Determinants of IPO Withdrawals. An Empirical Analysis of Germany

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Declaration of Authorship

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Dublin, 21th July 2016, Pia Helbing
Abstract

Stock markets represent a way for companies to access funds. To be able to make what is called an initial public offer (IPO), which is the term for when a company first accesses this market, a variety of legal and financial requirements need to be met. Often there is uncertainty about what investors are willing to pay for a stock of the company, hence IPOs are underpriced. This underpricing is costly for the company and can cause the firm to withdraw its initial public offer at any stage. In Germany from 2001 until 2015, about 14 % of the companies filing to go public withdraw. There is surprisingly little research on this area. Employing binary as well as multinomial probit regressions, this analysis focuses on the determinants of withdrawals in the German IPO market. Considering a multitude of academic papers about initial public offerings, we select market and firm characteristics and compute the respective effects on the probability to withdraw. Our work provides new insights into the German IPO market and the probability to withdraw. This analysis demonstrates that results on the US-American IPO market cannot be adapted to the German one without further proof. In contrast to the US-American market, withdrawn IPOs show higher levels of venture capital backing and of underwriter reputation. In the bank-dominated German market, the characteristics of both substantially differ from the US-American counterparts. Also, multinational companies are more likely to withdraw due to having a higher level of alternative sources of funding outside of Germany. We discovery that negative news prior to an IPO as well as the intent to retire debt increase the probability of withdrawal.
Executive Summary

The initial public offering (IPO) is considered to be one of the most defining events in a company’s life cycle. In contrast to a private company, a public one is owned by a multiplicity of investors who provide capital to fund the firm’s endeavours. There is uncertainty about the firm value when a company accesses the equity market for the first time. This gives rise to some puzzling phenomena that have attracted a variety of research – one area that stays in the background though are withdrawals. During the IPO process, the company might withdraw the attempt to go public at any stage. The paucity of research is focused on the US-American market. This work extends previous research to the German IPO market. This thesis aims to provide valuable insights into the particularities of withdrawals in the German market.

In the first part of our thesis, we briefly contrast the characteristics of the German equity and debt market. In Germany, the financial system is heavily bank-dominated, while the equity market plays a minor role compared to the size of the German economy or to other European equity markets. Traditionally, most equity has been owned by banks, insurances or other financial institutions, but this is gradually changing. The German equity market is rather volatile in quantities and qualities of IPOs and consequently lacks auspicious opportunities to go public. As a next step, we introduce the state of the art knowledge about initial public offerings. This includes the concept of information asymmetry prevailing between the issuers and the potential investors. It is identified as the root of uncertainty about the firm value. Often IPOs face underpricing which can be identified as a positive first day's return. The company “leaves money on the table”, therefore underpricing is manifested as a cost of going public. The process of an IPO is characterised by a constant game of signalling and revealing information from both: issuers and investors.
Investors might demand more severe underpricing as a mean to compensate uncertainty about the firm value and the company’s prospective. The costs of underpricing might exceed the costs of withdrawal. The latter includes reputational as well as sunk costs from pulling the initial public offering. In consequence, the issuer withdraws the IPO to evade substantial underpricing or in favour of a superior alternative.

In order to identify appropriate determinants of the probability to withdraw, in the first part of the literature review we take a closer look on various market characteristics that are introduced in the IPO literature. The majority of companies in Germany blame unfavourable markets for their withdrawal. Previous research proposes that favourable market conditions result in a lower information asymmetry and costs of going public. The cornerstones for efficient markets are a stable political system and a non-arbitrary enforcement of the legal framework. Therefore, we present indices that approximate the economic freedom, the level of corruption and the rule enforcement. In a low-interest rate environment, companies can secure alternative sources of funding and thus might choose to withdraw the initial public offering. We approximate the level of scarcity of capital on the one hand with the 10 year German Bund yield and on the other one with the term spread estimating the risk of short-term borrowings. Concluding this section, we take into account market sentiment indicators such as negative news or the levels of the Deutscher Aktienindex (DAX) and the Gross Domestic Product (GDP).

In the second part, we furthermore introduce the reader to a variety of firm characteristics that are deemed to reveal information on the firm value. The firm and the filing size as well as the company’s age serve as proxies to measure the associated risk of the issuer. The older and larger the company and filing size, the more readily available and the less
costly it is to obtain information. Moreover, investors use financial indicators to evaluate the firm’s potential. The more profound the financials prior to an IPO, the lower the ex-ante uncertainty. The level of capital expenditures are considered to indicate the company’s potential for future growth. Whereas on the signalling effect of debt, there is no consensus in academia. On the one hand, a higher level of debt indicates alternative sources of funding. On the other hand, leveraged companies face costs of financial distress which consequently increase the perceived risk. Also, the dependence on the IPO can be approximated with the intention to retire debt or the level of multinationality. Multinational companies might have alternative sources of funding outside the IPO country. Apart from that, technological companies create higher uncertainty about the firm value due to the complexity of assets. Though, a higher level of disclosure of a company’s competitive advantage can reduce the information asymmetry. IPOs offer the venture capitalists or the private equity investors an opportunity to exit. US-American studies on withdrawn IPOs manifest that venture capital backing certifies the issuer and consequently reduces uncertainty. Particularly in Germany, venture capital and private equity companies vary significantly in reputation and experience. Often they are interlinked and interdependent on banks. Venture capital investment is considered to be lagging behind in Germany. To complete the second part of the literature review, we introduce the role of the underwriter. Previous studies in the US-American market have presented that underwriters take a certification role reducing the ex-ante uncertainty. Due to the specifics of German banks offering a diverse range of services from commercial to investment banking, the causal link of the underwriters’ reputation and level of uncertainty might not hold. Often, underwriters are chosen based on pre-existing banking relations.
In order to identify the determinants of the probability to withdraw, we computed the descriptive statistics for successful and withdrawn IPOs. We also followed previous research in this area and created a binary probit regression. The dichotomous dependent variable differentiated between successful and withdrawn IPOs. Since the world of withdrawal is not binary, we extended the econometric model to a multinomial probit analysis that included three counterfactuals: Withdrawn, successful and trading, successful but delisted. Our data sample includes all German IPO filings from January 2001 until December 2015, excluding rights offerings, Real Estate Investment Trusts (REITs), American Depositary Receipts (ADRs), as well as close-end or mutual funds and special purpose entities. When possible, we focused on monthly data for the market characteristics and on the latest figures prior to an IPO for the firm specific characteristics. We created a database that includes every market and firm value for each IPO company.

Despite companies arguing, our findings indicate that withdrawn IPOs do not face worse market conditions than their successful counterparts. The majority of results of the econometric analyses are diametrically opposed to the US-American findings. In Germany, withdrawn IPO companies are bigger, older, and file a larger offer size. This might indicate that withdrawal is a feasible alternative to underpricing for larger and more experienced companies that are able to cope with the costs of withdrawal. We present that withdrawn IPOs are more often backed by venture capitalists. We reason with the strong linkages to banks combined with their inexperience compared to the American counterparts. A higher degree of underpricing demanded by the investors might be a consequence which leaves the company to withdraw. Also, withdrawn companies employ more reputable underwriters. The causal link of certification from underwriters proposed for the US-American market might not apply for the German market due
to the particularities of its banking system. Withdrawn IPOs reveal a higher degree of indebtedness and claim to retire debt with the proceeds which in general can be perceived as riskier. Investors might demand higher underpricing to compensate their risk resulting in a withdrawal of the IPO. Surprisingly, we also find that the level of capital expenditures positively influences the probability to withdraw. Whereas the intellectual capital disclosure has a negative effect on it. Withdrawn IPOs with a higher level of capital expenditures exhibit lower or even negative net income as well as a lower level of intellectual capital disclosure. Investors do not value the quantity of capital expenditures but prefer the quality of it. The level of multinationality positively influences the probability of withdrawal. We demonstrate that multinational companies, that withdraw their IPO, have access to alternative sources of funding outside of Germany and are thus more likely to withdraw. The findings from the binary probit regression are largely confirmed in the multinomial regression.

We conclude this thesis with a critical discussion of the work. We also identify new areas of interest for research that derive from our analysis. The next steps involve the extension of this analysis to other European countries such as Spain, France or the United Kingdom. Also, this would include the analysis of determinants for a second-time IPO after withdrawing the first attempt or the rationales for delisting. The results of such a delisting analysis in combination with the determinants of withdrawal and successful returns might help to explain the puzzle of the IPO market – especially with the increasing importance of equity markets in Europe.
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## Nomenclature

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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADR</td>
<td>American Depositary Receipts</td>
</tr>
<tr>
<td>BaFin</td>
<td>Bundesanstalt für Finanzdienstleistungsaufsicht</td>
</tr>
<tr>
<td>CapEx</td>
<td>capital expenditures</td>
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<td>DAX</td>
<td>Deutscher Aktienindex</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>H-L</td>
<td>Hosmer-Lemeshow</td>
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<td>IC</td>
<td>intellectual capital</td>
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<td>IPO</td>
<td>initial public offering</td>
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<tr>
<td>LHS</td>
<td>left hand side</td>
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<tr>
<td>LR</td>
<td>log likelihood ratio</td>
</tr>
<tr>
<td>NACE</td>
<td>nomenclature statistique des activités économiques dans la Communauté européenne</td>
</tr>
<tr>
<td>NI</td>
<td>net income</td>
</tr>
<tr>
<td>PE</td>
<td>private equity</td>
</tr>
<tr>
<td>PMI</td>
<td>Markit Purchasing Manager Index</td>
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<td>REITs</td>
<td>Real Estate Investment Trusts</td>
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<td>RHS</td>
<td>right hand side</td>
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<tr>
<td>US</td>
<td>United States</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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<td>VC</td>
<td>venture capital</td>
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1. Introduction to the German Equity Market, IPOs and Withdrawals

The German equity market can be characterised as rather inconsiderable when comparing its size to the economy or to other European benchmarks. Traditionally, the majority of the German equity was owned by insurances, banks or other financial institutions. Hence, the German equity market lacked auspicious opportunities for initial public offerings (hereinafter IPO) and consequently was rather illiquid. This is gradually changing (Klein, et al., 2016). In order to diversify the bank-dominated funding and to provide young and growth companies with a platform to raise money, in 1997 the New Market (Neuer Markt) was initiated by the German Stock Exchange. After initial success, in 2003 however, the Neuer Markt was shut down after its substantial decay. Bessler & Kurth (2005) even argue that the Neuer Markt mirrors the development of the German IPO market itself. The German IPO and stock market highly fluctuate. In 1999 and 2000, there were the highest numbers of IPOs which dramatically decreased in the following years. In 2003, there was not a single listing and in 2004 the withdrawal rate of initial public offerings peaked at 40 %. The German stock market recorded an increase after 2005 until the eruption of the world financial crisis in 2008. Ever since, the German equity market has not experienced similar levels of IPO frequency (Klein, et al., 2016). Today, Germany's financial system continues to be heavily bank-dominated. Commercial or retail banks, venture capitalists, investment banks and insurance companies are often closely linked and interdependent. Nonetheless, the importance of the equity market in Germany in terms of capital is colossal (Tykovová & Walz, 2007).
1.1 Background and Rationales

If a company is private, there are only few investors funding the firm’s endeavours. An initial public offering can be characterised as one of the most significant events in a company’s life cycle (Pagano, et al., 1998). When the company enters the equity market, significant changes in the ownership structure are involved. Now a multiplicity of public investors are “owning” the company and are providing capital. This partition of ownership and control introduces agency problems and consequently costs (Mikkelson, et al., 1997). Companies decide to go public based on many reasons outweighing the costs of being public. The company gains access to a major source of capital – the equity market – and is able to meet its funding needs to invest in arising business opportunities (Dittmar & Thakor, 2007). Also, the issuer benefits from a higher degree of risk diversification when going public. The company has a larger range to manoeuvre which improves its flexibility. With an IPO the company also gains access to outsider monitoring. Both increases the firm value (Chod & Lyandres, 2011). Apart from that, Chemmanur & He (2011) claim that firms increase their market share in the product market when going public. Rivals are worse off when a competitor successfully completes an IPO. Nonetheless, there are costs coming with an IPO such as agency or disclosure as well as administrative costs. A company optimally goes public when the benefits exceed the costs (Benninga, et al., 2005). One cost of going public is identified as underpricing which is the difference between the first day’s closing price to the offer IPO price. The issuing company “leaves money on the table” (Ritter, 1987). However, during the IPO process the issuer is able to withdraw at any time. This can be due to changing market conditions or negative information such as undervaluation which are revealed in the process of going public (Busaba, et al., 2001). It is commonly known that firms withdrawing face high sunk costs as well as reputational costs. The cost
of underpricing must be higher than the cost of withdrawal when a company decides to pull an IPO (Boeh & Dunbar, 2013). Previous research focuses on the US-American market which already identified some determinants of withdrawal. Although the European economic, financial as well as legal systems differ drastically from the USA, there is no application to the European market including Germany – the biggest economy in Europe (Bessler & Thies, 2007). That is the reason why the dissertation focuses on companies that have withdrawn their initial public offering in Germany. The aim of the research is to identify determinants that influence the probability to withdraw. Thus, the probability of withdrawal, based on market and issuer characteristics, will be derived to draw inferences for companies that intend to go public. This can be valuable information for issuers, underwriters and investors as well as authorities likewise. As stated above, filing an IPO is costly, especially losses due to underpricing can be severe for the firm (Boeh & Dunbar, 2013). The findings on determinants of withdrawal might help to minimise information asymmetry in the process of an IPO and hence influence the companies’ decision to pull the IPO.

In addition, companies may find conditions which initially were favourable become unfavourable over the period of time (Leite, 2007). From 2001 to 2015 about 14.24 % of all the initial public offerings were pulled on the German Market. Figure 1 displays the annual numbers of IPO withdrawals in Germany from 2001 to 2015. Due to the extraordinary numbers of IPOs and withdrawals caused by the dot-com bubble the year 2000 is excluded from this analysis.
Figure 1: Withdrawn IPOs in Germany from 2001 until 2015 in contrast to the German GDP percentage change.

In 2001 and 2008, the world economy went into recession due to the burst of the dot-com and the debt bubble respectively. In 2004, the German economy showed signs of recession in terms of Gross Domestic Product (GDP) growth whereas in 2011 the European debt crisis peaked. At first glance on the distribution in Figure 1, there are increasing numbers of withdrawals when there is recession in the country. However, this relation between withdrawals and the market conditions need to be tested with statistical models to gain more precise insights. In Figure 2, the number of withdrawals according to industry is drafted.

Figure 2: Withdrawn IPOs in Germany from 2001 until 2015 according to industries.

The industry classification is based on the NACE codes (Eurostat, 2016) where industrial includes chemicals, engineering or construction. The
industry of technology represents telecommunication or network companies whereas consumer includes retail or food and beverage. Finally, banks or private equity companies are categorised as financial. As depicted in Figure 2, most companies withdraw in industrial, still there is no clear pattern visible of a significantly higher or lower number of withdrawals in any given industry in Germany.

Nevertheless, why did the companies withdraw? What is the probability that a company withdraws? Considering the strategic importance of an IPO and the capital involved, there is limited research on the determinants of withdrawals in general. As mentioned above, in particular, for the European markets there is no such research. Furthermore, there is no comprehensive database where consolidated information on withdrawals are gathered. Both, Thomson Reuters Eikon and Bloomberg, provide profound information on IPOs but not on withdrawals. Would this information support the companies’ decision to withdraw an IPO in order to prevent underpricing and also possibly long-term underperformance? Would the increased level of information alter investors’ demand for new shares and hence would create a more accurate market price? To supplement the gap in finance literature this research shall firstly set up a database on withdrawn and successful IPOs in Germany between 2001 and 2015. Secondly, this analysis shall identify and categorise determinants for withdrawals to eventually draw inferences on the German IPO market. Therefore, this dissertation adds value to finance knowledge since it furthers the existing research on the determinants of withdrawals in the German IPO market. Also, this research will contribute to financial practice in providing more detailed information about the inclination that a company will withdraw. This reduces information asymmetries and ex-ante uncertainty about the firm value. Furthermore, it contributes to managers facing the decision whether to withdraw an IPO or to continue and face severe losses due
to underpricing and long-term underperformance. Putting it all together, this research is creating information to make the market and especially the German IPO market more efficient. Underpricing could be reduced as well as the negative long-term effects such as underperformance. Inefficiencies might be decreased that are wiping away millions of money every day (Bessler & Thies, 2007).

1.2 Information Asymmetry in the IPO process

Markets are not perfect. A multiplicity of small events add noise to efficient markets and perfect information. Hence, information asymmetries and uncertainty arise (Black, 1986). Noise is also present when going public. We can identify the issuers on the one side that have an insider information advantage and (mis)present their company to be of best quality (Benveniste & Spindt, 1989). On the other side there are investors who might possess an advantage on outside information. Neither party has incentives to reveal their information advantage creating uncertainty about the firm value of an IPO and consequently increasing the cost of going public (Ritter, 1987). The opinion prevails that underpricing is used to signal the quality of a company which will be able to recover the losses from underpricing its IPO (Allen & Faulhaber, 1989). Underpricing is defined as the difference of the filing price and the first day return of the newly issued stock. This IPO phenomenon has been extensively researched in academics and practice (Loughran & Ritter, 1995). Also, underpricing incentivises investors to reveal their private information about the market valuation. The first day returns represent a compensation mechanism for the investor’s information disclosure (Loughran & Ritter, 2004). However, Busaba (2006) argues that the firm’s option to withdraw the IPO also incentivises investors to reveal their market information and hence information asymmetries are reduced. The issuer can withdraw at any stage. Apart from that, there is
a positive relationship between the level of underpricing and the aftermarket liquidity. This perceived wealth gain may outweigh the loss of underpricing (Zheng & Li, 2008). Further explanations of the IPO phenomenon, incorporating the concept of agency conflicts of underwriters or managers, shed light on moral hazard (Ritter & Welch, 2002). During the course of the years multiple theories trying to explain this new issues puzzle arose, however the idea of information asymmetry is one of the mostly recognised ones (Kennedy, et al., 2006). This constant game of signalling and revealing information by the issuer as well as by the investor is a two-way information channel to reduce information asymmetries and uncertainty. On the left hand side, the issuers disclose information about the IPO. On the right-hand side, the investors reveal market valuation (Cotei & Farhat, 2013). Starting with the IPO filing date, this price discovery process is supervised by an underwriter that aggregates the private information revealed and undertakes price revisions.

1.3 Outline of Research

The remainder of the thesis is structured as follows. First, the approach for the data collection and the resulting database are described. Here, the quantities as well as the rate of withdrawn and successful IPOs are contrasted. Also, the current status of both, withdrawn and successful companies, is portrayed. Secondly, the methodological approach used in this analysis is outlined. Thirdly, the decision to withdraw an IPO is examined. Market as well as firm characteristics are introduced built on the findings of previous research. In the following section, the descriptive statistics for withdrawn and successful IPOs are generated. First inferences and possible explanations about the determinants of withdrawal in Germany can be made. In order to identify significant determinants, the probability of withdrawal is computed based on the
identified market and firm regressors. The binary probit regression is
extended to a multinomial one taking into account multiple
counterfactuals. Eventually, the results are reviewed for further research
to be undertaken.

2. The Decision to Withdraw

Not all the companies trying to go public are successful. Previous studies
have shown that the proportion of withdrawals on average keeps
constant over time. During the price discovery process information are
revealed which might lead the company to withdraw their IPO (Dunbar
& Foerster, 2008). Particularly when the ex-ante uncertainty around a
firm value is high, the propensity for negative information from investors
is higher and as a consequence for withdrawal, too (Cho, 2001). When
issuers face undervaluation of the IPO they might decide to withdraw
(Bergbrant, et al., 2014). Without doubt, withdrawals are costly.
Underwriter fees or other expenses for the IPO are sunk costs (Dunbar,
1998). Also, as of Lian (2006) companies that retry an IPO sell at a
significant discount compared to their first trial. Hence, we can conclude
that the withdrawal is negative public information and incorporated in the
second-time IPO. After a withdrawal, investors face even greater
valuation uncertainty due to the “lemon” problem which can have
negative consequences for the issuer (Akerlof, 1970). Consequently, the
cost of going public must be greater than the cost of withdrawal when a
company decides to pull the IPO (Boeh & Dunbar, 2013). Besides this,
companies can withdraw an IPO in favour of superior opportunities. This
can be associated with positive information perceived in the market
(Boeh & Dunbar, 2013). Furthermore, the option to withdraw can be used
to incentivise investors to reveal their private market information. The
company has gained bargaining power over the price when introducing
withdrawal as an alternative option to IPO (Busaba, 2006). Withdrawals are not a characteristic of a certain industry or period of time and hence an emerging literature is testing the determinants on the decision to withdraw (Busaba, et al., 2001). This empirical probit analysis is extended by Dunbar & Foerster (2008) who highlight the certification roles of venture capitalists and underwriters. The authors also conclude that issuers will less likely withdraw when there is uncertainty about a successful second-time IPO. They subsequently might face higher costs of underpricing in order to successfully complete the first-time IPO. Therefore, this paper intends to analyse the relation between offering characteristics such as market and issuer variables and the probability of withdrawal. When the company has ex-ante knowledge about the company’s likelihood to withdraw this might alter the withdrawal decision. In the following, we will introduce several variables which might influence the decision to withdraw. But this will be left for the probit analysis to be explained.

2.1 Market Characteristics

Often companies claim to withdraw IPOs based on unfavourable market conditions. In the given sample from 2001 to 2015 the total number of 42 IPOs were withdrawn. About 86 % blamed unfavourable market conditions, whereas the remaining 14 % were acquired during the process which consequently terminated the IPO. The latest example for an IPO withdrawal is given by CBR Fashion Holding AG reasoning their withdrawal with the market conditions and investors' lack of demand (Börsen-Zeitung, 2015). Also, research on market timing of IPOs argues that companies try to exploit time-varying favourable market conditions to issue equity in order to optimise their capital structure and benefit from information spill-overs (Baker & Wurgler, 2002). It is presumed when market characteristics indicate a bear market, the IPO comes with more
risks and costs which in consequence predicts a higher probability of withdrawal (Alti, 2005). On the contrary, investors’ demand peaks when the market characteristics flourish resulting in overvaluation and clustering of IPOs (Colak & Günay, 2011). Nevertheless, blaming the market conditions for withdrawals seems too easy and convenient to be true and can hardly explain all IPO failures. Of course, we must introduce market characteristics and examine their effect on the probability to withdraw. We have used multiple academic papers in order to identify market characteristics to approximate the sentiment on market conditions.

2.1.1 Political Stability and Legal Framework

A stable political system and comprehensive legal framework are the cornerstones of efficient economies and consequently equity markets (La Porta, et al., 1997; La Porta, et al., 1997). Therefore, country risk factors such as the political stability are found to impact stocks’ performance (Erb, et al., 1996). Other factors such as corruption, weak contract enforcement or low protection of intellectual property rights are increasing market uncertainty and cause higher levels of IPO underpricing (Banerjee, et al., 2011; Djankov, et al., 2008). In general, a higher level of political stability as well as legal framework can be considered as a favourable environment for IPOs (Engelen & van Essen, 2010). In order to quantify the political stability and legal framework indices such as the Index of Economic Freedom by the Heritage Foundation and the Transparency International’s Corruption Perceptions Index as well as the Rule of Law Index are used in this empirical analysis. These indices cover measurements of enforcement mechanisms, political stability and economic freedom and serve as proxies for country risk (Wu, 2012).
2.1.2 Equity and Debt Market

The debt market represents one of the most important pillars of capital funding. Bergbrant et al. (2014) argue that when yields rise and consequently credit standards get stricter, conclusions on the equity market can be drawn likewise. For that reason, when spreads are low debt financing might seems more attractive and cost-efficient than accessing the equity market through an IPO. Firms having an alternative source of capital especially in times of low-interest rate environment might chose to withdraw the IPO in contrast to high rates where capital is considered to be scarce and the equity market can be considered a necessary alternative source of funding (Dunbar & Foerster, 2008). Especially in Germany banks play an important role – not only as sources of capital but also as stakeholders (Tyková & Walz, 2007). Putting it together, the effect on the decision to withdraw an IPO needs to be examined. Therefore, proxies for the accessability of capital in the debt market are identified. Firstly, the monthly 10 year German Bund yield approximates the cost of lending in the economy. Secondly, the term spread is considered which signals the credit conditions. It is defined as the difference between the 10 year Bund and the 1 year German bond yields. Both time series are retrieved from Thomson Reuters Eikon. Smaller yield spreads indicate that investors demand a higher yield for the risk of short-term borrowing. We subsequently can presume market recessions or negative credit conditions.

2.1.3 Market Expectation and Sentiment

If market conditions seem promising, the cash flows of companies are positively affected (Benninga, et al., 2005). In general, companies try to exploit the overvaluation and overreaction of investors’ demand or what are considered to be favourable market conditions (Dittmar & Thakor, 2007). Also, Leite (2007) hipothesises that favourable market conditions
result in lower information asymmetry and costs of going public. As a consequence, the uncertainty and probability of withdrawal prior to an IPO are reduced, too. Often companies claim that the IPO is pulled due to an unfavourable market environment. However, market conditions first of all need to be assessed as favourable. Since this analysis focuses on the German equity market, the Deutscher Aktienindex (DAX) is used as a proxy for the bear or bull market the firm intends to IPO in. The DAX is backward-looking and hence to also grasp the expectations about where the economy is going the Markit Purchasing Manager Index (PMI) is included. Unfortunately, the PMI was only inaugurated in May 2004, therefore the German GDP will likewise be considered. For all market proxies the monthly data is taken from Bloomberg.

Apart from that, latest research on market sentiment manifests news to impact stock returns (Shi, et al., 2016). Hence, this might also apply to initial public offerings. A dimension for market sentiment can be examined introducing the dummy variable NEWS. A negative news analysis prior to the IPO and withdrawal can be conducted via the LexisNexis database. If the firm faces negative news, the NEWS proxy takes the value of 1 and 0 otherwise.

2.1.4 Rivalry

Every firm that goes public reveals information to its competitors about valuation, market conditions and the firm’s competitive advantage. Hence without doubt, there exists a trade-off between reaping the benefits of pioneering in IPOs and disclosing sensible information to competitors (Alti, 2005). Moreover, as time passes market information is aggregated and incorporated on the performance of all companies. Consequently, rivals attain an information advantage and face less uncertainty. Competitors possibly even benefit from more favourable market conditions (Colak & Günay, 2011). Eventually, rival companies
will go public in bulks which is a phenomenon commonly known as “hot markets” (Loughran & Ritter, 1995). Nonetheless, the IPO firm is found to increase the market share and leave rivals worse off which makes the level of rivalry an important source of information (Chod & Lyandres, 2011). The competitiveness can be measured by the number of filings 180 days prior to the IPO in order to grasp the “hotness” of the market to fully examine the effect on withdrawals (Dunbar & Foerster, 2008). Due to the rather limited sample size, no measurement according to industries can be made but the overall IPO “hotness” is approximated.

2.2 Issuer Characteristics

As outlined above, both parties – issuers and investors – face uncertainty about the firm value of the IPO due to limited information disclosure of privately held companies. There are several issuer characteristics that can be used as proxies for uncertainty prior to an IPO (Dunbar, 1998). Different issuer characteristics may create information and have effects on the IPO valuation (Barry & Mihov, 2015). Since this analysis focuses on the determinants of an IPO withdrawal, issuer characteristics are introduced in order to test the linkage with the likelihood of withdrawal. In the following section we will present a variety of academic papers on issuer characteristics that we deem necessary to decipher the withdrawal puzzle.

2.2.1 Firm and Filing Size

The firm’s size is found to be significant in creating or reducing uncertainties around an IPO. It services as a proxy to measure the associated risk of the IPO company (Carter, et al., 1998). For smaller companies information is more costly to obtain. Hence, information asymmetry between the IPO issuer and investors might be more pronounced and the company may face investor sentiment (Brav &
In contrast, for larger companies information is more readily available and less costly to obtain which results in reduced uncertainty prior to an IPO (Chahine & Filatotchev, 2011). Also, Chahine et al. (2012) point out that larger companies have more thoroughly control and accounting mechanism providing a higher quantity as well as quality of information. Consistent with prior research the size of a company is measured by the natural logarithm of the company's total assets at the most recent financial period prior to the IPO (Colak, 2012). In this analysis, companies are classified as small when having a value below average firm size (Carter, et al., 2011). Besides this, the filing size provides valuable information on the quality of the IPO and company (Busaba, et al., 2001). As a consequence, the natural logarithm of the expected offer size must be included (Dunbar & Foerster, 2008). Larger issues may attract institutional investors resulting in a higher level of information revealed and liquidity in the aftermarket (Busaba, et al., 2001).

### 2.2.2 Firm Age

Apart from the firm size, the firm’s age also plays an important role in the ex-ante uncertainty in an IPO about the firm value and long-run performance (Mikkelson, et al., 1997). The firm’s age reduces the information asymmetry since it is assumed to be negatively related to underpricing (Loughran & Ritter, 2004). More mature companies are perceived to be less risky since they have survived and published information for a longer period of time. Whereas younger firms have published less information and can be associated with higher idiosyncratic risk (Boulton & Campbell, 2016). Hence, the firm age provides information on the ex-ante uncertainty about the firm value at an IPO (Engelen & van Essen, 2010). The firm age is represented by the natural logarithm of years from foundation to the IPO filing (Feroz, et al.,...
Likewise for the firm size, firms are considered as mature with a value above the average firm age.

### 2.2.3 Financial Health

Financial indicators are used to assess the company’s performance and potential as well as risks for growth and future earnings. It is found that the level of capital expenditures (CapEx) serves as an indicator about the company’s long-term performance (Boulton & Campbell, 2016). The greater the expenditures in percentage to the company’s total assets the better the company is performing (Carter, et al., 2011). Also, the net income (NI) gives information about a company’s financial health and hence can be used as an indicator for the firm’s IPO quality (Colak, 2012). Besides, companies with positive earnings are easier to value reducing the uncertainty prior to an IPO (Kim & Ritter, 1999). Therefore, Busaba et al. (2001) argue that companies with better financial results are less likely to withdraw. However, Fama (1998) puts the earnings into an adequate context. Companies will display high earnings prior to their IPO as investors value past performance more. Firms can exploit this overreaction of the market at the time of the IPO which can presumed as favourable market conditions. Barry & Mihov (2015) state that financial intermediaries such as bank reduce information asymmetry. Thus, debt-financing provides information to the investor and consequently reduces the uncertainty about the firm value prior to the IPO. Also, a higher debt ratio indicates better access to alternative sources of capital and hence these companies may withdraw an IPO more likely (Busaba, et al., 2001). To the contrary, companies with too high leverage might also face costs of financial distress and bankruptcy which increases the risk to investors (Chahine & Filatotchev, 2011). Again there exists a trade-off between the benefit of reducing uncertainty and the costs of financial distress. As a proxy the total debt divided by
the total assets is taken (Colak, 2012). Dunbar & Foerster (2008) moreover include a debt retirement dummy as a proxy to measure the dependence on an IPO. The company is more likely to withdraw with the objective to refinance debt with the IPO proceeds. In conclusion, the more solid and profound the financials, the lower the ex-ante uncertainty of the IPO firm value (Abdou & Dicle, 2007).

### 2.2.4 High-tech vs. Low-tech

Technological companies that highly rely on their assets for future growth and earnings face risk of loss of these valuable assets due to changes in technology or copyrights issues (Abdou & Dicle, 2007). Also, due to the complexity of technological assets and the difficulty of quantification combined with the expectations of technological changes, investors might not value these assets correctly (Chahine, et al., 2012). The level of uncertainty prior to the IPO for high-tech corporations will be more pronounced (Engelen & van Essen, 2010). Kim et al. (2008) investigate the signalling of leverage for high-tech companies and find that leveraged high-tech firms signal even higher uncertainty prior to an IPO which consequently leads to more frequent price revisions and higher underpricing. Most important is that the negative signalling power of withdrawals might be more significant for high-tech companies which in turn may face more severe difficulties to retry the IPO (Dunbar & Foerster, 2008). Putting it together, we need to account for a high-tech factor in this analysis. The high-tech dummy takes a value of 1 if the company is belonging to the high-tech industry and 0 otherwise (Colak, 2012). The categorisation is based on the Eurostat definition of high-tech which includes a sector, product and patent approach (Eurostat, 2016).
2.2.5 Intellectual Capital Disclosure

As mentioned above, companies owning intangible assets such as technology, patents or key personnel create uncertainty about their actual firm value. This might result in underpricing or agency problems. The provision of information on intangible assets in the IPO prospectus or otherwise is defined as disclosure (Too et al., 2015). Especially for high-tech companies their intellectual capital (IC), which can include any intangible assets, is considered to constitute to the firms’ competitive advantage (Abdou & Dicle, 2007). Due to the strategic importance of intangible assets it is estimated that the disclosure of intellectual capital is key to investors when assessing an IPO’s value. Higher disclosure of the companies’ intangible assets reduces the information asymmetry between issuer and investor (van der Zahn et al., 2007). Nevertheless, there arises a trade-off between the benefit of disclosing intellectual property to reduce uncertainty and simultaneously protecting the competitive advantage (Singh & van der Zahn, 2007). Too et al. (2015) argue that disclosure might reduce the information asymmetry. The IPO company can benefit from reducing the costs of going public such as lower underpricing (Ritter, 1987). Therefore, the IC disclosure dummy is introduced that assigns a value of 0 to companies that do not disclose their intangible assets in the IPO process and 1 to disclosing companies (Singh & van der Zahn, 2007).

2.2.6 Ownership and Control

In IPO literature the effect of venture capital (VC) on underpricing and long-term performance of an IPO firm is thoroughly discussed. An IPO offers the venture capitalist or private equity investors an opportunity to exit the company (Bessler & Kurth, 2005; Bessler & Thies, 2006). In Germany, private equity and venture capital investments are closely linked with blurred borders in usage. Often, venture capitalists focus on but
are not limited to younger firms (KfW, 2015). Venture capitalists actively take a stake in the backed company by advising management on financial, strategic and operational matters while keeping a long-term focus and providing capital (Belghitar & Dixon, 2012). Furthermore, venture capitalists are experienced in timing the IPO when market conditions are favourable focusing on growth or start-up companies (Cotei & Farhat, 2013). Due to their experience and reputation as well as network, venture capitalists certify the backed company and reduce the information asymmetry by signalling their efforts with their reputation at risk (Chahine, et al., 2012). Also, Campbell II & Frye (2009) unveil that venture capitalists strongly influence the monitoring and governance structure in the backed company resulting in higher levels at the time of the IPO. Venture capitalist activity were observed to cluster IPOs during hot markets which can be explained by behavioural biases assuming that the past performance indicates the future performance (Gompers, et al., 2008). Particularly, in Germany however, venture capitalist firms as well as private equity investors vary significantly in reputation and experience as well as objectives. The German private equity and venture capital market is considered to be outshone on an international scale. In comparison to the US-American venture capital market, Germany is far from reaching the same level of investments (KfW, 2015). In particular, often German VC companies are bank-led (Tyková & Walz, 2007; Goergen, et al., 2009). The information that is revealed on the left hand side by bank credit and on the right hand side by venture capitalists might interfere (Bergbrant, et al., 2014). It is up to the analysis to clarify the conflicting views on the role of venture capital. Busaba et al. (2001) find VC-backed companies that withdrew their IPO less likely succeed a second-time IPO. In contrast, Dunbar & Foerster (2008) identify venture capitalist involvement as key for a successful return to the equity market. In the USA the importance of venture capitalists are exceeding the
private equity investors. Therefore, we assume that no prior study has examined the effect of private equity investment. We will include two dummy variables. The PE as well as the VC dummy variables both take the value of 1 if such an investment is present at an IPO and 0 otherwise.

2.2.7 Underwriter Characteristics

When a firm wants to go public it needs assistance of underwriters to get information on the investors’ willingness to pay for the offered shares. This process is characterised by mutual choice which means that issuers select underwriters based on abilities and reputation whereas the latter decide to take on an IPO looking at firm characteristics and the probability of a successful completion (Fernando, et al., 2005). Therefore following the theories of asymmetric information at an IPO, an underwriter’s reputation may be of colossal importance. A reputable investment bank underwriting an IPO certifies the quality of the firm (Ritter, 1987). In particular, since its own reputation is at stake when taking the lead in an IPO the underwriter is incentivised to reduce uncertainty and misevaluation (Migliorati & Vismara, 2014). This goes hand in hand with the argument of Carter et al. (1998) that the underwriter’s reputation is negatively linked to the level of underpricing and uncertainty based on the Carter-Manaster ranking of underwriters (Carter & Manaster, 1990). In contrast, investors’ demand for firms with reputable underwriters at the IPO time is higher and thus the issuers might face higher underpricing. Although the relation of the underwriter characteristics can alter over time (Jones & Swaleheen, 2010). The signalling power of the underwriter is also manifested by Fernando et al. (2005) that attribute a “graduation” effect when switching to a more reputable underwriter indicating. In a survey Krigman et al. (2001) conducted on why companies change underwriters, the majority of Chief Financial Officers considered the choice of underwriter as a key factor in
an IPO. This argument is enforced by Dunbar & Foerster (2008) who claim that the reputation of the underwriter is a key determinant for companies that withdrew and successful return to the equity market. Despite the general assumptions that underwriter act in the best interest of its client, research has indicated that there is moral hazard present in aligning the issuer’s and underwriter’s objectives (Nimalendran, et al., 2007). We focus our analysis on the German IPO market. The Carter-Manaster ranking covers the US-American underwriter market but not the German one. For that reason, the recent application of the underwriter ranking for European IPOs by Migliorati & Vismara (2014) is ideal to utilise. The lead underwriter is classified according to its ranking which can be used as a proxy in order to capture the signalling quality of the IPO. In case a consortium of underwriters manage an initial public offering the average is taken.

2.2.8 Multinationality

The degree of operational multinationality is considered to affect a company’s flexibility. The more diversified a company is operating on a global scale, the higher its ability to quickly respond and adapt to market risks and opportunities (Mudambi, et al., 2012). Compared to a less multinational company, the higher the degree of multinationality, the lower the uncertainty prior to an IPO and the higher the perceived quality of the IPO firm (Chahine & Filatotchev, 2011). Nonetheless, Abdou & Dicle (2007) point out that trade restrictions on imports and exports might increase the level of uncertainty surrounding the IPO company. Therefore, the scale of Aggarwal et al. (2011) is used to quantify the degree of multinationality.
3. Methodological Approach and Data Collection

3.1 Methodology

The probability of withdrawal and its determinants need to be identified. Hence, following previous research, a probit model seems adequate to employ as methodology (Dunbar & Foerster, 2008, Busaba et al., 2001). The binary probit model constitutes on the idea of a dichotomous variable. This observable variable can either take the value of one or zero (Nagler, 1994).

\[ y_i = \begin{cases} 1, & y^* > 0 \\ 0, & y^* \leq 0 \end{cases} \]  

(1)

In this analysis the dependent variable takes the value of one for companies that have withdrawn their IPO and the value of zero for successful IPOs otherwise. The employed probit regression estimates a probability that the dichotomous variable takes the value of one according to:

\[ \Pr(y_i = 1|x) = \Phi(\alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \ldots + \alpha_n x_n) \]  

(2)

where \( \Phi(.) \) is a binary function such that \( \Phi: x \Rightarrow [0,1], \Rightarrow \forall x \in \mathbb{R} \). In case of a probit model the function \( \Phi(.) \) is represented by the cumulative distribution function where \( \Phi(z) \) follows a normal density function (Nagler, 1994):

\[ \Phi(x) = \int_{-\infty}^{x} \phi(z) \, dz \]  

(3)

\[ \Phi(z) = \frac{e^{(-z^2/2)}}{\sqrt{2\pi}} \]  

(4)

The probability that the dichotomous variable takes the value of one can be derived from the latent dependent variable which is represented by:
\[ y^* = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \ldots + \alpha_n x_n + \epsilon \]  

(5)

where the error term \( \epsilon \) is assumed to be normally distributed and uncorrelated with \( E[\epsilon] = 0 \). In the probit model the observable variable, \( y \), will take the value one if \( y^* > 0 \), and 0 otherwise (Hagle & Mitchell II, 1992). The probit regression contradicts the assumptions for Ordinary Least Squares regression which are overcome by using a Maximum Likelihood Estimation. With this technique, estimations of the alpha-coefficients can be computed. However, the latent variable \( y^* \) cannot be used for direct interpretation of \( y \) when running the regression of the explanatory variables. Thus, the estimated marginal effects of the independent variables need to be calculated. It represents the effect of a unit change given one standard deviation of the variables on the probability that the dichotomous variable takes the value of one given that all other independent variables are constant (Nagler, 1994):

\[
\frac{dPr(y=1|x)}{dx} = \phi(x)\alpha
\]

(6)

Since the RHS variables are not constant, the average of individual marginal effects is taken in order to derive the effect on the probability for continuous variables and for dummy variables:

\[
AME = \frac{1}{n} \sum_{i=1}^{n} \phi(x)\alpha
\]

(7)

\[
AME = \frac{1}{n} \sum_{i=1}^{n} [\Phi(x\alpha|x^k=1) - \Phi(x\alpha|x^k=0)]
\]

(8)

Therefore, the values need to be transformed first in order to get information on the marginal effect on \( y \) of each independent, explanatory variable on the RHS (Nagler, 1994).

In order to evaluate the adequacy of the estimated probit model appropriate goodness-of-fit tests need to be identified. Hagle & Mitchell II (1992) propose the Pseudo-R\(^2\) measure such as the McFadden- R\(^2\) to
identify the variability explained by the model as well as the deviations of the model from the observed data. In general, $R^2$ statistics work better for ordinary least square regressions (OLS) than maximum likelihood, hence the McFadden- $R^2$ for binary probit models will output a smaller value than for OLS regressions. A McFadden- $R^2$ statistics between 0.2-0.4 is considered to be a decent goodness of fit. Also, the Log-likelihood ratio assesses the improvement of models over others and consequently can be used to examine the adequacy when taking subsets of significant variables into new models. Whereas Hosmer et al. (1997) divide the observations into ten equally-sized groups according to their probabilities and compute a $\chi^2$ - test with these “deciles of risk”. The calculated $p$-value indicates the adequacy of the model.

As mentioned above, the world of IPO outcomes is more diverse than contrastings withdrawn to successful IPOs. Possible counterfactuals of withdrawals include bankruptcy, delisting or acquisition. In the binary probit model, about a quarter that are classified as “successful” are delisted or insolvent. In particular, the paucity in previous studies of considering multiple counterfactuals gives rise to the question of the reliability of the binary classification. A multinomial probit model can be computed to predict multiple binary outcomes conjointly. Hence, there are used $m-1$ latent variables $y^*_i$ where $m$ denotes the number of dependent variables $y_i$ and $0 < m < \infty$ (Smirnov, 2011). The latent variable for the $M$-equation can be defined by:

$$y^*_{im} = \alpha_m x_{im} + \epsilon_{im}, \ m=1, \ldots, M$$ (9)

and

$$y_{im} = 1 \text{ if } y^*_{im} > 0 \text{ and } 0 \text{ otherwise}$$ (10)
where the dependent variable \( y_{im} \) can represent \( M \) different choices at the same time which defines the multivariate model. Henceforth, the probability is given by:

\[
Pr(Y_i = y_i | \alpha, \Sigma) = \int_{A_{i1}} \ldots \int_{A_{iM}} \Phi_M(x | 0, \Sigma) dx
\]

where \( \Phi_M(x | 0, \Sigma) \) denotes the density function of a \( M \)-variate normal distribution with a mean of vector 0 as well as variance matrix \( \Sigma \) and where \( A_{iM} \) defines the interval (Cappellari & Jenkins, 2003). In summary, the binary probit model is extended to an \( m \)-dimensional vector regression adding degrees of complexity to the regression itself as well as to the marginal effects computation.

### 3.2 Procedure of Data Collection

This study includes all IPO filings in Germany from January 2001 until December 2015. However, following existing literature such as Dunbar & Foerster (2008) and Busaba (2006), Real Estate Investment Trusts (REITs), American Depositary Receipts (ADRs), as well as close-end or mutual funds and special purpose entities are excluded. Also, rights issuances are omitted from the sample but unlike other studies financial companies remain in the sample. The data will be derived from a number of sources. The market level-information will be retrieved from Thomson Reuters Eikon and Bloomberg. Whereas the firm-level information need to be hand-collected from the IPO filing prospectuses, the Amadeus database or annual reports. Some of the most important sources of information are the LexisNexis database or the German Handelsregister platform as well as the BaFin database. Why chose this limitation for the sample? Apart from the paucity of research on withdrawn IPOs in Germany, the scope of time is chosen from 2001 to 2015 due to the poor quality of data and information on the IPO filings prior to the millennium. However, the year 2000 is excluded from this analysis since it is
generally characterised as a rather atypical year of the equity market. Therefore, to balance the quality and quantity of data the chosen time frame is grasping various phases of the equity and IPO market. Thus it can be labelled as representative.

Before any analysis can be computed, a comprehensive database needs to be created. Thus, the first step contains:

1) Collection of data of the sample size through market information platforms.
2) Checking the data for accuracy.
3) Developing a database structure including a coherent and harmonised list of the sample size.

Especially the second point is of colossal importance since this work assures that the data collection process does not include inaccuracies which reduce the quality of the research. Other problems arising are the sample size or information losses due to inadequate information platforms. One way to address the latter issue is to cross-check the information from two or more platforms to allow for harmonisation as indicated before.

The database includes a total of 295 companies that filed an IPO from 2001 to 2015 of which 253 were successful and 42 withdrew their IPO totalling at a 14.24 %. In Figure 3 the outcome of all IPO filings per year are portrayed and contrasted to changes in the German Gross Domestic Product (GDP). At first glance it can be noticed that the IPO frequency is heavily varying over the 15 years examined. Taking the changes of GDP into consideration, the amount of IPOs seems to mirror the GDP development. Furthermore, the correlation between the number of successful IPOs and withdrawn IPOs is 0.6132. An increase of successful IPOs is also shown in an increase of withdrawals, however
less pronounced. Although the exact relationships of the variables need to be left for the analysis to be explained.

Figure 3: Successful and withdrawn IPOs from 2001 until 2015 are displayed which are contrasted to the German GDP change on the right axis.

In Table 1 the IPO filings are further broken down according to year and status. The rate of withdrawal varies significantly from 40% in 2004 to zero in 2014. The average rate of withdrawal between 2001 and 2015 is 18.94% and hence higher than the total rate. This indicates that the variability of the withdrawal ratio is rather pronounced. In contrast, the maximum number of successful IPOs is 73 in 2006 with no IPO at all in 2003.
Table 1: Withdrawn and successful IPOs from 2001 until 2015.

<table>
<thead>
<tr>
<th>Year</th>
<th>Withdrawn IPOs</th>
<th>Successful IPOs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>5   16.67%</td>
<td>25  83.33%</td>
<td>30</td>
</tr>
<tr>
<td>2002</td>
<td>2   28.57%</td>
<td>5   71.43%</td>
<td>7</td>
</tr>
<tr>
<td>2003</td>
<td>0   0.00%</td>
<td>0   0.00%</td>
<td>0</td>
</tr>
<tr>
<td>2004</td>
<td>4   40.00%</td>
<td>6   60.00%</td>
<td>10</td>
</tr>
<tr>
<td>2005</td>
<td>2   8.00%</td>
<td>23  92.00%</td>
<td>25</td>
</tr>
<tr>
<td>2006</td>
<td>6   7.59%</td>
<td>73  92.41%</td>
<td>79</td>
</tr>
<tr>
<td>2007</td>
<td>5   9.80%</td>
<td>46  90.20%</td>
<td>51</td>
</tr>
<tr>
<td>2008</td>
<td>5   38.46%</td>
<td>8   61.54%</td>
<td>13</td>
</tr>
<tr>
<td>2009</td>
<td>1   20.00%</td>
<td>4   80.00%</td>
<td>5</td>
</tr>
<tr>
<td>2010</td>
<td>1   6.67%</td>
<td>14  93.33%</td>
<td>15</td>
</tr>
<tr>
<td>2011</td>
<td>4   23.53%</td>
<td>13  76.47%</td>
<td>17</td>
</tr>
<tr>
<td>2012</td>
<td>2   18.18%</td>
<td>9   81.82%</td>
<td>11</td>
</tr>
<tr>
<td>2013</td>
<td>3   33.33%</td>
<td>6   66.67%</td>
<td>9</td>
</tr>
<tr>
<td>2014</td>
<td>0   0.00%</td>
<td>9   100.00%</td>
<td>9</td>
</tr>
<tr>
<td>2015</td>
<td>2   14.29%</td>
<td>12  85.71%</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>42  14.24%</td>
<td>253 85.76%</td>
<td>295</td>
</tr>
</tbody>
</table>

Taking a closer look into going public outcomes according to industry, the energy segment is diverging from the average distribution of withdrawn and successful IPOs. First, there are the fewest IPO filings in total compared to the remaining industries. Second, the rate of withdrawal of 27% is almost double the amount. This phenomenon may be explained by the inconstancy of the German governmental directives on energy businesses. Still, the rate of withdrawal seems to be deviating around 14.24% in the remaining industries.

Table 2: Distribution of successful and withdrawn IPOs in Germany from 2001 until 2015 according to industries.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Withdrawn IPOs</th>
<th>Successful IPOs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer</td>
<td>8   12.31%</td>
<td>57  87.69%</td>
<td>65</td>
</tr>
<tr>
<td>Energy</td>
<td>7   26.92%</td>
<td>19  73.08%</td>
<td>26</td>
</tr>
<tr>
<td>Financial</td>
<td>6   9.84%</td>
<td>55  90.16%</td>
<td>61</td>
</tr>
<tr>
<td>Industrial</td>
<td>12  15.38%</td>
<td>66  84.62%</td>
<td>78</td>
</tr>
<tr>
<td>Technology</td>
<td>9   13.85%</td>
<td>56  86.15%</td>
<td>65</td>
</tr>
</tbody>
</table>
Apart from that, the world of withdrawn and successful IPOs is not binary at all when analysing the status of the companies as of July 2016. In Figure 4 the status of the withdrawn and successful IPOs are depicted. The majority of the withdrawn companies stay private of which about 17 % were acquired. Out of the 14.24 % of withdrawn IPOs from 2001 to 2015 approximately 19 % successfully retry an IPO for the second time. Whereas, about a quarter of all companies withdrawing their IPO faced bankruptcy, but in contrast only 1 % of the successful IPO companies shared this destiny.

*Figure 4: The status of the withdrawn IPOs in Germany from 2001 until 2015 as of July 2016 are depicted on the left hand side. The status of the successful IPOs are on the right hand side.*

Out of the successful IPO companies about 70 % are still listed and trading. Nonetheless, a quarter is delisted which seems surprisingly high. A marginal amount is acquired or suspended. In general, the risk of bankruptcy seems higher for companies that withdrew their IPO in the first place. At the same time, about 19 % return successfully. Therefore, the decision to withdraw might bear long-term consequences that need to be considered.
4. The Determinants of Withdrawal: Empirical Evidence

In the following section, we will employ univariate statistics to identify first differences between successful and withdrawn IPOs in Germany. We then regress the market and firm characteristics on the outcome of the IPO with a binary probit model. In order to account for more counterfactuals, the binary regression is extended to a multinomial probit model.

4.1 The Univariate Analysis

The first step of the analysis is the univariate descriptive statistics. In Table 3 the mean, standard deviation as well as the number of observations are reported for each explanatory variable broken down by the outcome of the IPO. Furthermore, the p-value which was derived from the two sample t-statistic test is given. As mentioned before, the database includes 295 observations for all variables except for the $\alpha_3$ Markit Purchasing Manager Index (PMI). Since this index only was inaugurated in May 2004, observations previous to this date do not have values. As a consequence, this variable will be omitted for the first round of the probit analysis.

The majority of the companies blamed the unfavourable market conditions for their withdrawal. Starting with the market characteristics it does surprise that the majority of the nine variables do not show significance when undertaking the t-test. The means of the two outcomes do not diverge largely for market characteristics. However, the Rule of Law index is significantly higher for successful IPOs. The stricter enforcement of laws seems to benefit the success of going public in Germany. This is coherent with previous findings (La Porta, et al., 1998).
Also, the rivalry dummy suggests significantly higher competition for successful IPOs opposed to previous findings for the US-American market by Dunbar & Foerster (2008). Thus, we can deduct that higher rivalry reveals more inside information to market participants. Who thus signal the success of the IPO through higher demand (information spill-over). Finally, market sentiment seems to have a stake in the decision to withdraw. The output in Table 3 suggests that negative news coverage is significantly more frequent for companies that withdraw their IPO than for successful companies. Apart from the Rule of Law index, this is the second finding supporting the statement of withdrawal due to unfavourable market conditions or lack of demand. In general, the results of the descriptive statistics indicate that the market environment does not differ significantly for successful and withdrawn IPOs. It is justified to call the validity of blaming unfavourable market conditions into question. Anyhow, this conclusion still needs to be proven by the probit analysis.
Table 3: The output of the descriptive analysis according to outcome of the IPO broken down by market and firm characteristics.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Successful IPOs Mean</th>
<th>St. D.</th>
<th>Obs.</th>
<th>Withdrawn IPOs Mean</th>
<th>St. D.</th>
<th>Obs.</th>
<th>p-value successful vs. withdrawn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Market Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\alpha_1$ IEF</td>
<td>0.53</td>
<td>0.09</td>
<td>253</td>
<td>0.55</td>
<td>0.09</td>
<td>42</td>
<td>0.1089</td>
</tr>
<tr>
<td>$\alpha_2$ CPI</td>
<td>0.79</td>
<td>0.02</td>
<td>253</td>
<td>0.79</td>
<td>0.03</td>
<td>42</td>
<td>0.4920</td>
</tr>
<tr>
<td>$\alpha_3$ Rule of Law</td>
<td>0.69</td>
<td>0.04</td>
<td>253</td>
<td>0.67</td>
<td>0.04</td>
<td>42</td>
<td>0.0719</td>
</tr>
<tr>
<td>$\alpha_4$ 10yr Bund Yield bps</td>
<td>350</td>
<td>113</td>
<td>253</td>
<td>359</td>
<td>123</td>
<td>42</td>
<td>0.6675</td>
</tr>
<tr>
<td>$\alpha_5$ Term Spread bps</td>
<td>80</td>
<td>71</td>
<td>253</td>
<td>97</td>
<td>77</td>
<td>42</td>
<td>0.1390</td>
</tr>
<tr>
<td>$\alpha_6$ PMI</td>
<td>55</td>
<td>4</td>
<td>221</td>
<td>54</td>
<td>4</td>
<td>31</td>
<td>0.2553</td>
</tr>
<tr>
<td>$\alpha_7$ GDP</td>
<td>620</td>
<td>56</td>
<td>253</td>
<td>620</td>
<td>61</td>
<td>42</td>
<td>0.9891</td>
</tr>
<tr>
<td>$\alpha_8$ Dax</td>
<td>6588</td>
<td>1494</td>
<td>253</td>
<td>6586</td>
<td>1624</td>
<td>42</td>
<td>0.9926</td>
</tr>
<tr>
<td>$\alpha_9$ Rivalry</td>
<td>0.5257</td>
<td>0.5003</td>
<td>253</td>
<td>0.3333</td>
<td>0.4771</td>
<td>42</td>
<td>0.0209</td>
</tr>
<tr>
<td>$\alpha_{10}$ Negative News</td>
<td>0.0553</td>
<td>0.2291</td>
<td>253</td>
<td>0.3095</td>
<td>0.4679</td>
<td>42</td>
<td>0.0000</td>
</tr>
<tr>
<td><strong>Firm Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\alpha_{11}$ Firm Size (€m)</td>
<td>3,030</td>
<td>18,100</td>
<td>253</td>
<td>6,360</td>
<td>19,700</td>
<td>42</td>
<td>0.2777</td>
</tr>
<tr>
<td>$\alpha_{12}$ Offer Size (€m)</td>
<td>154</td>
<td>319</td>
<td>253</td>
<td>877</td>
<td>1,560</td>
<td>42</td>
<td>0.0000</td>
</tr>
<tr>
<td>$\alpha_{13}$ Age</td>
<td>21</td>
<td>36</td>
<td>253</td>
<td>30</td>
<td>43</td>
<td>42</td>
<td>0.1500</td>
</tr>
<tr>
<td>$\alpha_{14}$ CapEx</td>
<td>0.0413</td>
<td>0.0820</td>
<td>253</td>
<td>0.1198</td>
<td>0.1831</td>
<td>42</td>
<td>0.0000</td>
</tr>
<tr>
<td>$\alpha_{15}$ Net Income</td>
<td>1.1505</td>
<td>19.1905</td>
<td>253</td>
<td>-0.0165</td>
<td>0.3726</td>
<td>42</td>
<td>0.6942</td>
</tr>
<tr>
<td>$\alpha_{16}$ Debt</td>
<td>0.5723</td>
<td>0.3157</td>
<td>253</td>
<td>0.6611</td>
<td>0.2876</td>
<td>42</td>
<td>0.0887</td>
</tr>
<tr>
<td>$\alpha_{17}$ Debt Retirement</td>
<td>0.0474</td>
<td>0.2130</td>
<td>253</td>
<td>0.2857</td>
<td>0.4572</td>
<td>42</td>
<td>0.0000</td>
</tr>
<tr>
<td>$\alpha_{18}$ High-tech</td>
<td>0.3478</td>
<td>0.4772</td>
<td>253</td>
<td>0.2143</td>
<td>0.4153</td>
<td>42</td>
<td>0.0886</td>
</tr>
<tr>
<td>$\alpha_{19}$ Intellectual Capital</td>
<td>0.1581</td>
<td>0.3656</td>
<td>253</td>
<td>0.1429</td>
<td>0.3542</td>
<td>42</td>
<td>0.8017</td>
</tr>
<tr>
<td>$\alpha_{20}$ Private Equity</td>
<td>0.1107</td>
<td>0.3143</td>
<td>253</td>
<td>0.2857</td>
<td>0.4572</td>
<td>42</td>
<td>0.0021</td>
</tr>
<tr>
<td>$\alpha_{21}$ Venture Capital</td>
<td>0.0040</td>
<td>0.0629</td>
<td>253</td>
<td>0.1190</td>
<td>0.3278</td>
<td>42</td>
<td>0.0000</td>
</tr>
<tr>
<td>$\alpha_{22}$ Underwriter</td>
<td>0.2718</td>
<td>0.2949</td>
<td>253</td>
<td>0.3773</td>
<td>0.3356</td>
<td>42</td>
<td>0.0363</td>
</tr>
<tr>
<td>$\alpha_{23}$ Multinationality</td>
<td>0.2953</td>
<td>0.2028</td>
<td>253</td>
<td>0.3878</td>
<td>0.2076</td>
<td>42</td>
<td>0.0068</td>
</tr>
</tbody>
</table>

Apart from that, the arithmetic mean is computed for the samples. Since the sample sizes for successful with 253 and withdrawn IPOs with 42 are rather small, outliers are magnified. This becomes especially obvious when reviewing the outputs for the firm characteristics. Also, the standard deviation given for the firm characteristics variables often exceeds the mean which indicates that the values vary massively for the
different observations. Previous studies (Busaba, et al., 2001, Dunbar & Foerster, 2008) found that for successful IPO companies the firm as well as the offer size were significantly larger than for companies that pulled their IPO. The results in Table 3 oppose these findings. Even when taking the geometric mean, which portrays the central tendency more accurately than the arithmetic one, the picture does not change. Withdrawn IPOs show a significantly larger filing size with an average of € 877 mn in contrast to € 154 mn. Busaba, et al. (2001) point out that a larger offer size might reveal more information and thus reduces uncertainties – at least for the US-American IPO market. This statement lacks proof for the German market. Companies intending to go public with a massive volume might more easily pull their IPO when they face skepticism. Underpricing in magnified for large offer volumes. When going public withdrawn companies are also larger and older compared to their successful counterfactuals. Consequently, the results may not directly contradict but at least do not prove that the size nor the age of the company reduce uncertainties around an IPO (Chahine & Filatotchev, 2011). Furthermore, Bessler & Thies (2007) analysed the effect of firm and filing size on the long-run performance in Germany. The authors reason that larger companies show more negative abnormal returns likewise small companies evidently outperform larger ones.

Despite, withdrawn companies have a significantly higher ratio of capital expenditures. CapEx indicate the potential for the future (Boulton & Campbell, 2016). But in the end it is not the level of investments but the potential to generate cash displayed by the net income that is relevant. Successful IPO companies on average reported positive net income in contrast to the negative mean by withdrawn IPO companies. This result goes hand in hand with the idea that firms that are in good financial health less likely withdraw (Busaba, et al., 2001). Nonetheless, perhaps
successful IPO companies are more convincing in presenting positive results prior to the process in order to exploit the market euphoria. The latter is manifested by the higher level of competition for successful IPOs (Fama, 1998). In terms of the indebtedness, withdrawn companies display significantly higher levels of debt and also more often claim to use the IPO proceeds to retire outstanding debts. Therefore, one can conclude that debts increase the risks associated prior to an IPO (Chahine & Filatotchev, 2011). Investors demand higher underpricing which leads the company to withdraw more likely. Likewise, debt retirement might also raise the level of risks perceived by the investor which may lead to a lack of demand. This is diametrically opposed to the interpretation of Dunbar & Foerster (2008) who hypothesize the higher mean of the debt retirement dummy for withdrawals as a sign of alternative sources of finance. The results for the high-tech dummy show a significantly higher mean for successful IPOs than for withdrawn ones. Investors might rank high-tech companies better in terms of growth potential and long-term performance (Abdou & Dicle, 2007) since the mean for the intellectual capital disclosure is also exceeding the withdrawn counterparts but is not found to be significant. The result of the next couple of variables seem rather surprising. The levels of venture capital as well as private equity involvement for withdrawn companies are higher than the ones computed for successful companies. The certification role of venture capitalists and private equity companies cannot be rectified for the German IPO market (Chahine, et al., 2012). As Goergen et al. (2009) argue, the role as well as reputation of venture capitalists may differ substantially in Germany. The venture capitalists in Germany do not have a long history to look upon and are often closely liked to bank and underwriters. Moral hazard and substantial conflicts of interest may arise. In general, the market of venture capital is still assumed to be lagging behind (Bessler & Kurth, 2005). Tyková & Walz (2007) debate
that venture capitalists have an information advantage over investors and will exploit this. They even find evidence that VC-backed IPOs face more severe underpricing as an up front fee for this exploitation hazard – at least this would be a more plausible explanation for the output of the descriptive statistics in Table 3. In particular, underpricing is more pronounced when the venture capitalists are linked to the underwriter (Bessler & Kurth, 2005). Additionally, in contrast to previous findings, the mean for the underwriter reputation employed by companies that pulled their IPO is significantly exceeding the value for the successful ones (Carter & Manaster, 1990; Krigman, et al., 2001). Often German companies planning to go public choose their underwriter not based on reputation but on preexisting bank relationships. In Germany banks can be classified as universal banks offering a diverse range of services from investment to commercial banking (Klein, et al., 2016). This may interfere with the causal link of underwriter reputation and the decision to withdraw build up by previous studies. Results in the US-American market verified the importance of the underwriter’s reputation (Dunbar & Foerster, 2008). This perception may have been adopted to the German market without proof. Despite, multinational companies are more diversified and flexible in their operations which can result into a competitive advantage (Aggarwal, et al., 2011). However, withdrawn IPOs are characteristed by a significantly higher degree of multinationality. Multinational companies are assumed to have higher operationally flexibility. We can suspect that multinational companies have a variety of alternative sources of funding outside of Germany. They are less dependent on the IPO proceeds which increases the likelihood of withdrawal. To further clarify this finding, we will need to examine the probit regression.

In summary, the descriptive analysis already introduced controversial findings for the German IPO market in contrast to previous studies that
focused on the Anglo-American market. Findings for the US-American market cannot be verified by the results of the descriptive statistics for the German market. Possible explanations might be based on cultural differences considering the equity and debt market in Germany. Nonetheless, one needs to bear in mind that the analysis of the descriptive statistics is a helpful but imprecise tool to deduct impressions on the determinants for withdrawals – particularly with a limited sample size. It must be examined in combination with the results of the probit analysis which will be conducted in the next chapter.

4.2 The Probability of Withdrawal

After analysing the descriptive statistics, the probability of withdrawal and its determinants must be examined. To do so, the probit model from the previous chapters must be conceptualised:

\[ \Pr(y_i = 1|x) = \Phi(\alpha_0 + \alpha_1 \text{Index of Economic Freedom} \\
+ \alpha_2 \text{Corruption Perception Index} + \alpha_3 \text{Rule of Law} \\
+ \alpha_4 \text{10yr Bund Yield} + \alpha_5 \text{Term Spread} + \alpha_6 \text{PMI} + \alpha_7 \text{GDP} \\
+ \alpha_8 \text{Dax} + \alpha_9 \text{Rivalry} + \alpha_{10} \text{Negative News} + \alpha_{11} \text{Firm Size} \\
+ \alpha_{12} \text{Offer Size} + \alpha_{13} \text{Firm Age} + \alpha_{14} \text{CapEx} \\
+ \alpha_{15} \text{Net Income} + \alpha_{16} \text{Debt} + \alpha_{17} \text{Debt Retirement} \\
+ \alpha_{18} \text{High-tech} + \alpha_{19} \text{IC} + \alpha_{20} \text{Private Equity} \\
+ \alpha_{21} \text{Venture Capital} + \alpha_{22} \text{Underwriter} \\
+ \alpha_{23} \text{Multinationality}) \]

where the latent dependent variable \( y \) can take the value of either 0 for a successful IPO or 1 for a withdrawn IPO. The cumulative distribution function is defined with \( \Phi \). This equation regresses the probability of
withdrawal based on 23 variables and the intercept $\alpha_0$. As outlined above, the independent variable PMI reduces the overall number of observations. It is excluded in the first round of the probit regression. In Table 4 the results of the regression are given broken down by each variable. We report the coefficient value, the respective $p$-value as well as the marginal and predicted effect. The results of the probit regression are largely coherent with the findings from the descriptive statistics. For instance, the predicted effects coincide with the inferences from the univariate analysis. Variables such as the level of debt have a positive effect on the probability of withdrawal whereas the index of economic freedom or the rule of law negatively affect the probability to withdraw. However, the predicted effect alone does not provide a definite answer. Taking a closer look at the significance and the marginal effects of the variables is more appropriate to draw inferences on the probability to withdraw. With a significance level of 10 %, only six regressors are significant which are the negative news dummy, the ratio of capital expenditure to total assets, the debt retirement dummy, the intellectual capital disclosure (IC) and venture capital dummies as well as the degree of multinationality. What does this suggest?

If the negative news are present prior to an IPO, then the probability of withdrawal increases approximately by 34.4 percentage points. An infinitesimal change of the capital expenditure ratio increases the probability of withdrawal. Combined with the findings from the descriptive statistics we can conclude that potential investors do not value the quantity of capital expenditures but prefer the quality of it. Companies with a higher level of CapEx exhibit a lower or even negative value of net income. This is also indicated by the significantly negative effect of the intellectual capital disclosure dummy. Withdrawn IPOs with higher capital expenditures are characterised by a lower level of intellectual capital disclosure.
Table 4: The output of the binary probit regression. The respective coefficient, p-value, marginal as well as predicted effect are provided for every market and firm characteristic.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>p-value</th>
<th>Marginal Effect</th>
<th>Predicted Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\alpha_0$ Intercept</td>
<td>5.9680</td>
<td>0.3632</td>
<td>2.357146</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_1$ Index of Economic Freedom</td>
<td>-0.0322</td>
<td>0.9858</td>
<td>-0.012698</td>
<td>-</td>
</tr>
<tr>
<td>$\alpha_2$ Corruption Perception Index</td>
<td>-4.3022</td>
<td>0.6064</td>
<td>-1.699196</td>
<td>-</td>
</tr>
<tr>
<td>$\alpha_3$ Rule of Law</td>
<td>-8.5831</td>
<td>0.1233</td>
<td>-3.390010</td>
<td>-</td>
</tr>
<tr>
<td>$\alpha_4$ 10 yr Bund Yield</td>
<td>0.0027</td>
<td>0.2165</td>
<td>0.001057</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_5$ Term Spread</td>
<td>0.0001</td>
<td>0.9594</td>
<td>0.000057</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_7$ GDP</td>
<td>-0.0026</td>
<td>0.6552</td>
<td>-0.001013</td>
<td>-</td>
</tr>
<tr>
<td>$\alpha_8$ Dax</td>
<td>0.0003</td>
<td>0.2001</td>
<td>0.000107</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_9$ Rivalry Dummy</td>
<td>-0.7071</td>
<td>0.0868</td>
<td>-0.088334</td>
<td>-</td>
</tr>
<tr>
<td>$\alpha_{10}$ Negative News Dummy</td>
<td>1.3961</td>
<td>0.0001</td>
<td>0.344354</td>
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</tr>
<tr>
<td>Firm Characteristics</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$\alpha_{11}$ Firm Size Dummy</td>
<td>-0.5330</td>
<td>0.1597</td>
<td>-0.066091</td>
<td>-</td>
</tr>
<tr>
<td>$\alpha_{12}$ Offer Size Dummy</td>
<td>0.5494</td>
<td>0.1401</td>
<td>0.067553</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_{13}$ Age Dummy</td>
<td>0.0184</td>
<td>0.9453</td>
<td>0.003174</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_{14}$ CapEx</td>
<td>2.9503</td>
<td>0.0007</td>
<td>1.165254</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_{15}$ Net Income</td>
<td>0.0005</td>
<td>0.9897</td>
<td>0.000186</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_{16}$ Debt</td>
<td>0.3326</td>
<td>0.4310</td>
<td>0.131381</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_{17}$ Debt Retirement Dummy</td>
<td>0.7311</td>
<td>0.0384</td>
<td>0.135926</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_{18}$ High-tech Dummy</td>
<td>-0.4148</td>
<td>0.1840</td>
<td>-0.044951</td>
<td>-</td>
</tr>
<tr>
<td>$\alpha_{19}$ IC Dummy</td>
<td>-0.6603</td>
<td>0.0877</td>
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<td>-</td>
</tr>
<tr>
<td>$\alpha_{20}$ Private Equity Dummy</td>
<td>0.3123</td>
<td>0.2982</td>
<td>0.046070</td>
<td>+</td>
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<td>$\alpha_{21}$ Venture Capital Dummy</td>
<td>2.7314</td>
<td>0.0004</td>
<td>0.813768</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_{22}$ Underwriter</td>
<td>0.6665</td>
<td>0.1074</td>
<td>0.263260</td>
<td>+</td>
</tr>
<tr>
<td>$\alpha_{23}$ Multinationality</td>
<td>1.1970</td>
<td>0.0337</td>
<td>0.472784</td>
<td>+</td>
</tr>
</tbody>
</table>

If a company aims to repay debt with the proceeds of an IPO, the probability of withdrawal increases by 14 percentage points. A high level of debt (13 % increase) and a debt retirement objective might be perceived as risky for potential investors.

The probit regression confirms the role of the venture capitalists that the univariate analysis has already suggested. If a company is VC-backed when filing for an IPO, the probability to withdraw is raised by around 81
percentage points. Since this is diametrically opposed to the US-American findings (Dunbar & Foerster, 2008), this needs more thorough examination. As mentioned above, the German venture capital market is not as developed as in the USA. The role of banks is of colossal importance since they often also engage in venture capital funding or underwriting activities (Bessler & Kurth, 2005). One important exit strategy for venture capitalists in the USA is an initial public offering. In Germany however, the annual number of IPOs varies significantly from zero to about 70. Due to this inconsistency of IPOs in Germany this exit strategy of venture capitalists will only be implemented when the estimated pay-off is highest. The majority of VC-funding is invested in start-up companies that themselves are perceived to be riskier (BVK, 2016). Furthermore, venture capitalists are expected to exploit their information advantage over outside investors and to time the IPO at most favourable date. Tyková & Walz (2007) found that VC-backed companies underperform after the venture capitalists exit. As a consequence, one might deduct that in Germany, venture capitalists do not serve as a certification of quality. In fact, due to their linkages to banks or their “short” experience conflict of interest might arise. The investors are thence more restrained when it comes to an IPO. They demand a discount of the offering price for the aforementioned reasons. This might be assumed by the investor who demands an even higher discounting then. The issuing company might pull their IPO in response to the discount and the cost of underpricing. Likewise for the venture capitalists the IPO exit is not worthwhile anymore due to a staggered pay-off which leads to a withdrawal of the IPO. It would be interesting to scrutinise the development of the venture capitalist industry in Germany and their effect on the probability to withdraw. Will the influence switch signs if the role of venture capitalists were more defined and separated
from traditional banks? Even in 2016, the level of venture capitalist investment is below average in Europe (BVK, 2016).

Also, in contrast to the US-American studies, the underwriter reputation comes out insignificant but with a positive marginal as well as predicted effect. This finding goes hand in hand with the result of the descriptive statistics. The banking system in Germany can be considered quite different from the one in the USA. In Germany, more universal banks offering multiple services such as venture capital funding, underwriting, or commercial lending. *Klein et al.* (2016) argue that companies chose their underwriter not on reputation but on previous linkages. Therefore, the certification role of underwriter that is observed in the USA does not apply to Germany due to the specific universal operations of banks. A preexisting lending relationships with the underwriter bank may facilitates the access to further credits. We consider this as an alternative to the IPO. The presence of a feasible alternative in consequence might increase the probability to withdraw.

In addition, coherent with the findings of the univariate analysis, a unit increase of the degree of multinationality results in an increase of the probability to withdraw by 47%. As suspected above, multinational companies might be less dependent on an IPO in Germany. They might even have a variety of alternative sources of financing in the countries of operation. To test this idea, we introduce an alternative funding dummy variable. If a company prior or shortly after the IPO withdrawal issued debt or is listed outside of Germany, the dummy variable takes the value of 1 and 0 otherwise. Finally, the *t*-statistics as well as the mean are computed for the subsample broken down by the dummy variable. The results are unambiguous: the withdrawn companies that show a higher degree of multinationality also have a higher level of alternative sources of funding outside of Germany. That is the reason why, we
deduct that multinational companies are less dependent on an IPO as a source of funding and are more likely to withdraw in favor of alternative financing outside of Germany.

In contrast to the univariate analysis, the marginal and predicted effects of the market characteristics indicate a negative effect on the probability to withdraw. Meaning that more favourable market conditions are decreasing the probability to withdraw. Still, neither variable shows significance. Nonetheless following Wasserstein & Lazar (2016) the explanatory power of \( p \)-values must be limited and put into context. Combining the conflicting outputs from the descriptive statistics and the probit regression conclusions can be drawn. Unlike often claimed by companies withdrawing their IPO, market conditions cannot be identified as the principal determinants of withdrawal. Nevertheless, the market environment which is approximated by indices or indicator values might decrease the probability of withdrawal.

For the second probit regression the Markit Purchasing Manager Index is included reducing the number of observations. The results, which can be found in the appendix, do not diverge drastically from the first probit regression and show an insignificant PMI. After examining the results of the binary probit regression, the goodness of fit statistics also need to be considered. Some test statistics are depicted in Table 5. As outlined in the methodology section, the Hosmer-Lemeshow (H-L) assesses the fit of the probit model. The H-L Statistic value for the proposed probit model is the lowest compared to regressions including PMI or excluding insignificant regressors. Also, the probability of the Hosmer-Lemeshow test does not indicate that the probit model does not fit adequately. However, the test statistics cannot be used to measure the level of accuracy. Another statistic to consider is the McFadden \( R^2 \) which reports a value of 0.3952. This indicates that the model fits the actual data quite
The values for log likelihood and the log likelihood ratio (LR) statistics also show the highest values when comparing the probit models with only significant variables or the inclusion of the PMI regressor. In summary, the goodness of fit test statistics suggest a decent goodness of fit for the binary probit model. Still one needs to bear in mind that it is close to impossible to include every possible determinant explaining the probability to withdraw.

Table 5: Goodness of fit statistics.

<table>
<thead>
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<tr>
<td>H-L Statistic</td>
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<tr>
<td>Prob. Chi-Sq(8)</td>
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</tr>
<tr>
<td>McFadden R-squared</td>
<td>0.3952</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-73.0197</td>
</tr>
<tr>
<td>LR statistic</td>
<td>95.4168</td>
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For the conceptualising of the multinomial probit regression the dependent variable takes the value of 1 for successful IPOs that are now delisted or insolvent, 2 for successful IPOs that are still trading, and 3 for withdrawals. Due to the limitation of the small sample size more counterfactuals cannot be considered. Likewise, the independent variable of PMI is excluded for the first round of the analysis. In Table 6 the results of the multinomial regression with the base outcome of trading (2) are mostly coherent with the findings from the binary probit regression. The first significant regressor is the news dummy. Negative news prior to an IPO positively affect the probability to withdraw as well as venture capital investment. The latter again can be explained by the particular role of universal banks in Germany and the underpricing demanded as compensation for moral hazard. The intention to retire debt with the proceeds of an IPO significantly increases the probability of withdrawal likewise the ratio of capital expenditures. However, the intellectual capital disclosure has a negative impact on the probability to
withdraw. In contrast to the binary probit regression, the rivalry dummy does not show significance. While the size of the company is estimated to significantly decrease the probability to withdraw an IPO. Information on larger companies can be accessed easier which reduces uncertainties prior to an IPO. Another significant regressor is the underwriter reputation suggesting that employing a more reputable underwriter increases the probability to withdraw. Consistent with previous explanations this might be rooted on the one hand in the moral hazard role. On the other hand this can be explained with the inexistence of the causal linkage between reputation and certification since underwriter are often chosen due to pre-existing banking relationships (Klein, et al., 2016). Contrasting the determinants of withdrawal to the characteristics of companies that successfully completed their IPO but are now delisted there are similarities as well as differences. The regressors of the firm size, capital expenditures and underwriter reputation show same results. Although for withdrawn IPOs market conditions are not found to be significant, for the counterfactuals of delisted companies a different picture is shown at the time of their IPO. Companies that successfully went public in favourable market conditions such as the Corruption Perception Index or the equity market sentiment proxied by the DAX display a lower probability of delisting. In summary, withdrawn IPOs and successful IPOs that later delisted show some similarities. A further analysis of delisting companies at the time of IPO and delisting date will be insightful to compare to the findings of the withdrawn IPOs.
Table 6: Output of the multinomial probit regression. The base outcome is set as trading companies. The values for the coefficient, p-value and predicted effects are given.

<table>
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<tr>
<th>Variable</th>
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<th></th>
<th></th>
<th>Withdrawn</th>
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<td>p-value</td>
<td>Predicted Effect</td>
<td>Coefficient</td>
<td>p-value</td>
<td>Predicted Effect</td>
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<td>α1 Index of Economic Freedom</td>
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<td>0.6010</td>
<td></td>
<td>0.6221</td>
<td>0.8040</td>
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<td>0.0780</td>
<td>-</td>
<td>-12.5559</td>
<td>0.2860</td>
<td>-</td>
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<td>α3 Rule of Law</td>
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<td>0.8900</td>
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<td>-9.3546</td>
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<td>α4 10 yr Bund Yield</td>
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<td>α5 Term Spread</td>
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<td>-0.2119</td>
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<td>α18 IC Dummy</td>
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<td>α21 Underwriter</td>
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<td>1.1993</td>
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<td>α22 Multinationality</td>
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<td></td>
<td>1.2442</td>
<td>0.1110</td>
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5. Review of Findings and Future Development

From 2001 until 2015 a total of 295 companies wanted to go public in Germany of which about 14 % withdrew their offer during the IPO process. The annual withdrawal ratio ranges from 40 % in 2004 to 0 % in 2014 with an overall average of almost 19 % and consequently can be considered as rather volatile. This analysis extended the previous studies on withdrawn IPO in the US-American market to the German market from 2001 until 2015. It enlarges the understanding of the puzzling determinants of withdrawals for the German market. A binary as well as a multinomial probit regression is conducted to identify...
determinants that influence the probability to withdraw. Withdrawn IPOs do not face worse market conditions than their successful counterparts. Although negative news are more frequent before the withdrawal. Furthermore, withdrawn companies on average are bigger and older with a larger filing size to go public. The size and experience of the companies might indicate that withdrawal is a feasible alternative to underpricing and that the company is more able to cope with the costs of withdrawal than smaller and more inexperienced ones. This might also apply to the larger filing size. Also, unlike the US-American findings, withdrawn IPOs show a significant higher VC-backing ratio. This might be rooted in the specific bank-dominated environment in Germany opposed to the public market importance in the USA. In fact, venture capitalist involvement does not signal certification. This might be reasoned with the strong linkages to banks combined with their inexperience compared to the American counterparts. A higher degree of underpricing demanded by the investors might be a consequence which leaves the company to withdraw. Likewise, the analysis exhibited that companies withdrawing their IPO employ more reputable underwriters. Again, the particularities of the German banking system and the interdependences and interlinkages of investment banks, commercial banks or venture capitalists might be an explanation. Often IPO companies contract their pre-existing banking institution. Hence, the causal link of certification of underwriters proposed for the US-American market might not apply for the German market. Apart from that, one significant determinants of the probability to withdraw is the intention of the IPO. Withdrawn IPOs reveal a higher degree of indebtedness and claim to retire debt with the proceeds which in general can be perceived as riskier. Investors might demand higher underpricing to compensate their risk resulting in a withdrawal of the IPO. This idea is confirmed when looking at the companies that withdrew but successfully went public on
a second try. Most companies that returned significantly deleveraged. Surprisingly, withdrawn IPOs are more multinational in their operations than their successful adversaries. However, we have demonstrated that multinational companies, that withdraw their IPO, have access to alternative sources of funding outside of Germany. Multinational companies have alternatives to an IPO and are therefore more likely to withdraw. One interesting observation is that the companies retrying an IPO after withdrawing do not face discounted filing prices but a decreased offer size. Therefore, we can conclude that the decision to withdraw reduces the overall proceeds gathered by the IPO company but does not discount the offer price. Apart from the aforementioned determinants of withdrawal, other variables are not proven significant by the probit model. The findings from the binary probit regression are largely confirmed in the multinomial regression. This research provides valuable insights into the German IPO market. Investors, financial institutions in the public as well as private sector and not to forget companies that plan to go public can draw inferences on the probability to withdraw the IPO. As a consequence, the true market price for an initial public offering can be found considering that every party gains supplemental information on the IPO. Hence, the IPO market can be made more efficient with fewer “lemon” IPOs in the market and less pronounced underpricing. There are about 25 % delisted companies in the German equity market that went public from 2001 until 2015, a prior analysis of the probability to withdraw might have revealed more information about future success.

The findings of this analysis lead to ideas for further research. One obvious opportunity that arises is to extend the analysis on other major European countries such as France, Spain, Italy or Great Britain. It would be interesting to analyse differences or similarities of determinants of withdrawal in the European countries. Eventually, the consolidation of
databases to a comprehensive and integrated European one on withdrawn IPOs can serve to contrast the European to the US-American one. Often findings from US-American studies are taken as evident for Europe without further proof. Therefore, the proposed research will increase the knowledge about the European IPO market and serve investors, banks and prospective issuers likewise in finding the true market price. The next step would also include the analysis of successful IPOs at the second try after withdrawing the intention to go public. What would be the probability to successfully return after a withdrawn IPO? Did the companies suffer in terms of financials, operations or sentiment? What are the risks? How long does it take for the companies to dare a second IPO? What are the determinants of a successful second IPO? Additionally, a more thorough analysis of the counterfactuals of successful IPO such as delisting rates might be of special interest to gain more information on the determinants of delisting. The results of such a delisting analysis in combination with the determinants of withdrawal and successful return help to explain the puzzle of the IPO market – especially with the increasing importance of equity markets in Europe.
Bibliography


<table>
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<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>p-value</th>
<th>Marginal Effect</th>
<th>Predicted Effect</th>
<th>Coefficient</th>
<th>p-value</th>
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<td></td>
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<td>( \alpha_0 ) Intercept</td>
<td>5.9680</td>
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<td>0.5943</td>
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<td>-0.0322</td>
<td>0.9858</td>
<td>-0.012698</td>
<td>-</td>
<td>2.4907</td>
<td>0.4109</td>
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<td>( \alpha_2 ) Corruption Perception Index</td>
<td>-4.3022</td>
<td>0.6064</td>
<td>-1.699196</td>
<td>-</td>
<td>-10.2025</td>
<td>0.603</td>
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<td>-8.5831</td>
<td>0.1233</td>
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<td>-6.8359</td>
<td>0.3608</td>
<td>-2.707171</td>
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<td>( \alpha_4 ) 10 yr Bund Yield</td>
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<td>0.9858</td>
<td>0.001057</td>
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<td>0.0036</td>
<td>0.2213</td>
<td>0.001436</td>
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<td>-0.0601</td>
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<td>-</td>
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<td>0.936</td>
<td>0.000328</td>
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<td>0.2001</td>
<td>0.000107</td>
<td>+</td>
<td>0.0002</td>
<td>0.4523</td>
<td>0.000088</td>
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<td>0.3680</td>
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<td>( \alpha_{22} ) Underwriter</td>
<td>0.6665</td>
<td>0.1074</td>
<td>0.263260</td>
<td>+</td>
<td>0.4187</td>
<td>0.3947</td>
<td>0.165812</td>
<td>+</td>
</tr>
<tr>
<td>( \alpha_{23} ) Multinationality</td>
<td>1.1970</td>
<td>0.0337</td>
<td>0.472784</td>
<td>+</td>
<td>1.0267</td>
<td>0.1005</td>
<td>0.406599</td>
<td>+</td>
</tr>
</tbody>
</table>

Appendix A: Results of the binary probit regression, excluding and including PMI.
### Market Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>St. D.</th>
<th>Obs.</th>
<th>Mean</th>
<th>St. D.</th>
<th>Obs.</th>
<th>Mean</th>
<th>St. D.</th>
<th>Obs.</th>
<th>Anova F-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_1 ) IEF</td>
<td>0.5342</td>
<td>0.0809</td>
<td>76</td>
<td>0.5232</td>
<td>0.0909</td>
<td>177</td>
<td>0.5500</td>
<td>0.0863</td>
<td>42</td>
<td>0.1821</td>
</tr>
<tr>
<td>( \alpha_2 ) CPI</td>
<td>0.7863</td>
<td>0.0265</td>
<td>76</td>
<td>0.7912</td>
<td>0.0202</td>
<td>177</td>
<td>0.7871</td>
<td>0.0259</td>
<td>42</td>
<td>0.2294</td>
</tr>
<tr>
<td>( \alpha_3 ) Rule of Law</td>
<td>0.6753</td>
<td>0.0288</td>
<td>76</td>
<td>0.6911</td>
<td>0.0427</td>
<td>177</td>
<td>0.6744</td>
<td>0.0399</td>
<td>42</td>
<td>0.0028</td>
</tr>
<tr>
<td>( \alpha_4 ) 10 yr Bund Yield bps</td>
<td>376</td>
<td>89</td>
<td>76</td>
<td>339</td>
<td>121</td>
<td>177</td>
<td>359</td>
<td>123</td>
<td>42</td>
<td>0.0580</td>
</tr>
<tr>
<td>( \alpha_5 ) Term Spread bps</td>
<td>88</td>
<td>74</td>
<td>76</td>
<td>76</td>
<td>70</td>
<td>177</td>
<td>97</td>
<td>77</td>
<td>42</td>
<td>0.1578</td>
</tr>
<tr>
<td>( \alpha_6 ) PMI</td>
<td>55</td>
<td>4</td>
<td>60</td>
<td>55</td>
<td>4</td>
<td>161</td>
<td>54</td>
<td>4</td>
<td>31</td>
<td>0.5237</td>
</tr>
<tr>
<td>( \alpha_7 ) GDP</td>
<td>602</td>
<td>46</td>
<td>76</td>
<td>628</td>
<td>58</td>
<td>177</td>
<td>620</td>
<td>61</td>
<td>42</td>
<td>0.0034</td>
</tr>
<tr>
<td>( \alpha_8 ) Dax</td>
<td>6031</td>
<td>1038</td>
<td>76</td>
<td>6827</td>
<td>1595</td>
<td>177</td>
<td>6586</td>
<td>1624</td>
<td>42</td>
<td>0.0005</td>
</tr>
<tr>
<td>( \alpha_9 ) Rivalry Dummy</td>
<td>0.5395</td>
<td>0.5018</td>
<td>76</td>
<td>0.5198</td>
<td>0.5010</td>
<td>177</td>
<td>0.3333</td>
<td>0.4771</td>
<td>42</td>
<td>0.0669</td>
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<tr>
<td>( \alpha_{10} ) Negative News Dummy</td>
<td>0.0132</td>
<td>0.1147</td>
<td>76</td>
<td>0.0734</td>
<td>0.2616</td>
<td>177</td>
<td>0.3095</td>
<td>0.4679</td>
<td>42</td>
<td>0.0000</td>
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</tbody>
</table>

### Firm Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1) Delisted</th>
<th>(2) Trading</th>
<th>(3) Withdrawn</th>
<th>Anova F-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_{11} ) Firm Size (€mn)</td>
<td>6,630</td>
<td>28,100</td>
<td>76</td>
<td>2,630</td>
</tr>
<tr>
<td>( \alpha_{12} ) Offer Size (€mn)</td>
<td>275</td>
<td>842</td>
<td>76</td>
<td>245</td>
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<tr>
<td>( \alpha_{13} ) Age</td>
<td>21</td>
<td>38</td>
<td>76</td>
<td>24</td>
</tr>
<tr>
<td>( \alpha_{14} ) CapEx</td>
<td>0.0549</td>
<td>0.1340</td>
<td>76</td>
<td>0.0354</td>
</tr>
<tr>
<td>( \alpha_{15} ) Net Income</td>
<td>3.9063</td>
<td>35.0189</td>
<td>76</td>
<td>-0.0328</td>
</tr>
<tr>
<td>( \alpha_{16} ) Debt</td>
<td>0.5650</td>
<td>0.2990</td>
<td>76</td>
<td>0.5754</td>
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<tr>
<td>( \alpha_{17} ) Debt Retirement Dummy</td>
<td>0.0395</td>
<td>0.1960</td>
<td>76</td>
<td>0.0508</td>
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<tr>
<td>( \alpha_{18} ) High-tech Dummy</td>
<td>0.3816</td>
<td>0.4990</td>
<td>76</td>
<td>0.3333</td>
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<tr>
<td>( \alpha_{19} ) IC Dummy</td>
<td>0.1711</td>
<td>0.3791</td>
<td>76</td>
<td>0.1525</td>
</tr>
<tr>
<td>( \alpha_{20} ) Private Equity Dummy</td>
<td>0.0526</td>
<td>0.2248</td>
<td>76</td>
<td>0.1356</td>
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<tr>
<td>( \alpha_{21} ) Venture Capital Dummy</td>
<td>0.0000</td>
<td>0.0000</td>
<td>76</td>
<td>0.0057</td>
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<tr>
<td>( \alpha_{22} ) Underwriter</td>
<td>0.2985</td>
<td>0.3432</td>
<td>76</td>
<td>0.2603</td>
</tr>
<tr>
<td>( \alpha_{23} ) Multinationality</td>
<td>0.2368</td>
<td>0.1575</td>
<td>76</td>
<td>0.3204</td>
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</tbody>
</table>

Appendix B: Descriptive statistics for the multinomial probit regression.