.669)	(1.211)	(1.259)
Management recommendation	1.577***	1.569***	0.507	0.566	0.479	0.488
	(0.581)	(0.574)	(0.341)	(0.370)	(0.304)	(0.307)
Stake index funds x Management recommendation		710.666		-11.420		-654.706
		(791.021)		(14.018)		(1,146.590)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.213	0.216	0.136	0.136	0.128	0.129
N	51	51	62	62	76	76

This table presents estimates from a fractional logit regression and contains sub-sample regression estimates using the sub-sample of bidders with a toehold above 30%. Specifications (1) and (2) present regression estimates for the sub-sample of bidders with a toehold between 30% and 50%. Specifications (3) and (4) present regression estimates for the sub-sample of bidders with a toehold between 50% and 75%. Specifications (5) and (6) present regression estimates for the sub-sample of bidders with a toehold above 75%. The dependent variable is success rate. Controls are the same as specified in regression model 5.1. Explanatory variables are specified in table 4.2. Statistical significance is represented at the 1% (***), 5% (**), and 10% (*) level.

Appendix 7.7: Correlation matrix for explanatory and control variables

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]
[1] Stake index funds	1.000																			
[2] Stake individual shareholder	-0.100*	1.000																		
[3] Stake strategic shareholder	-0.143*	0.4601***	1.000																	
[4] Stake foreign shareholder	0.420***	0.151***	0.171***	1.000																
[5] Stake institutional shareholder	0.478***	-0.146***	-0.196***	0.635***	1.000															
[6] Toehold	-0.191***	-0.056	-0.133*	-0.285***	-0.265***	1.000														
[7] Ownership concentration	-0.104*	0.154***	0.342***	0.119**	-0.058	-0.216***	1.000													
[8] Offer premium	0.037	-0.006	-0.056	0.047	0.122**	-0.111**	-0.028	1.000												
[9] Management recommendation	0.067	0.015	-0.144***	0.037	0.144***	0.017	-0.102*	0.322***	1.000											
[10] Competing offer	-0.029	0.028	0.059	0.094*	-0.014	-0.175***	0.142**	0.075	0.022	1.000										
[11] Crisis	-0.051	0.139**	0.034	-0.058	-0.089	-0.009	0.111**	0.142***	-0.013	0.068	1.000									
[12] Largest shareholder bidder	-0.192***	-0.095*	-0.160***	-0.177***	-0.153***	0.455***	-0.210***	-0.170***	-0.158***	-0.090	-0.103*	1.000								
[13] Size	0.512***	-0.167***	-0.075	0.339***	0.425***	-0.168***	-0.052	0.050	0.127**	0.060	-0.056	-0.277***	1.000							
[14] Method of payment	-0.281***	0.036	0.077	-0.095*	-0.086	0.208***	0.048	-0.019	-0.114**	0.047	0.075	0.194***	-0.192***	1.000						
[15] Minimum acceptance rate	0.201***	0.017	-0.051	0.061	0.124**	-0.376***	0.062	0.251***	0.184***	0.025	0.138**	-0.466***	0.218***	-0.328***	1.000					
[16] Mandatory offer	-0.175***	-0.041	-0.087	-0.212***	-0.255***	0.281***	-0.163***	-0.172***	-0.261***	-0.123**	-0.054	0.426***	-0.366***	0.168***	-0.349***	1.000				
[17] Multiple round	0.279***	0.015	-0.026	0.139**	0.126**	-0.237***	0.028	0.084	0.008	0.218***	0.041	-0.174***	0.212***	-0.045	0.128**	-0.266***	1.000			
[18] Financial investor	-0.132**	0.108*	0.136**	0.078	-0.006	0.002	0.113**	-0.147***	-0.142***	0.025	0.024	0.101*	-0.210***	0.166***	-0.122**	0.030	-0.069	1.000		
[19] Foreign bidder	0.052	0.002	-0.024	0.118**	0.087	0.045	-0.005	0.185***	0.103*	0.053	-0.029	0.069	0.120**	0.072	0.110**	-0.120**	0.076	0.081	1.000	
[20] Strategic investor	0.171***	-0.090	-0.088	0.004	0.034	-0.017	-0.112**	0.095*	0.101*	-0.029	0.002	-0.106*	0.228***	-0.208***	0.121**	-0.027	0.030	-0.765***	-0.053	1.000

This table presents the Pearson correlation between all independent variables and control variables used in the regression analyses. Variables are defined in table 4.2

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