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The glass ceiling of going public: does board gender diversity affect IPO performance?

An examination of gender diversity on boards of firms going public and its effect on short- and long-term IPO performance

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Abstract

Gender diversity on boards is one of today's most relevant topics in corporate governance. While society stresses the beneficial effects of increasing diversity, empirical evidence on the matter has presented mixed findings. This paper aims to contribute to the debate by researching the effect of board gender diversity on IPO performance. The sample consists of 297 technology firms going public in the period 2009-2019. Building upon theories of information asymmetry and board performance, it is expected that board composition affects IPO performance by impacting the level of uncertainty. More specifically, gender diversity on boards is expected to have an impact on short-term IPO performance, either positive or negative, measured by the extent of underpricing. First, my research confirms that a gender bias still exists in the technology sector. While substantial progress has been made in the last decade, the gender distribution of director positions is still far from equal. Moreover, using Ordinary Least Square (OLS) estimation, my findings show that gender diversity on boards is positively related to first-day returns: a 10% increase in gender diversity on boards translates into an absolute increase in underpricing of 1.74%. Considering that the average underpricing in my sample is 14.7%, this implies a relative increase of over 10%. This relationship becomes insignificant when the level of gender diversity surpasses 15%, or when more than one woman serves on the board, which could be an indication of 'tokenism'. Moreover, gender diversity has a positive effect on short-run Tobin's Q: a 10% increase in gender diversity results in an increase in Tobin's Q of 8.63%. Finally, I expand my research by including long-term stock performance to determine whether the possible effect of diversity on long-term firm performance may help explain short-term outcomes. I find no evidence for the existence of a significant relationship between gender diversity and 3-year stock performance. Hence, my findings indicate that underpricing is unlikely to be explained by the impact on stock performance. Subsequently, my research calls into question whether underpricing in my research setting is due to uncertainty. Rather, I propose that the positive effect of gender diversity on short- and long-run performance measures leads to a discrepancy in the initial valuation between the issuing firm and investors. Hence, my findings point towards the possible impact of behavioral, control and institutional theories in the research of IPO performance and provide ground for further research on the subject.

Keywords: IPO Performance, Underpricing, Firm Performance, Gender Diversity, Board of Directors
JEL: G14, G24, G30, J16, M14
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1. Introduction

In August 2019, Silicon Valley start-up WeWork announced its intention to go public. With a valuation between $43 and $96 billion, WeWork was what many said to be the ultimate ‘unicorn’ (Platt & Edgecliffe-Johnson, 2020). After this announcement, the company faced enormous backslash from investors for planning to go public without a single woman on the board and the lack of gender diversity brought many other corporate governance issues to light. As a result, WeWork’s CEO was forced to resign, its valuation was reduced to $8 billion and just two months later its initial public offering (IPO) officially went bust. Nevertheless, WeWork’s IPO was not a one-off event and tech companies in general have been heavily criticized for their lack of diversity (Rooney & Khorram, 2020, para. 3). Back in 2013, the IPO of Twitter heightened the interest in gender diversity in tech firms (Kristof, 2013). And in 2017, Uber was placed under investigation after complaints about gender discrimination and workplace sexual harassment (O’ Brien, 2018, para. 1).

The gender diversity problem within Silicon Valley and what many call the “bro-culture” of the tech industry seem to be persistent and in the past few years, many have called for change (Conway, Ellingrud, Nowski & Wittemyer, 2018). Nevertheless, it still came as a surprise when Goldman Sachs, who functioned as one of WeWork’s underwriters, announced that the company will no longer take any company public that does not have a minimally diverse board of directors. Starting in July 2020, the firm will not manage any American or European initial public offerings that have a “white, all-male” board (Green, 2020, para. 1). The criteria will be extended to two board members in 2021 with a focus on including women, but also other characteristics such as gender identity and sexual orientation. During an interview with CNBC, Goldman Sachs’ CEO David Solomon argued that the performance of U.S. IPOs with at least one woman on the board has been significantly better than IPOs with an all-male board. Furthermore, he claimed that pursuing a diverse board is “the best advice for companies that want to drive premium returns for their shareholders” (Son, 2020, para. 5).

However, prior empirical evidence on the effect of board diversity on firm performance is mixed. Whereas some find a positive impact of diversity on performance, others report no, or even negative, effects (Carter el al., 2003; Gregory-Smith, Main & O’Reilly, 2014). Furthermore, it is important to note that the largest share of research on board diversity has focused on public companies. Although both initial public offerings as well as diversity are heavily researched topics, not much empirical evidence exists documenting the possible relationship between both concepts. Considering that going public is one of the most significant events in a firm’s lifetime and that going public entails increased public scrutiny, it is interesting to explore whether and how board diversity influences IPO success. In addition, there seems to be a stark contrast between diversity in public and in private firms. According to the latest numbers by Catalyst (2020), women now hold 26% of board seats in U.S public companies and this number has steadily increased over the years. In contrast, research that focused on “some of the most heavily funded private companies” showed that only 7% of board seats in these companies were held by women and that 60% of these companies had an ‘all-male’ board (Mehnert, 2020, para. 3). Considering the contrast between private and public markets, this brings up an interesting question: what happens when a private firm decides to go public? Non-profit organization 2020 Women on Boards (2020) documents the five-year average of women on board seats in IPOs to be just 12%. And although their research showed that the number of female directors in IPOs increased in 2019, current numbers for 2020 call into question whether this increase is persistent: out of the seventeen firms that went public in 2020, prior to March 13, only one had a female CEO and over a third went public without a woman on board (Grossman, 2020, para. 6).

Does increased diversity indeed lead to better IPO performance? If this is the case, these numbers seem hard to align with the current diversity practices and performance of new boards of firms engaging in IPOs. Furthermore, this would indicate that changing diversity practices may present exploitable opportunities for issuing firms, investment banks and investors. This research aims to contribute to the debate by researching the specific impact of gender diversity within boards on the performance of firms going public. By focusing on the technology sector, I hope to add valuable evidence supporting the importance of diversity within the sector. If a positive effect of gender diversity on IPO performance exists, this can provide support for diversity initiatives in the tech sector.

I proceed as follows. Within the first chapter, I discuss the previous research and theoretical background on the concepts of IPO performance and board diversity. To do so, I elaborate on both the foundation of theory and the previous empirical evidence. Next, I explain the research framework and present the main research question and underlying hypotheses. Subsequently, I discuss the methods used to collect the data and create the sample. More specifically, I discuss the construction of the different variables and provide the motivation for my methodology. This is important as prior empirical evidence on the matter is scarce and both the methodology and the findings of previous researchers vary widely. Next off, I provide an overview of the applied econometric model and the rationale behind it. I then thoroughly discuss the results of my analyses. Finally, I end with the conclusion as well as the limitations and recommendations for further research.

2. Literature review

This chapter discusses the relevant prior literature related to the key concepts of the research. First, the theoretical background of initial public offerings will be discussed. I then discuss short- and long-term IPO performance and present relevant theories that help explain the prior empirical findings. Next, diversity theory and its implications on IPO performance are presented on which the hypotheses are based.

2.1. Initial Public Offerings

Considering that going public marks the moment in which a company transitions from being private to public, the initial public offering is a critical juncture in a firm's lifetime (Park & Patel, 2015). Subsequently, IPOs have received a lot of attention from researchers, both from a finance and a management perspective (Daily, Certo & Dalton, 2003). A second reason for the extensive research on the topic is that an IPO also generally represents the first moment in which firm-specific information is disclosed to the public. Following the regulations set by the Securities and Exchange Commission (SEC), any firm that goes public must provide an extensive set of documents that contains information about the firm, its management, its financials and the intended use of the raised capital. These documents are necessary to obtain regulatory approval but are also used by investors to assess the value of the company and the shares it offers (Daily, Certo, Dalton & Roengpitya, 2003).

Going public is a complicated and time-consuming process with many different parties involved. Often, the first step for a company wishing to go public is the selection of an investment bank to function as an adviser and underwriter. Together, issuing firms, investors and investment banks comprise the key parties in the IPO process (Ljungqvist, 2007). Underwriting is considered a traditional role of the investment bank and relates to the services it provides to a firm undertaking an equity offering. These services, among others, relate to structuring the transaction, performing due diligence and determining the pricing and timing of the issue. Furthermore, the investment bank is responsible for managing the relationships between all the different parties involved (Geddes, 2003, p. 31). Hence, the role of the investment bank is also to balance the interests of the issuing firm and the investors and to help overcome possible information asymmetry between the involved parties. A letter of intent is then drafted and a registration statement is filed with the SEC. Together with the issuing firm, the underwriter creates the prospectus. This document contains all the relevant information about the IPO and is part of the registration statement (Daily et al., 2003). In the next phase, the IPO is marketed to investors to determine the interest in the market. Often, this is referred to as the 'road show' as the issuing firm and underwriters travel around the world to give presentations and attend meetings with prospective investors (Ritter, 1998). After undertaking the marketing process, the issuing firm and investment bank must determine the pricing of the issue and the number of shares to be sold. This is a critical decision point for management: regardless of the level of demand, shares cannot be offered for a higher price on the first day of trading once the price has been set (Gordon & Jin, 1993). To do so, there are three possible approaches. The first one is the auction, in which the allocation is determined after investors bid for shares. An offer can also have a fixed price, in which the investment bank attempts sells the shares on a best efforts basis. This implies that the bank buys the offered securities from the issuer and then attempts to sell them to the market, thereby functioning as a middleman (Iannotta, 2009, p. 52). It may then offer the IPO on a second possible fixed price basis, where it is required to buy the proportion of unsold shares outstanding relative to their commitment of underwriting. Another possibility is bookbuilding, where the investment bank only functions as an underwriter if it knows there is enough market demand for the shares. It then undertakes an extensive marketing campaign in which a book is 'built' that displays a clear overview of the market demand at different price levels of the shares. Most IPOs are executed on a bookbuilding basis as many argue it provides the most price flexibility, it maximizes proceeds and allows for more control over the share distribution (Geddes, 2003, p. 57).

2.1.2. Why do firms go public?

Companies may decide to go public for a multitude of reasons: to raise capital, to improve their reputation or to create a currency, the stock, that can be used to compensate employees and finance acquisitions (Draho, 2004). It also brings an opportunity to create liquidity for current shareholders and to provide them with the opportunity to diversify their investments (Daily et al., 2003). Out of these reasons, the access to capital is often said to be the most important and the raised funds can be used to expand activities and enable management to pursue growth opportunities that may not have been accessible before (Daily et al., 2003). Moreover, Rock (1986) proposes that entrepreneurs leverage their company up to a point where the level of debt can no longer be increased or, if commercial credit is available, the covenants may be too restrictive due to the risk profile of growth opportunities. Hence, issuing equity may provide a twofold benefit as it provides the necessary funds and reduces the debt to equity ratio of the firm (Daily et al., 2003). Of course, the decision to go public must be based on a consideration of benefits and disadvantages. Disadvantages of going public may include the high costs of going public, increased disclosure requirements and monitoring and the dilution of ownership (Roell, 1996).

2.2. IPO performance

2.2.1. Short-term IPO performance and underpricing

Throughout the years, IPO stocks have consequently generated significant and positive returns on the first trading day. For the period of 1980-2014, Jay Ritter (2015) reports average first day returns of U.S. firms to be 18%. These findings occur throughout time and are documented in many countries and stock markets (Jenkinson & Ljungqvist, 2001; Loughran, Ritter & Rydqvist, 1993). If markets are efficient, these large initial returns seem puzzling. After all, a price increase indicates that investors think the stock is worth more than its issue price, which in turn implies that the issuer leaves money on the table. Or, put differently, the issuing firm could have obtained an additional amount of proceeds by setting the offer price at the appropriate level (Certo, Daily & Dalton, 2001).

When these initial returns exist, a firm is said to have priced its shares below the true market value. Hence, the anomaly of the large initial returns is often referred to as the underpricing puzzle. This phenomenon is measured by the percentage difference between the issuing price and the price at which shares trade in the market afterwards (Ljungqvist, 2007). Most often, the offer price is compared to the closing price of the first day of trading. Alternatively, underpricing can be calculated by estimating the total amount of 'money left on the table'. This is calculated by multiplying the number of shares sold by the difference between the offer price and the first-day closing price (Loughran & Ritter, 2004). The phenomenon of underpricing was first documented by Ibbotson in 1975, who reported average initial returns of U.S. stocks that went public in the 1960s to be 11.4%. The phenomenon is so persistent, that Carter & Manaster (1990) even propose underpricing to be an equilibrium outcome.

Loughran & Ritter (2004) show that the degree of underpricing is highly dependent on market conditions. For example, they show that the average first day returns for firms going public in the 1980s were 7%, whereas first day returns during the internet bubble of 1999-2000 were 65%. Others confirm the impact of market conditions, but also point out the possible effect of firm-specific factors (Schuster, 2003), location effects (Ritter, 2003) and the involvement of external parties. For example, Carter, Dark & Singh (1998) find that underpricing is lower when the IPO is backed by a more prestigious underwriter. Interestingly, a similar role is reserved for venture capitalists, but the evidence on their involvement provides mixed outcomes. On the one hand, researchers such as Lee & Wahal (2004) document that underpricing is higher with VC involvement, especially in hot markets. They propose that venture capital funds are incentivized to underprice more as it allows for larger future fund inflows. On the other hand, most researchers seem to follow the proposition that the involvement of reputable venture capitalists brings along extensive monitoring services and guidance to the issuing firm. In turn, they argue that the quality of these services is recognized by financial markets and the need for underpricing becomes lower (Barry, Muscarella, Peavy & Vetsuypens, 1990; Gompers, 1996).

2.2.2. Long-term IPO performance

Interestingly, these large initial returns seem to erode in the after-market period. To start, it is important to note that several different methods are used to determine after-market performance and that the findings of prior research are dependent on the method employed. For example, Ritter (1991) published a paper on the long-run performance of IPOs. Here, he shows that raw, unadjusted IPO returns increase in the 36 months after going public. He then uses cumulative average adjusted returns and wealth relative measures to prove that issuing firms underperform when returns are matched to comparable firms or an index. More specifically, he uses matching-firm adjusted, small-firm adjusted and market-adjusted returns. For all these measures, adjusted returns show a significant decrease following the initial return period (Ritter, 1991). Negative returns are largely driven by younger firms going public and firms that went public in hot issue markets (Ritter, 1984).

Further research on the possible effects of firm- and issue-specific variables is performed by Brav & Gompers (1997), who investigate a sample of venture-backed and non-venture backed IPOs in the period 1972-1992. They find that underperformance is not specifically due to going public, but that non-issuing firms similar in size and book-to-market ratios perform just as poor. They propose that long-run underperformance is due to the fact that these firms are relatively young, high-growth firms rather than the decision to go public by itself. However, they do find that IPOs backed by venture capitalists significantly outperform those that are not, using both the Fama-French (1993) three factor model and multiple comparable benchmarks. They propose that non-venture backed, and smaller-sized IPOs are more likely to be held by individual investors, which may point towards fads of investor sentiment. More research that examines the effects of involved stakeholders has been performed by Carter, Dark & Singh (1998). Their results show that the relative three-year underperformance of firms that go public is lower when the IPO is backed by more prestigious underwriters.

2.2.3. Windows of opportunity

If, on average, long-run returns are relatively low, this calls into question whether IPO markets are efficient. Hence, much of the literature on the long-run performance of IPOs proposes that not all investors are rational and that bounded rationality and investor sentiment play a role. The effect of investor sentiment is said to be especially prevalent during ‘hot’ markets, periods in which the number of firms going public is substantially higher than normal (Ritter, 1991). Aggarwal & Rivoli (1990) propose that when investors overestimate the growth potential of IPOs and become too optimistic, this creates fads in the market. This provides opportunities for managers to take advantage of favourable market conditions and periods of high stock pricings (Levis & Vismara, 2013). Similarly, Loughran et al. (1993) propose that issuing firms time their IPOs to periods with excessive optimism. In turn, this suggests that firms may make use of ‘windows of opportunity’ and time their issues to the market (Ibbotson & Ritter, 1995). Lee, Shleifer & Thaler (1991) confirm this proposition and find that more firms go public during periods with high investor sentiment. Over time, the overoptimism of investors will fade, which results in long-run underperformance.

Ibbotson & Jaffe (1975) were among the first to document a significant and positive correlation between monthly average short-run IPO returns and the number of IPOs. Moreover, Ritter (1984, 1991) shows that the number of firms going public varies widely over time and concentrates in certain time periods. He shows that IPO volume is significantly higher following periods in which market returns are high and that firms going public in hot issue markets have the largest initial returns. In contrast, going public in cold markets, periods when stock markets are stable or declining, leads to lower returns and performance. Additional empirical evidence shows that hot issue markets may be further concentrated within industries and groups of underwriters (Lowry & Schwert, 2002).

Opinions are divided on whether the hot market phenomenon coincides with a greater number of high quality or low-quality firms. According to signalling theory models, a greater number of high-quality firms goes public during hot markets due to lower adverse selection costs (Allen & Faulhaber, 1989; Welch, 1989). In contrast, Loughran & Ritter (1995), who observe long-term IPO performance, find that firms going public in hot markets display worse long-term stock returns and subsequently conclude that firms going public in hot markets are of lower quality.

2.3. Theoretical foundation of underpricing

Throughout the years, many researchers have attempted to explain the underpricing puzzle. Ljungqvist (2007) classifies the proposed theories in four categories: behavioral, control, institutional and information asymmetry theories. Behavioral theories are based on the notion of 'irrational investors', who drive up prices beyond fundamental value. Control theories propose that underpricing is applied to shape the shareholder base in such a way that intervention from outside shareholders is reduced, so that the private benefits of being in control are protected. Third, institutional theories are focused on the marketplace and three of its features: taxes, litigation and price stabilization methods employed by banks as trading of the stock starts. And finally, information asymmetry theories are based on differences in the available information between involved parties. It seems highly unlikely that one theory can provide a full explanation of the underpricing puzzle. Instead, it is more likely that all theories contribute a separate piece to the puzzle. Nevertheless, empirical evidence seems to point towards a first-order effect of information asymmetry on underpricing (Ljungqvist, 2007) and most research is based on this theory. Central to this proposition is the existence of information asymmetry among the issuing firm, investment banks and groups of investors. According to classical information asymmetry theories, managers hold an advantage over the market when predicting firm-specific events because they possess more firm-specific information (Cohen & Dean, 2005). This information asymmetry presents an exploitable benefit for managers, with which they can gain at the expense of the market (Dierkens, 1991). Simultaneously, these information frictions make it hard for investors to determine the true value of the issued shares (Ritter & Welch, 2002). As a result, investors may be wary to participate in an IPO, unless they are offered a discount: the underpricing. Although a variety of information asymmetry theories exist, I will now discuss three of the most important models based on asymmetric information relevant to my research.

2.3.1. The winner's curse

In 1986, Rock published his paper about the winner's curse, an application of the well-known lemons problem proposed by Akerlof (1970). In this paper, he researches the phenomenon of underpricing and bases his argument on the existence of information asymmetry between the different types of investors. Rock distinguishes between informed and uninformed investors. Informed investors possess superior information, which makes them more likely to recognize IPOs that are overpriced. Consequently, they will then decide to not participate, leaving uninformed investors with a larger part of the allocated shares of the overpriced issue. Uninformed investors are then affected by a 'winner's curse': as the issue is overpriced, they will earn smaller, or negative, returns. Knowing this, uninformed investors will no longer participate unless they receive compensation for the possible risk: the underpricing. This has an important implication: namely that the degree of underpricing may function as an indicator of the perceived degree of information asymmetry by investors (Cohen & Dean, 2005). As the uncertainty about firm value increases, a higher discount must be offered to make the offer attractive for investors to compensates public investors for the risk they take on (Ljungqvist, 2007; Loughran & Ritter, 2004).

Ritter (1984) builds upon Rock's model to propose another theory: the changing risk composition hypothesis. According to this theory, risky firms are more difficult to value, thereby creating uncertainty for investors. In turn, this will lead to higher initial returns. In his research, Ritter (1984) uses sales as a proxy for risk and he subsequently finds that higher risk firms that go public experience higher initial returns and a higher variation in these returns. He further proposes that hot markets, in which the average underpricing is high, reflect periods in which relatively more firms go public that operate in high-risk industries. This implies that there is autocorrelation in riskiness of firms going public and there should also be autocorrelation in the realised returns. These findings confirm the theory of windows of opportunity and the fact that companies may time their issue to the market.

2.3.2. Theories with an active role for underwriters

A second strand of theories is based on the existence of information asymmetry between the issuing firm and the underwriter. Investment banks fulfil three roles in the IPO process: underwriting, advising and distributing. These functions may generate conflicting incentives, forcing underwriters to trade-off the costs and benefits of underpricing. On the one hand, underwriting fees are often set as a percentage of total proceeds. From this perspective, underwriters should thus minimize underpricing to maximize proceeds (Ljungqvist, 2007). On the other hand, Baron (1982) proposes that underwriters may deliberately underprice an IPO to reduce the required effort and the chance of having to buy the unsold shares. This creates a principal-agent problem. Another explanation based on an active role of underwriters is the bookbuilding theory (Benveniste & Spindt, 1989). Following this proposition, the investment bank builds upon information from investors to determine the true value of a firm. Investors then face a trade-off between bidding low, to obtain higher returns when selling their investment, and risking that they bid too low and are not a part of the share allocation. This theory is supported by empirical evidence. For example, Hanley (1993) documents a positive relationship between returns and the relation between the offer price and range of offer prices included in the prospectus. Cornelli & Goldreich (2001) show that underwriters allocate more shares to investors that include information in their bid. In sum, these findings suggest that investment bank decision-making may directly affect the IPO process and the extent of underpricing.

2.3.3. Underpricing as a method of signalling

Initial public offerings provide a context in which current owners often have substantially more knowledge about a firm. After all, they have access to information about the operations of the firm and its potential, whereas investors have access to a relatively limited scope of public information. With imperfect information, investors do not possess the information necessary to distinguish between high- and low-quality firms (Daily et al., 2003). In turn, this may impact their valuation of a firm and their willingness to invest. Hence, it can be concluded that information asymmetry plays an important role in the IPO process and the determination of the extent of underpricing (Spence, 1978).

To overcome this problem, firms can employ signals to inform outsiders about the true value of their firm (Certo, Daily & Dalton, 2001). This concept is known as signaling theory. Some research argues that firms use underpricing as a signal by itself. For example, Welch (1989) proposes that high-quality firms employ underpricing to obtain better valuations in subsequent equity offerings. He finds that underpricing at an IPO makes it more likely that a firm will undertake a seasoned equity offering and raises more capital when doing so. Allen & Faulhaber (1989) propose that firms use underpricing to receive a better valuation after signalling information about earnings and dividend announcements. However, Ljungqvist (2001) raises the question of why firms will signal through underpricing if they have a much larger range of signals to choose from that are not as costly. Ritter (2011) even classifies these propositions as ‘silly academic theories’, siding with Ljungqvist (2001) and stating that underpricing is an extremely costly signalling method that will only occur when conditions are extremely restrictive.

Indeed, empirical evidence confirms that investors do employ other signals to assess the true firm value. Documented examples are positive relationships between IPO valuation and observable information such as debt levels and prior capital investments (Ross, 1977) and possessing greater innovation capabilities (Heeley, Matusik & Jain, 2007). In the IPO setting, the prospectus is considered the most important mechanisms for signalling firm value (Daily et al., 2008). Park & Patel (2015) find that as information in the prospectus is less ambiguous, underpricing becomes lower. Again, research has identified various signals derived from the prospectus that influence the level of underpricing. Examples are the reputation of the underwriter (Carter & Manaster, 1990) or involved venture capitalists

(Lee & Wahal, 2004) and firm size and age (Daily et al., 2003). According to Becker-Blease & Irani (2008), signals related to corporate governance can also influence the degree of information symmetry. Hence, the prospectus may provide signals through information such as the percentage of equity retained by owners (Downes & Heinkel, 1982), but also through internal practices and policies. These may include firm values, priorities and diversity efforts (Cook & Glass, 2008; 2011; Prabhu & Stewart, 2001). In turn, multiple researchers propose that boards fulfil an important role in signalling the firm's legitimacy to outside stakeholders and provide credible signals to the market in doing so (Certo, 2003; Cohen & Dean, 2005; Ljungqvist, 2007). Prior research shows that both board composition as well as board characteristics signal firm quality to the public (Certo, 2003). Others find proof that firms do indeed use their board for signalling purposes and that this is especially prevalent when going public (Certo et al., 2009; Khoury, Junkunc & Deeds, 2013).

2.4. Boards, corporate governance & firm performance

Within corporate governance literature, the role of boards has drawn the interest of many. The role of boards is twofold. First, it is responsible for monitoring the conduct of business. This includes the tasks of hiring, evaluating, replacing and compensating managers. Second, it fulfils an advising role in which it should ensure that strategic decisions are taken in the best interest of shareholders (Adams & Ferreira, 2007; Hillman & Daziel, 2003).

Over time, researchers have employed several theories to explore the relationship between boards and firm performance. A well-known concept is agency theory, focusing on the monitoring task of boards. Central lies the separation of ownership and control as proposed by Fama & Jensen (1983) and the subsequent occurrence of conflicts of interest between agents, the managers, and the principals, the owners (Eisenhardt, 1989). According to agency theory, improved monitoring can reduce agency costs and thereby increase firm performance. Most research based on this perspective focuses on proxies of incentives for monitoring, such as equity compensation and board independence.

A second perspective is based on resource dependence. According to this theory, boards form an essential connection between a firm and the resources it needs to maximize firm performance (van der Walt & Ingley, 2003). Examples could be the provision of advice, the creation of legitimacy and provision of industry networks. From this perspective, boards thus provide both human and relational capital that can impact firm performance (Hillman & Daziel, 2003) and reduce firm uncertainty (Pfeffer, 1972). To conclude, Masulis, Wang & Xie (2012) propose that the degree of efficiency with which boards fulfil these two roles defines the quality of the board in determining firm value. Prior research has largely investigated the impact of board composition on firm value. Among others, variables that have been researched include the size of the board (Kini, Kracaw & Mian, 1995), the percentage of inside board members (Hermalin & Weisbach, 1991) and board meeting frequency (Vafeas, 1999).

2.4.1. Board diversity and firm performance

A more recent topic of exploration is that of board diversity. The notion of diversity within corporate governance relates to the composition of boards and the combination of characteristics, skills and attributes contributed by its members in relation to decision-making and board processes (van der Walt & Ingley, 2003). It is important to first establish that diversity is a broad concept. In essence, diversity relates to matters of inclusion and differences, but as Konrad, Prasad & Pringle (2005, p. 2) state in the introduction of their Handbook of Workplace Diversity: “there remains no easy agreement on either the nature of differences that should be considered or the kind of inclusionary measures that should be practiced”. So, diversity includes a wide array of variables that can relate to both observable and unobservable diversity. Observable diversity consists of demographic characteristics like gender, ethnicity and age. In contrast, non-observable diversity relates to cognitive aspects such as values, education and personal characteristics (Erhardt, Werbel & Schrader, 2003).

Relying on theories drawing from social psychology, researchers propose that board diversity can affect firm performances through influencing group processes and decision-making (Miller & del Carmen Triana, 2009). Theoretically, if such a relationship exists, it could be either positive or negative. A first strand of literature follows agency theory and proposes that a higher degree of board heterogeneity may lead to better and quicker decision-making and improved monitoring. In turn, this could translate into better firm performance (Carter et al., 2003). A second strand of literature bases itself on resource dependency and argues that a more diverse board provides a wider base of resources, thereby increasing board efficiency and strategic decision making, which may translate into economic gains (Adams & Ferreira, 2009). Many others report similar findings. Morrison (1992) finds that gender diverse boards employ a diverse array of contacts and member experience to improve competitiveness. Hillman et al. (2000) propose that diverse boards provide a competitive advantage, for example by using broader networks to lower transaction costs.

Next to the theories based on agency theory and resource dependency, there are two other relevant theories that focus on group processes and its effects on firm performance. First presented by Hambrick & Mason (1984), upper echelon theory aims to predict organizational outcomes by analysing the background and characteristics of management. According to this theory, everyone has their own knowledge about future events, alternatives and the consequences of choices (Hambrick & Mason, 1984). The decisions an individual makes are connected to one’s values and cognitive biases. In turn, these values and biases will be affected by the individual’s personal characteristics and background. This makes gender a relevant characteristic to research. Furthermore, Hambrick & Mason (1984) establish that a more heterogeneous management team is better at solving complex problems in a fast-paced environment, thereby leading to higher profitability. Considering the complex and dynamic environment surrounding initial public offerings, the propositions of this theory may become especially relevant when going public and this provides further ground for researching the effects of board composition on IPO performance. Moreover, Janis (1972) developed the concept of groupthink. According to this theory, intra-group behaviour and social power may prompt an individual to conform to a specific type of behaviour. This can occur for a multitude of reasons, including having a similar socio-economic background or previous experience (Janis, 1972). In turn, groupthink may lead to homogeneous decision making and decreased problem-solving capabilities (Hart, 1991), whereas it also inhibits change by confirming the group to a current situation (Janis, 1972). According to Janis (1972), this type of groupthink may become especially prevalent when members are in positions of power or high prestige. Translating this to the board realm, more diversity and a variety of backgrounds and education may reduce groupthink, thereby improving firm performance (Kamalnath, 2017).

On the other hand, more diversity can negatively impact the decision-making process as it may become harder to align perspectives and reach consensus. In turn, this may impede the competitive behaviour of a firm (Marinova, Plantenga & Remery, 2016). Smith et al. (2006) propose that the coordination of more heterogenous boards can be more costly and complicated and increases the possibility of conflicts. Furthermore, Carter et al. (2003) discuss the possibility that diverse board members are marginalised, thereby reducing the possible positive effect on decision-making efficiency. Hence, it can be concluded that board diversity may also bring along costs and complications and that it is important to determine whether the possible positive effects of board diversity outweigh the associated costs.

Empirical evidence on the effects of board diversity does not bring clarity, but rather a stream of mixed results. In line with the argument that diversity is beneficial, Carter et al. (2003) establish that there is a positive relationship between the percentage of minorities and women on boards and firm value. Similarly, Miller & del Carmen Triana (2009) find a positive relationship between racial diversity and firm innovation and reputation. Erhardt et al. (2003) provide further evidence of a positive impact of ethnic, racial and gender diversity on return on assets (ROA) and return on investment (ROI). Beckman, Burton & O'Reilly (2007) show that investors positively react to top management teams (TMT) with functional diversity, a measure of prior experiences, and diverse prior company affiliations. Others find no proof of a relationship between both concepts (Marinova et al., 2016; Ntim, 2015). Finally, Adams, Akyol & Verwijmeren (2018) research the individual skill sets of directors and their contribution to firm performance, measured by Tobin's Q. They propose that greater diversity causes a lack of common ground, thereby inhibiting effective decision making. Subsequently, greater skill diversity has a negative effect on firm performance and this relationship is persistent accounting for potential reverse causality. Moreover, they discuss how their research complements that of Kim & Starks (2016), who find that female directors provide new functional expertise and thereby contribute to skill diversity. If this is the case, increased gender diversity on the board may negatively affect firm performance.

In sum, it can be concluded that empirical evidence on the matter of diversity provides conflicting findings. However, one should be cautious when drawing conclusions as the matter is not so straightforward. As discussed, the notion of diversity contains a wide array of variables and so do measures of firm performance. Hence, it should be recognized that any outcomes on the relationship between these concepts may be highly dependent on the definitions and included variables.

2.4.2. Gender diversity within boards and firm performance

In my research, I choose to specifically focus on the concept of gender diversity within boards. To start, there is evidence supporting evolutionary differences between both genders that may influence work behaviour. From a behavioral perspective, a long-standing and recurrent observation is that men and women behave differently and display different risk profiles. For example, Barber & Odean (2001) find that women hold less risky portfolios and men display more portfolio turnover due to overconfidence. Similarly, Olsen & Cox (2001) show that, given a target return, women display more focus on downside risk and risk reduction, whereas men focus on increasing returns. By itself, these genetic differences may bring a diverse set of traits and approached to the board room. But even looking past any genetic characteristics, a multitude of researchers proposes that diversity benefits arise with adding women on the boards. Combining agency theory and resource dependency theory dimensions, Women on Boards (WOB) theory proposes that that women on boards lead to better monitoring and that they bring a diverse set of resources (Johnson, Daily & Ellstrand, 1996). In turn, firm performance should be maximised by adding women to boards. Others argue that firms do not necessarily add a woman to their board to optimize performance. These propositions have built upon the notion of 'tokenism', where firms add a woman to their boards as a symbolic display of inclusion, rather than due to skills or performance efforts, thereby making her serve as a 'token' (Kanter, 1977, p. 208-209).

The empirical outcomes of prior research on gender diverse boards are mixed. In 2015, McKinsey presented a report on the importance of diversity in the workforces. Outcomes showed, among others, that gender-diverse companies were 15% more likely to outperform less-diverse peers and this number increased to 35% when comparing ethnicity diversity. Furthermore, they documented a clear, linear relationship between ethnic and racial diversity in the United States: for every 10% increase in the diversity of the team of senior executives, EBIT rose 0.8%. Outcomes in the United Kingdom indicated an even larger impact of gender diversity on firm performance: with every 10% increase in diversity of top management leading to an increase in EBIT of 3.5%. In May of this year, a subsequent report was published that shows that these positive effects have become stronger over time. For example, the likelihood of outperformance by gender-diverse companies has increased from 15% in 2015 to 25% in 2019 (Dixon-Foyle, Dolan, Hunt & Prince, 2020, para. 5).

But not all research presents outcomes that are as straightforward as the findings of McKinsey. Expanding the concept of risk-taking, some research finds a negative impact of female board representation on factors such as falling behind on loan repayments (Beck, Behr & Guettler, 2013). Others find no support for a relationship of gender diversity in boards and equity risk or changes in firm leverage (Sila, Gonzalez & Hagendorff, 2015; Matsa & Miller, 2013). In contrast, findings by Berger, Kick & Schaeck (2014) indicate that portfolio risk increases with the percentage of female directors in banks. In addition, from the strand of literature that focuses on profitability as a measure of performance, no clear picture can be drawn (Carter el al., 2003; Gregory-Smith, Main & O'Reilly, 2014). Hoogendoorn, Oosterbeek & van Praag (2013) show that increased gender diversity of the board influences the quality and the process of decision-making which should improve firm profitability according to agency theory propositions. Adams & Ferreira (2007; 2009) confirm that gender diversity on boards leads to better monitoring and reduced share price variability, but also find that it negatively affects ROA and Tobin's Q, a measure of firm market value. On the contrary, Carter et al. (2003) find that gender diversity has a positive impact on Tobin's Q. Cook & Glass (2011) show that investors reward firms for diversity efforts, which leads to a significant increase in share value. Specifically, their results show that investors reward firms for signals related to the advancement of women.

2.4.3. Gender diversity within boards and IPO performance

Both signalling theory and resource dependency theory provide ground to explore the relationship between gender diversity in boards and IPO performance. Following signaling theory, the appointment of female board members may signal firm quality to outsiders (Carter et al, 1998). From a resource dependency perspective, female board members may provide unique and valuable resources to the firm (Daily et al., 1999) and adding women to the board may also decrease groupthink (Janis, 1972) and lead to better organizational outcomes following upper echelon theory (Hambrick & Mason, 1984). Hence, it should be of interest to explore the impact of gender diversity and IPO performance. Moreover, if investors value these signals accordingly, it is expected that a higher percentage of women on boards impacts the degree of underpricing.

Nevertheless, the relationship between diversity and IPO underpricing has yet to become a well-researched topic. The evidence that does exist presents conflicting results. McGuinness (2018)**,** who researches IPOs in Hong Kong, finds evidence that female representation increases initial valuations and documents a negative, but insignificant, relationship with underpricing. Mohan & Chen (2004) research pricing differences between IPOs led by men and women and find no statistical differences after controlling for firm-specific variables. Hence, they propose that a gender bias does not exist in IPOs because those involved may possess a more similar set of wealth, knowledge and opportunities. Similar results are presented by Kaur & Singh (2015) and Handa & Singh (2015), who find no evidence of a significant relation between gender diversity and underpricing. Specifically focusing on the U.S. IPO market, Reutzel & Belsito (2015) find a positive relationship between the percentage of female directors and IPO underpricing. Quintana-García & Benavides-Velasco (2016) research biotechnology

IPOs and report a negative relationship between gender diversity and IPO value per share. This is an interesting finding, considering that others find that gender diversity is positively related to short-term firm performance measured by Tobin's Q (Welbourne, Cycyota & Ferrante, 2007) and a positive relation between gender diversity in TMT on stock price informativeness (Gul, Srinidhi & Ng, 2011). Nevertheless, Bigelow, Lundmark, McLean Parks & Wuebker (2014) find evidence suggesting discrimination in investor's judgment of IPO prospectuses. They show that IPOs led by women were perceived a less attractive investment opportunities, even after holding personal and firm characteristics constant. This is a striking observation, considering others find that investors do value board heterogeneity related to other characteristics. For example, Monica Zimmerman (2008) documents that board diversity related to educational and functional background of board members leads to higher capital raising in IPOs. Furthermore, Mohan & Chen (2004) report no differences in IPO characteristics such as offering price, the percentage of shares floated and gross proceeds of the offering. Expanding the concept of signalling, Zimmerman & Zeitz (2002) propose that legitimacy is created by the group of relevant stakeholders that is critical for a firm's survival. Building upon this, McHugh & Perrault (2018) state that during the initial public offering, two new stakeholders come into play: regulators and society. Miller & del Carmen Triana (2009) subsequently propose that board diversity may signal a better understanding of different markets and stakeholders as well as adherence to social norms and laws.

In conclusion, the mixed empirical evidence provides no clear consensus on the effects of board gender diversity. Hence, it is interesting to explore how the market reacts to board composition signals as this may provide insight into the perceived effects of gender diversity. Furthermore, it raises the question as to whether firms can compose their board in such a way that IPO success can be maximized.

2.4.4. Gender diversity within boards and long-term IPO performance

Although much of the prior research on board composition and IPO performance suggest long-term performance as a possible area of future research (Filatochev & Bishop, 2002; Kaur & Singh, 2015; Mohan & Chen, 2004; Singh & Gupta, 2018), specific empirical evidence on the effect of gender diversity on long-run performance of firms going public is limited. Welbourne et al. (2007) find that women on boards are positively related to 3-year growth in both stock price and earnings per share when specifically researching firms that went public in 1993. McGuinness (2018) researchers the impact of gender diversity on 3-year buy-and-hold returns and finds that a greater percentage of women on boards is correlated with higher 3-year returns, but only for firms without intra-board family ties. Interestingly, Dobbin & Jung (2011) report that much of the research reporting a positive relation between gender diversity on boards, stock values and profitability is often dependent on few data points. They argue that this relationship disappears, or even becomes negative, when using data over multiple years. In turn, this may suggest that the relationship between gender diversity on boards and performance is spurious and points to possible reverse causality, where successful firms appoint women rather than vice versa.

3. Research framework and hypotheses

In sum, the strand of literature that has focused on board composition and IPO performance is strong in the sense that it has explored a broad variety of concepts. Nevertheless, much of this research has failed to incorporate the specific concept of gender diversity. Previous empirical evidence on the relationship between board gender diversity and IPO performance is scarce and provides mixed findings. Furthermore, theory seems to point towards a negative relationship between both concepts, whereas empirical evidence fails to convincingly support this proposition. Consequently, it remains unclear to issuing firms, investors and other stakeholders what the implications of increased gender diversity within firms going public are. Additionally, little research has focused on specific sectoral patterns and much of the research has focused solely on short-term IPO performance. Hence, with my research I aim to fill the gap by examining a specific sector in both the short and long run. My methods mostly incorporate measures of IPO performance as proposed by Jay Ritter (1991; 1998). Next to that, I employ methods in line with prior research to classify gender diversity and the subsequent relationship with IPO performance (Adams & Ferreira, 2004; Baker & Gompers, 2003; Mohan & Chen, 2004). Furthermore, this thesis specifically focuses on the technology sector. There are multiple reasons why an examination of this sector is interesting. First, during the last three years, the technology sector has consistently ranked in the top-3 sectors from which most issuing firms came (PwC, 2020) and the sector had the highest IPO proceeds in 2019 (Rudden, 2020). But more important, this sector has been heavily criticized for its general lack of diversity, both within and out of the boardroom (Conway et al., 2018). Consequently, the topic has received a lot of attention and many incentives are being undertaken to create a more-balanced perspective. This makes the sector interesting to research. With my research, I aim to provide new insights on the importance of gender diversity within the tech sector. Accordingly, the main research question of my work is as follows:

To what extent does gender diversity influence IPO performance of U.S. technology firms?

By answering this question, I hope to address two main research objectives. First, I hope to provide new insights on whether gender diversity can positively contribute to the short-run and long-run performance of firms going public in the U.S. technology sector. Second, I hope that with my research and the corresponding results, I can provide further evidence on the importance of gender diversity, both for issuing firms as well as investors and regulators. Hence, to answer my research question my first hypothesis is as follows:

H_{1A}: In the United States, the fraction of women on board at the time of the IPO has no effect on underpricing

H_{1B}: In the United States, the fraction of women on board at the time of the IPO has an effect, either positive or negative, on underpricing

Dobbin & Jung (2011) propose that prior research is often dependent on few data points. They argue that a negative or non-existing relationship may be found when incorporating the long-term in research. In addition, they discuss the possibility that the relationship between gender diversity on boards and firm performance suffers from reverse causality and that the direction of the relationship may change over time. Hence, solely considering the moment of the firm going public, gender diversity within boards may function as a one-off method for profit maximisation at the day of the IPO, bearing no long-term value. In contrast, by including long-term performance measures I explore whether gender diversity within boards also affects long-term performance. This is relevant for firms, but also for investors. If price patterns exist between the moment of going public and long-run performance, this provides opportunities for trading strategies and generating excess returns (Ritter, 1991). To explore whether this is the case in the specific context of going public, my second hypothesis is as follows:

H_{2A}: In the United States, the fraction of women on board at the time of the IPO has no effect on long-run stock performance

H_{2B}: In the United States, the fraction of women on board at the time of the IPO has an effect, either positive or negative, on long-run stock performance

To answer these questions, I identify the relationship between gender diversity and stock price performance. This is in line with previous research (Dobbin & Jung, 2011; Handa & Singh, 2015; McGuinness, 2018). Gender diversity is measured as both the absolute number of women on boards as well as the ratio of women on boards, similar to the research of Kaur & Singh (2015), Marinova et al. (2016), Sila et al. (2016) and Singh & Gupta (2018). Hence, the included variables and research methods overlap with prior research to a certain extent, which allows me to compare my outcomes with previous empirical findings.

4. Data and methodology

To start, this section provides insight into the data collection process and the creation of the sample. I then discuss the theoretical rationale behind the included variables and explain how the variables are constructed. Finally, I discuss my research methodology.

4.1. Data

To verify my theoretical propositions, primary data is obtained from the Securities Data Company's (SDC) New Issues Database. The sample consists of initial public offerings taking place in the United States between January 1, 2009 and 31 December 2019. By choosing this period, a sample period is created that allows for a sample size that is both large enough and that allows for the observation of time trends. In addition, choosing 2009 as my starting point helps to avoid the possible impact of the financial crisis. This is important, as research has shown that the financial crisis influenced the risk aversion of investors (Guiso, Sapienza & Zingales, 2018). In turn, this could affect the number of firms going public and the extent of underpricing (Ljungqvist et al., 2006). Following research by Nelson (2003) and Ritter (1991), I include only those firms that issue public equity for the first time and do not have any stock outstanding trading on other stock exchanges. This is done to mitigate any possible comparability problems that may occur when including different offering types due to differences in offer structure. Following methodology by Liu & Ritter (2011) and Ritter (2020), follow-on issues, unit issues and closed-end funds are excluded from the sample to account for differences in issuing firm characteristics. Likewise, stocks with an offer price lower than $5.00 per share, so-called penny stocks are excluded (Chambers & Dimson, 2009; Liu & Ritter, 2011). Furthermore, I exclude small best efforts, natural resource limited partnerships, American Depositary Receipts (ADRs), real estate investment trusts (REITs), special purpose acquisition companies (SPACs). Bank and Savings & Loans IPOs are excluded as these offerings may be subject to different types of regulations. Lastly, I include only those firms that are listed on the NYSE and NASDAQ to include only firms listed by the Centre for Research in Security Prices (CRSP). By applying these search criteria, the sample contains only those issues that are of interest to institutional investors (Loughran & Ritter, 2004).

In an effort to analyse a large sample within a specific industry, I focus on technology stocks. By doing so, industry effects caused by confounding relationships between independent and dependent variables are reduced (Dess, Ireland & Hitt, 1990). Note, however, that the possibility of industry effects is not entirely eliminated as technology firms do come from different sectors. To identify relevant stocks, I follow the definition of technology stock as proposed by Loughran & Ritter (2004). This qualifies technology stocks as both internet-related stocks and other technology stocks, excluding any companies operating in biotech. I apply the subsequent list of relevant 4-digit Standard Industrial Classification (SIC)-codes in the search criteria, but add several new technology SIC codes as proposed by Jay Ritter (2016). An overview of the applied SIC codes can be found in Appendix A. One of these new codes

(3576) is not an official SIC code but is used by the SEC for filings-review responsibility. To make the sample as representative as possible, I manually checked filing documents for all 159 firms that have registered under this code to ensure that no deals were missing. After including all the discussed requirements and checking the filing documents for the firms registered under SIC code 3576, the initial sample consisted of 300 firms. Table 1 presents a detailed overview of the applied selection criteria and the sample selection.

Table 1: Stepwise sample selection

Applied selection criteria:	
Number of original U.S: IPOs in the period of 2009-2019	4084
Exclude: non-technology IPOs	(3033)
Exclude: unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships	(463)
Exclude: stocks not listed on either the NASDAQ or NYSE	(255)
Exclude: penny stocks with an offer price of less than $5	(31)
Exclude: firms with missing accounting and/or board data	(3)
Final sample	**297**

Note. The stepwise construction of the sample using the discussed selection criteria and the SDC New Issues Database.

After the creation of the initial sample, the SDC New Issues database is used to obtain all information related to the offering, such as the offer date, offer price, number of shares sold and venture-capital or private-equity backing. Other data obtained from this database relates to firm-specific characteristics, such as firm age, prior revenues and total assets. Firm age is measured as the calendar year between the date of incorporation and the calendar year of going public. This method is in line with the methodology of other researchers (Loughran & Ritter, 2004). If numbers are available, revenues are documented for the last twelve months (LTM) prior to going public. If these figures were missing, the numbers for the most recent fiscal year are used as provided in the prospectus. To obtain information regarding the underwriters, the SDC New Issues database is used.

Next, underwriter prestige is determined. An often-used method is based on the underwriter prestige rankings developed by Carter & Manaster (1990) and Carter, Dark & Singh (1998). These rankings are based on the pecking order of investment banks as obtained from the tombstone advertisements. This method ranks underwriters on a scale from 0 to 9 and is widely recognized to be the most precise method of ranking underwriters (Cohen & Dean, 2005; Quintana-García & Benavides-Velasco, 2016; Singh & Gupta, 2018). Unfortunately, these rankings are only available for the period up until 2015. Considering both the extensive process used to create these rankings and my own resource constraints, I was not able to recreate this method for the second half of my sample. Subsequently, I was forced to choose another method. Carter, Dark & Singh (1998) evaluate three different measures of underwriter prestige and they confirm that although the Carter-Manaster proxy has the most explanatory power, two other methods are also significantly related to initial returns. The first other method they consider is the Johnson-Miller measure, that classifies underwriters into four rankings of which the "bulge bracket" is the highest and consists of a group of leading investment banks. The last measure is developed by Megginson & Weiss (1991) and is based on the relative market share of each underwriter, serving as a proxy for underwriter reputation. Here, the market share is calculated as the cumulative deal value for a specific underwriter divided by the total value of all completed deals in the sample period. The Megginson-Weiss measure is acknowledged and applied throughout literature and hence, I have chosen to use this approach as a starting point for my underwriter measure (Carter et al., 2001; Fernando, Gatchev & Spindt, 2005). Subsequently, I have chosen to follow the methods of Handa & Singh (2015) who use this relative market share to classify a top 10 of investment banks to create a dummy variable, taking the value of 1 if a top investment bank is involved and 0 if no top-tier investment bank is involved. To do so, I retrieve the relative market shares of all U.S. underwriters in the period 2009-2019 from Bloomberg. The top 10 investment banks I establish, consists of all nine investment banks that are widely acknowledged as the "bulge brackets" plus RBC Capital Markets, acknowledged as a bulge-bracket in Canada. This may be an indication of the validity of this measure. In addition, I have tested dummies based on the top 5 underwriters and the top 15 underwriters, but this did not change the sign or significance of the relationship. While I acknowledge that this measure may have its limitations, I believe it is the best proxy I could create considering both data and resource constraints.

To obtain data on board composition and director characteristics, I manually examined the prospectus of every initial public offering. These documents are available through the SEC's Electronic Data Gathering and Retrieval system (EDGAR), available at http://www.sec.gov. In this system, final prospectuses are classified as document 424B. The prospectus is the mandatory document that must be filed with the SEC at the time of the public offering. According to Beatty & Zajac (1994), this document provides valuable information to investors, underwriters, regulators and other relevant parties. Many prior studies have used the IPO prospectus as a primary data source for research on the effect of corporate governance and IPO performance (Cohen & Dean, 2005; Daily et al., 2003; 2005; Zimmerman, 2008). As required by the SEC, the prospectus includes information about the management of a firm. Along with other specifications, companies are required to provide a list with the names of executives. These names were examined to determine the gender of the board members. If it was unclear whether a board member was male or female, the description of the board member's profile and duties were examined to obtain any references to gender specific words (e.g. *him* or *her* and *Mr.* or *Ms.*). In addition, the number of independent directors was obtained from the prospectus. A required section of the prospectus relates to director independence and discusses the position of board members. Directors are classified as independent if they are not current or former employees, are not interlocked with or related to management and have no other business relation with the issuing firm (Adams & Ferreira, 2009).

Nevertheless, many observations were incomplete. The missing information was manually adjusted for and collected from several sources, including the prospectuses and relevant supplements provided through EDGAR. One specific variable that had a lot of missing observations in the SDC New Issues Database was the founding date. To obtain this information, the Field-Ritter dataset of company founding dates was used[1]. This database contains the founding dates for an extensive list of U.S. firms going public during the period of 1975-2018. If the founding date could not be obtained from this database, it was collected from the company's prospectus. Missing information related to prior revenues and total asset size was collected from the issuing firm's prospectus. Furthermore, not all issuing firms explicitly stated the number of independent directors in their prospectus. In multiple cases, a blank space was left open where the total number of independent directors should have been mentioned. To resolve this issue, I manually checked other documents filed with the SEC, including prior versions of the prospectus and appendices. Nevertheless, not all missing data could be retrieved from other sources. After excluding the firms that had missing accounting data or data on board composition, the initial sample was reduced from 300 firms to 297 firms. Subsequently, first-day closing prices were obtained from Eikon Datastream. Considering that all observations are technology stocks, the CRSP value-weighted NASDAQ index is used as the market index.

4.1.1. Dependent variables

To research the impact of gender diversity on IPO performance, I use classic event study methodology. Returns are calculated over two intervals. First, raw returns are calculated for the initial return period. In line with prior research, this measures underpricing through the initial returns (Certo et al., 2001; Ritter, 1991). According to existing literature, this is the most common method of measuring underpricing (Loughran & McDonald, 2013). Underpricing is then determined as the closing price of the first day minus the offer price, divided by the offer price (Certo et al., 2001; Kaur & Singh, 2015):

$$Initial\ Returns\ = \frac{(P_1 - P_0)}{P_0} \tag{1}$$

Here, P_1 is the closing price on the first day of trading and P_0 is defined as the initial offer price. Closing prices are obtained from Datastream, whereas offer prices have been collected through the SDC New Issues Database. Although underpricing is a clear, short-term performance measure, it is hard to draw conclusions on what causes these returns. To be better able to interpret the short-run returns, I include a second firm performance indicator: Tobin's Q. This variable is defined as the book value of assets after going public, minus the book value of equity plus the market value of equity measured with the first day closing price, divided by the book value of assets. According to Welbourne et al. (2009, p.

[1] See Field & Karpoff (2002)

533), Tobin's Q can be used to gauge "the investment community's expectations about the potential of the organization".

Next, I observe 3-year stock performance to establish whether a relationship between gender diversity and long-run performance exists. This methodology is in line with prior research (McGuiness, 2018; Welbourne, 2009). To observe whether possible outcomes are persistent or spurious, I have chosen to also examine certain periods between the initial return period and the 3-year event window. To measure stock performance, I calculate the cumulative market-adjusted returns. I have chosen to use this method over the firm- and size-adjusted methodologies, since I am focused only on the impact of gender diversity. Matching firms on firm or size characteristics could provide biased results if not also adjusted for gender composition on boards. Note that I do include a control variable for firm size to account for possible size effects in my regressions. The adjusted returns are computed as the daily raw returns on a stock, adjusted for the returns on the benchmark. I use the value-weighted NASDAQ index as the benchmark. This methodology is in line with the research of Jay Ritter (1991). The initial return period is set to be event month 0, whereas the after-market period consists of the subsequent 36 months and thus starts at month 1. Each month consists of 21 trading days, so that the three-year period consists of the 756 days after the initial return period. Furthermore, I account for any delistings prior to the three-year mark by truncating the after-market period if this is the case. The cumulative adjusted returns then end with the last listing price (Ritter, 1991). For each stock i, the benchmark-adjusted return *AR* for each trading day *t* is:

$$AR_{it} = R_{it} - R_{mt} \quad (3)$$

Where R_{it} is the daily return on the price of stock *i* for day *t* and R_{mt} is the corresponding daily return on the market index. The cumulative benchmark-adjusted returns for the after-market period are then calculated as the sum of the daily benchmark-adjusted returns during the event period.

$$CAR_i = \sum_{t=I_1}^{I_2} AR_{it} \quad (4)$$

Where CAR_i denotes the cumulative abnormal return on stock *i* and I_1 and I_2 denote the start date and end date of the event window.

4.1.2. Independent variable

The independent variable is gender diversity on boards measured as the fraction of female board members. This percentage was calculated as the number of women as a percentage of the total number of board members at the time of going public. The total board size thus includes board members and board nominees that will take a seat prior to or at the time of going public, as documented in the prospectus. This measure is in line with the methodology of several others, such as Adams & Ferreira (2004) and Baker & Gompers (2003). Others have applied different methodology, such as a dummy variable taking the value of 0 if a firm has no female directors and a value of 1 if the firm has 1 or more female directors (Adams & Ferreira, 2009; Kaur & Singh, 2015). However, I have chosen not to apply such measures as they are restrictive in the sense that they do not allow for the testing of variation within the independent variable as all values within a category are considered equivalent (e.g. the distinction between firms with or without female board members). This may weaken the strength of my findings. Furthermore, measuring gender diversity as a percentage of total board members acknowledges that the impact of adding a woman on a board may differ with the board size. As a second measure, I employ the absolute number of women present on the firm's board, another often-used measure of gender diversity (McGuiness, 2018; Reutzel & Belsito, 2015), as a robustness check for my results.

4.1.3. Control variables

A key assumption when performing an OLS estimation is that the model is accurately specified. Hence, I include several control variables in my research to account for board attributes, firm attributes, issue-specific effects and market effects of which prior research suggests that they may influence IPO performance.

Board-specific control variables

Board size: Board size is one of the most important control variables when researching board heterogeneity (Carpenter, Geletkanycz & Sanders, 2004). This is because there is a positive relationship between board size and board heterogeneity (Anderson et al., 2011) as well as IPO performance (Finkle, 1998). Furthermore, prior research shows that board size may impact the number of women on boards (Carter, Simkins & Simson, 2003). As a control, the natural logarithm of the number of directors is used which is in line with the methods of Carter, Simkins & Simson (2003).

Board independence: Filatochev & Bishop (2002) find that governance parameters are used by investors to screen and value the firm going public. Serving as a commonly used measure for board monitoring ability, an important governance measure is board independence. In line with the methodology of others, I include a control variable for the degree of board independence, measured as the percentage of independent directors on the board (Adams & Ferreira, 2009; Bruton, Filatochev, Chahine & Wright, 2010; Handa & Singh, 2015).

Firm-specific control variables

Firm age: Firm age is frequently used as a control variable (Finkle, 1998; Megginson & Weiss, 1991; Ritter, 1998). Finkle (1998) argues that older firms may have an advantage when it comes to acquiring information and resources and establishing more relationships, which may influence firm performance. Furthermore, it is believed that investors perceive older firms are less risky and hence require a lower risk compensation when going public (Megginson & Weiss, 1991; Ritter, 1998). Hence, older firm should experience relatively less underpricing when going public (Ritter, 1991). A control for firm age is created, based on the natural logarithm of the firm age in years (Carpenter et al., 2003; Carter, Dark & Singh, 1998; Reutzel & Belsito, 2015). Here, firm age is defined as the number of years between the calendar year of incorporation and calendar year of going public (Carter et al., 1998; Filatochev & Bishop, 2002; Loughran & Ritter, 2004; Zimmerman, 2008).

Firm size: Firm size is another possible factor impacting both the number of women on boards (Daily et al., 2003) as well as the initial returns of firms going public (Ritter, 1984; Ritter, 1991). Ritter (1984; 1991) argues that issues by larger firms are perceived to be less risky, thereby requiring a lower degree of underpricing. I use asset size as a proxy for firm size, measured by the book value of total assets at the IPO date. To normalize, a logarithmic transformation is applied (Singh & Gupta, 2018).

High-technology: As the last firm-specific control variable, I include a dummy for high-technology firms. Previous research proposes that firms that high-technology firms are harder to value due to growth options (Certo et al, 2001; Lowry & Schwert, 2010). In turn, these firms may be perceived as riskier and more uncertain and they may subsequently experience a higher degree of underpricing. Hence, a dummy variable is coded based on whether the SDC New Issues Database classifies a firm as high-technology. The dummy takes a variable of 1 if this is the case and a value of 0 if otherwise.

Issue-specific control variables

Issue size: Almost all previous research on IPOs controls for issue size by using the natural logarithm of gross proceeds, measured by the offer price times the number of shares issued (Carter, Dark & Singh, 1998; Cohen & Dean, 2005; Singh & Gupta, 2018). According to Ritter (1984; 1991), smaller issues may face greater information asymmetry and thus more risk. Similarly, Carter, Dark & Singh (1998) suggest that larger issues are often executed by more established firms, thereby corresponding to lower risk. Hence, the relationship between issue size and underpricing is expected to be negative, so that larger issues will have a relatively lower degree of underpricing.

Percentage of retained equity: Prior evidence on the relationship between the percentage of equity retained by insiders and the degree of underpricing is mixed. Whereas some argue that a higher percentage of equity retained signals high firm quality (Allen & Faulhaber, 1989; Certo et al., 2001), others argue that a higher proportion of retained equity decreases liquidity. In turn, an increase in retained equity should lead to an increase in underpricing as an offset (Zheng, Ogden & Jen, 2003). To create this control variable, I use the percentage of equity retained by insiders (Allen & Faulhaber, 1989; Bruton et al., 2010). Insiders are defined as the group of all stock-holding executive officers and directors as denoted in the prospectus.

Underwriter prestige: According to the certification hypothesis proposed by Booth & Smith (1991), issuing firms can employ an underwriter to certify to outsiders that the offer price correctly reflects inside information. Further empirical evidence has shown that underwriter reputation impacts IPO performance, with the involvement of more prestigious underwriters translating into less underpricing (Beatty & Ritter, 1986; Carter, Dark & Singh, 1998; Cohen & Dean, 2005; Loughran & Ritter, 2004). Hence, a control is used for underwriter reputation. Accordingly, a dummy is created that takes a value of 1 if at least one of the top-10 most prestigious underwriters is involved and that takes a value of 0 if this is not the case. In line with prior research, underwriter prestige is expected to reduce underpricing.

Venture capital (VC) involvement: Much of the prior research on IPO performance has considered the impact of VC involvement (Brav & Gompers, 1997; Megginson & Weiss, 1991; Zimmerman & Zeitz, 2002). Most researchers follow the certification hypothesis as proposed by Booth & Smith (1991), where venture capitalists may fulfil a similar role in certifying the correctness of the offer price. Among others, Megginson & Weiss (1991) and Brav, Geczy & Gompers (2000) show that IPOs backed by venture capitalists outperform those without VC involvement. In line with prior research, venture-capital backing is controlled for in the form of a dummy variable, where a value of 1 implies that the firm is VC backed and a value of 0 implies no VC involvement (Brav & Gompers, 1997; Reutzel & Belsito, 2015; Singh & Gupta, 2018; Zimmerman, 2008). In line with the findings of Megginson & Weiss (1991), I expect that VC involvement lowers IPO underpricing.

Market-specific control variable

Hot market: To account for the potential effect of so-called ‘hot’ markets, a dummy variable for such periods is included. Years with high IPO activity are often classified as hot markets (Loughran & Ritter, 1995; Ritter, 1984; Zimmerman, 2010). I classify a year as ‘hot’ if the number of IPOs during that year is higher than the yearly median in the sample period. To account for general trends in the IPO market that may be of influence, rather than solely technology stocks, I use the total number of U.S. IPOs as provided by Ritter (2020). Subsequently, the dummy takes a variable of 1 if the firm went public in 2013, 2014, 2015 or 2018 and 0 if otherwise.

4.2. Methodology

In line with previous research, I make use of quantitative analysis techniques. More specifically, I perform linear regression using the Ordinary Least Squares (OLS) method as this is suitable for cross-sectional data (Loughran & Ritter, 2004). The outcomes of these statistical analyses will allow me to test the hypotheses and provide further insight into the relationship between gender diversity on boards and IPO performance. To establish whether a causal relationship between gender diversity in boards and IPO performance exists, it is important to address the probability of endogeneity. Endogeneity can occur due to omitted variables influencing both my variables of interest. Hence, it is important to include variables that influence gender diversity within boards as well as factors that are known to impact IPO performance. Carter et al. (2003) find that the proportion of women on boards increased with both board size and firm size but decreases with the number of insiders. I thus choose to include these variables as controls. Secondly, I choose to include firm-specific, issue-specific and market controls. Nevertheless, there is still a possibility that omitted variables will cause endogeneity in my model. Another issue that needs to be addressed is possible reverse causality. As shown by Dobbin & Jung (2011), much of the prior research on the impact of gender diversity on firm performance is dependent on few data points. They suggest that by using data over multiple years, this relationship may become negative or non-existent. In turn, their findings point towards a possible reverse causality effect, where successful firms choose to appoint women rather than the possibility that women on boards make a firm more successful. Considering that underpricing functions as a measure of firm performance, a two-stage least squares (2SLS) regression is employed to examine the possible existence and impact of endogeneity.

Incorporating all the relevant and discussed variables, the model for the determinants of initial and market-adjusted returns is described as follows:

$$Initial\ returns = \alpha + \beta_1 WomenDirectors_i + \beta_2 BoardIndependence_i + \beta_3 BoardSize_i + \beta_4 LnSize_i + \beta_5 LnAge_i + \beta_6 HighTechnology_i + \beta_7 LnIssueSize_i + \beta_8 RetainedEquity_i + \beta_9 Top5Underwritter_i + \beta_{10} VC - backing_i + \beta_{11} Hot\ Period_i + \varepsilon_i$$

5. Empirical findings

This section provides a thorough interpretation of the results from my analysis. To start off with, I present the descriptive characteristics of my data. I interpret these statistics and discuss some of the notable features. Next, I provide an overview of the outcomes of the applied models and give a detailed interpretation.

5.1. Gender distribution of directors on boards

First, I examine the specific independent variable of interest. Table 2, presented below, clearly shows that female directors are underrepresented within the boards of technology firms that went public in the period 2010-2019. For the 297 companies in the sample population, women hold only 176 of the 2200 board positions. Put differently, female directors held only 8% of the board positions in the sample.

Table 2: Distribution of the number of women across IPO boards

Characteristics	No women directors	One woman director	Two women directors	Three women directors	Five women directors
No. of firms	164	101	23	8	1
% of total	55.22	34.01	7.74	2.69	0.34

Note. An overview of the distribution of the number of women across the boards of the firms included in the sample. The total number of firms is 297. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships and stocks with an offer price below $5 are excluded.

In addition, Table 3 provides further insight into the gender distribution on the boards of directors of the 297 firms in the sample. The average number of women on board is less than one, ranging between 0 and 5. The fraction of women on board varies between 0% and 50%. Out of all 297 firms, over half (55.22%) went public without a single woman on the board. As for the remaining 44.78% of firms, the majority has a single woman on the board, whereas only 10.77% of the boards has two or more board seats held by women. These numbers are roughly equal to the findings by non-profit organization 2020 Women on Boards (2020), who researched the average percentage of board positions held by women for IPOs in all industries. They report a 12.3% average of board positions held by women for the period 2014-2019, whereas the average for this period in my sample is 12.24%.

Table 3: Gender characteristics of directors across IPO boards

Board members	No. of positions	No. of firms	Min.	Max.	Mean
Men	2024	297	2	13	6.81
Women	176	133	0	5	0.79
Total board positions	2200	297	2	13	7.41

Note. An overview of the total number of director positions by gender. The total number of firms is 297. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships and stocks with an offer price below $5 are excluded.

Interestingly, the numbers display a clear time trend. First, Figure 1 depicts the percentage of board seats held by women for all firms going public per year. In the first years of the sample period, the number of women on boards decreased from 5.22% to 2.86%. From 2011 onwards, the percentage of women on board at the time of an IPO has increased to 17.58% in 2019.

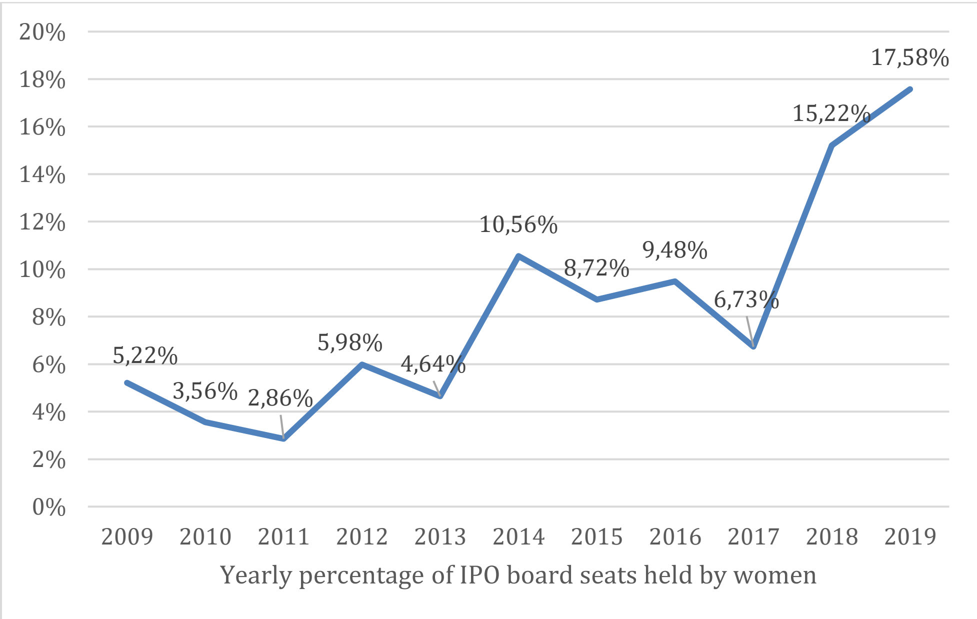

Figure 1: Percentage of IPO board seats held by women, by issue year

Likewise, Figure 2 depicts the percentage of boards of firms going public with at least one woman on board. Again, a similar pattern shows. There is a decrease for the percentage of firms with at least one women director from 33% to 19% in the period 2009-2011. After that, the number increases up to 80% in 2019. This is more than three times as much as in 2010. Clearly, this shows a positive trend for the total number of women holding board positions in technology firms going public, which seems to be in line with the general trends of gender diversity on boards (Catalyst, 2020).

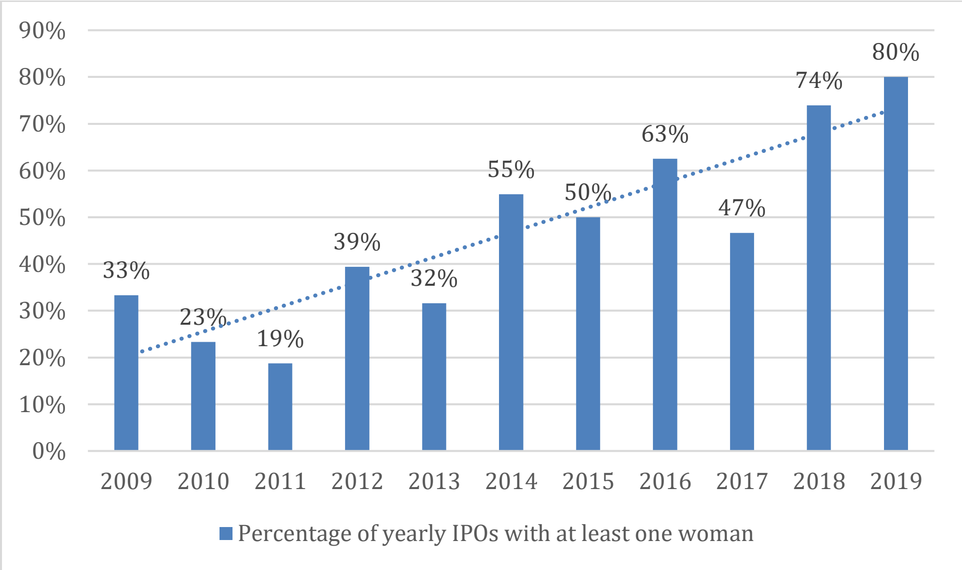

Figure 2: Percentage of IPOs with at least one woman on board, by issue year

5.2. Descriptive statistics

Table 4 displays the annual volume of U.S. technology IPOs. All in all, the yearly numbers are in line with the trends in yearly general U.S. IPO volume for the period 2009-2019 (Ritter, 2020). The test statistics confirm that underpricing exists in the sample and that it is a yearly recurring phenomenon.

Table 5 gives insight into the descriptive statistics for the variables included in the analysis. First, the initial returns of the IPOs included in the sample display great variation, ranging from -29,1% to +54,9% percent. The mean value is 14.7%, confirming previous the existence of underpricing. Note that this number is below the average degree of underpricing for this period as documented by Jay Ritter (2020), who reports an average of 16.0%. Although this difference is not too big, this finding goes against the general proposition that technology stocks are more underpriced than non-technology IPOs (Loughran & Ritter, 2004). The standard deviation is high, but this is not surprising. Previous research proposes that small, young and technology firms are relatively difficult to value, thereby causing a high volatility of initial returns (Lowry et al., 2010; Ritter, 1984). Next, Tobin's Q shows a wide dispersion with a minimum value of 0.638 and a maximum value of 286.44. To allow for a more normal distribution, I make use of its natural logarithm in my regression analyses (Welbourne et al., 2009).

The CARs display a clear, downward trend. Where the average CARs for the 3-month aftermarket period amount to -1.6%, they decrease to -9.4% for the 3-year aftermarket period. These findings are consistent with the long-run underperformance of IPOs as discussed in prior literature (Loughran & Ritter, 2004; Ritter, 1991).

Table 4: Distribution of Initial Public Offerings and abnormal returns, by year

Year	No. of IPOs	Aggregate gross proceeds ($ Mil)	Average underpricing (%)	*t*-stat
2009	15	2304,41	13.45%	4.05
2010	30	3908,21	8.49%	4.58
2011	32	6664,02	13.63%	5.49
2012	33	3868,52	15.54%	5.45
2013	38	7357,64	12.62%	3.59
2014	51	9144,28	16.98%	7.30
2015	24	3551,56	13,57%	4.32
2016	16	1610.65	14.56%	3.55
2017	15	1813,27	11.86%	4.32
2018	23	4397,05	20.81%	5.56
2019	20	16515,36	20.64%	5.29

Note. N = 297. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships and stocks with an offer price below $5 are excluded.

Next, the board-specific characteristics are examined. Board size is normally distributed with an average of 7 directors, a minimum of 2 and maximum of 13 board members. Likewise, the number of independent directors ranges between 1 and 10, with an average of 5. Both board size and the measures for director independence are normally distributed. In contrast, the firm-specific attributes show a wide dispersion. Both firm age and firm size are positively skewed. Hence, these variables have been normalized with a logarithmic transformation to reduce the variation and disparity and allow for a more normal distribution. Finally, 62.3% of the firms in the sample can be classified as high technology, as the dummy shows. Moving onto issue-specific variables, a similar positive skew can be observed for issue size. Again, the issue size is transformed with a natural logarithm to allow for a more normal distribution. The percentage of equity retained by prior shareholders ranges from 0% to 100%, with a mean of 48.7%. Turning to the dummy variables, results show that 69.4% of the firms in the sample was VC-backed prior to going public and 82.2% has at least one top-10 underwriter. Finally, the 'hot' market dummy shows that almost half of the firms went public during hot markets, confirming that hot markets are indeed reflected by higher numbers of firms going public in these periods.

Table 5: Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Initial returns (%)	297	0.147	0.164	-0.291	0.549
Tobin's Q	297	7.584	18.034	0.638	286.44
Log of Tobin's Q	297	1.484	0.972	-0.450	5.658
CAR-3 (%)	297	-0.016	0.138	-0.892	0.548
CAR-6 (%)	297	-0.011	0.175	-0.693	1.088
CAR-12 (%)	297	-0.033	0.264	-1.205	1.591
CAR-24 (%)	297	-0.067	0.313	-1.981	0.978
CAR-36 (%)	297	-0.094	0.541	-3.030	1.540
No. of women	297	0.593	0.792	0	5
Women on board (%)	297	0.079	0.103	0	0.500
No. of independent directors	297	5.215	1.823	1	10
Independent directors (%)	297	0.703	0.182	0.100	1.000
Board size	297	7.407	1.654	2	13
Total assets ($ Mil)	297	582.724	1762.927	1.400	16042.300
Log of assets	297	4.753	1.634	0.336	9.683
Firm age (years)	297	13.492	12.641	2	115
Log of firm age	297	2.374	0.629	0.693	4.745
High-technology dummy	297	0.623	0.485	0	1
Issue size ($ Mil)	297	205.842	542.407	4	8100
Log of issue size	297	4.726	0.954	1.386	9
Retained equity (%)	297	0.487	0.266	0	1.000
Top-10 underwriter dummy	297	0.822	0.384	0	1
VC-backing dummy	297	0.694	0.462	0	1
'Hot' market dummy	297	0.458	0.499	0	1

Note. The total number of firms is 297. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships and stocks with an offer price below $5 are excluded. The number after the cumulative adjusted returns (CAR) reflects the number of months in the event period.

Table 6: Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Initial returns (%)	1.000													
2. Three-year returns (%)	0.019	1.000												
3. Tobin's Q	0.047	0.029	1.000											
4. Women directors (%)	0.135	-0.054	0.085	1.000										
5. Independent directors (%)	0.122	-0.015	-0.008	0.025	1.000									
6. Board size	0.018	0.092	0.015	0.024	0.021	1.000								
7. Log of firm size ($ Mil)	-0.014	0.071	-0.084	0.081	-0.210	0.419	1.000							
8. Log of firm age (years)	-0.099	0.025	0.008	0.048	-0.180	0.138	0.378	1.000						
9. High-technology dummy	0.135	0.043	0.028	-0.027	0.026	-0.035	0.017	-0.068	1.000					
10. Log of issue size ($ Mil)	0.195	0.026	-0.072	0.164	-0.124	0.413	0.823	0.280	0.076	1.000				
11. Retained equity (%)	0.100	-0.003	-0.075	-0.145	0.213	-0.037	-0.310	-0.280	0.047	-0.253	1.000			
12. Top-10 underwriter dummy	0.156	0.133	-0.106	0.058	0.041	0.291	0.456	0.062	0.145	0.560	-0.006	1.000		
13. VC-backing dummy	0.217	0.019	0.024	0.032	0.343	0.049	-0.247	-0.240	0.025	-0.037	0.185	0.186	1.000	
14. 'Hot' market dummy	0.108	-0.011	0.087	0.249	0.005	0.022	0.011	0.064	0.295	0.082	-0.100	-0.020	-0.018	1.000

Note. The total number of firms is 297. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships and stocks with an offer price below $5 are excluded.

In Table 6, the correlation matrix is presented. The correlation coefficient can be interpreted as the strength of the relationship between two variables. Although a high correlation does not necessarily imply causation, it may indicate multicollinearity. The correlation matrix shows that there is high correlation between firm size and issue size. This relationship is expected: firms with more assets are said to be better able to raise larger offer proceeds due to decreased uncertainty and better access to resources (Ritter, 1984; Ritter, 1991). Lastly, there is a strong correlation between board size and the number of independent directors, which is also to be expected (Anderson et al., 2011). To test for possible multicollinearity, the variance inflation factors (VIF) are calculated. A general rule of thumb is that any VIF higher than 10 indicates high correlation (O'Brien, 2007). Testing for the VIF shows that all variables have a VIF below 4.05. Hence, no variables are removed from the analysis.

5.3. Regression analyses

5.3.1. Pre-estimation diagnostic tests

Apart from the identification of possible multicollinearity, several pre-diagnostic tests were conducted to assure that the model did not suffer from any heteroskedasticity problems and to assure that it was well-specified. First, the model was checked for influential outliers. Note that not all outliers are influential as not all outliers have a significant effect on the slope of the regression line. These cases are identified using Cook's distance measures as well as the DfBetas. One by one, the influential cases were checked to see if removing them had a significant effect on the model. Only one case was removed at a time. All things considered, I have decided to remove three observations. Next, postestimation analysis was performed to check for constant variance of the residual error term. It is important to do so, as heteroscedasticity may pose a problem when using cross-sectional data and homoscedasticity is an important assumption of OLS methods. Note that the presence of heteroskedasticity does not imply that regression coefficients are biased. Instead, only the estimates of variances in the regression analysis may be biased, thereby possibly decreasing the power of the test (Field, 2009). Visual inspection provides no evidence of an heteroskedasticity. This is further confirmed with a Breusch-Pagan test and a White's test. The former tests whether the error terms of the regression are correlated with the independent variables, whereas the White's test checks for any nonlinear heteroskedasticity. Both fail to reject the null hypothesis of homoscedasticity and hence provide evidence of a normal distribution of the residuals. Hence, I conclude that it is unlikely that standard errors are biased and I do not make use of robust standard errors. In addition, both visual inspection as well as the Shapiro-Wilk test provide evidence of a normal distribution of the error terms. Lastly, the model was checked to see if it was correctly specified. Model specification may occur when relevant variables are omitted from the model or if irrelevant variables are included in the model. In turn, this can impact the estimation of the regression coefficients. Since IPO underpricing has proven to be a complex and puzzling concept, it may be the case that potentially relevant concepts are not included in my regression. However, the Ramsey RESET test indicates that there is no significant evidence that my model has omitted variables. In addition, a linktest is performed that uses both the linear predicted values and the squared linear predicted values to test for specification errors. Again, this test confirms that the model is well-specified. The same tests were performed when testing for the short run performance using Tobin's Q and for the long-term regressions. Outcomes for the diagnostic tests were mostly similar, but I did find evidence for heteroskedasticity. Hence, these regressions do make use of robust standard errors.

5.3.2. Short-term performance

In Table 7, the regression results of the independent variables on the initial returns are displayed using the percentage of women on board. In the first model, a univariate regression is performed to test for the impact of the variable of interest, namely gender diversity, on the initial returns. In Model 2 the other board-specific characteristics are added. Next, Model 3 adds the firm-specific characteristics to the regression. Model 4 incorporates the issue-specific variables and Model 5 adds the market-specific dummy variable to test for the effect of so-called hot markets. As hypothesized, my results thus show that gender diversity indeed affects underpricing. Throughout all models, the fraction of women displays a significant and positive relationship on underpricing. After adding all control variables, Model 5 shows that a 10% increase in women on board results in an absolute increase in underpricing of 1.74%. Considering that the mean percentage of underpricing is 14.74%, this implies a relative increase of over 10%. Hence, my results indicate gender diversity plays an important role in short-term IPO performance.

As for the other board-specific characteristics, the fraction of independent directors also displays a positive relationship with underpricing, that becomes insignificant when more variables are added. The direction of this relationship is not as expected, but both the direction and the insignificance are similar to the findings of prior research (Bruton et al., 2010; Singh & Gupta, 2018). Firm size, measured by the natural logarithm of total assets, displays a negative relationship with underpricing. Model 5 shows that a 10% increase in asset size leads to a decrease in underpricing of 0.14%. This is in line with the prior prediction that having a larger asset base decreases uncertainty (Ritter, 1984; 1991). Firm age displays a similar effect, but this relationship is insignificant. Next, the high-technology dummy shows to be significant throughout all models. This confirms findings of prior research that high-technology firms display more underpricing because they are harder to value (Lowry & Schwert, 2010). Moving on to the issue-specific variables of interest, issue size displays a significant effect on underpricing, but the sign of the relationship is not as expected. Whereas, a negative relationship is expected, the outcome here is that issue size has a significant and positive effect on underpricing. A 10% increase in issue size leads to an increase of underpricing around 0.42%. Although this outcome is not expected, several prior researchers find similar relationships, although they do not discuss their implications or possible causes. For example, Cohen & Dean (2005) find a positive and significant coefficient between offer size and the degree of underpricing. Similarly, Reutzel & Belsito (2015) find a positive relationship between IPO proceeds and underpricing significant at the 1% level. Throughout their models, they find a coefficient of around 0.09, which means that for every 10% increase in offer size, underpricing increases by 0.37%.

Next, the relationship between percentage of equity retained by insiders and underpricing is significant at the 10% level and positive. A 10% increase in equity retained by insiders results in an increase of underpricing of around 0.6%. This may be evidence in favour of prior findings by Zheng et al. (2003), who propose that a higher percentage of retained equity decreases the liquidity for investors. However, note that this outcome does contradict the widely accepted notion that a higher percentage of retained equity functions as a signal of firm quality. The sign of the relationship between having a top-10 underwriter and underpricing is as expected and the coefficient shows that having a top-10 underwriter decreases underpricing by 1.32 to 1.36%. However, the relationship is insignificant which may be caused by the limited resources available for the construction of the variable. Next, my results show that having VC-backing increases underpricing. Significant at the 5% level, the coefficient shows that VC-backing increases underpricing by 4.88%. Finally, the sign of the hot market dummy coefficient shows that, indeed, going public in a hot market increases underpricing. However, this relationship is not statistically significant in my model. Finally, the adjusted R^2 of the final model is 0.197, which shows that 19.7% of the variation of the initial returns can be explained by the model. Considering that underpricing is a largely unexplained phenomenon and that the aim of this research is to establish whether a relationship between gender diversity and underpricing exists, rather than predicting underpricing, the observed R-squared seems reasonable. Furthermore, Model 5 displayed a significant F-statistic (p = 0.000), so that the relationship between the set of independent variables and the dependent variable is statistically reliable.

Table 8 shows the results using Tobin's Q as the dependent variable. The fraction of women on board has a positive effect on Tobin's Q. After adding all control variables, a 10% increase in gender diversity results in an increase in Tobin's Q of 8.63%. Although the relationship is insignificant when using the fraction of female directors, it is significant when using the number of women as the independent variable[2]. Note that the coefficient for gender diversity is relatively big compared to the other independent variables. Out of the other control variables, only two other variables have a significant effect on Tobin's Q. First, board size displays a negative effect on Tobin's Q, but the direction reverses after the other control variables effect are added. The coefficient in Model 5 indicates that adding an additional board member results in an increase in Tobin's Q of 6.15%. Next, firm size has a negative effect on Tobin's Q, significant at the 1% level. For every 10% increase in the natural logarithm of firm size, Tobin's Q decreases by 2.47%.

[2] The results in Table X in Appendix B indicate that having an additional woman on the board results in a 13.31% increase in Tobin's Q.

Table 7: Short-run regression results, by fraction of women directors

	Dependent variable: Initial returns (%)				
Independent variable	Model 1	Model 2	Model 3	Model 4	Model 5
Women directors (%)	0.248***	0.241***	0.250***	0.181**	0.174**
	(0.0908)	(0.0904)	(0.0898)	(0.0852)	(0.0860)
Independent directors (%)		0.107**	0.0984*	0.0351	0.0352
		(0.0510)	(0.0524)	(0.0510)	(0.0511)
Board size		0.00288	0.00254	-0.00390	-0.00384
		(0.00566)	(0.00617)	(0.00582)	(0.00583)
Log of assets ($ Mil)			0.00548	-0.0342***	-0.0337***
			(0.00682)	(0.0105)	(0.0106)
Log of firm age (years)			-0.0238	-0.0131	-0.0135
			(0.0160)	(0.0153)	(0.0154)
High-tech dummy			0.0467**	0.0342*	0.0344*
			(0.0189)	(0.0178)	(0.0179)
Log of issue size ($ Mil)				0.102***	0.102***
				(0.0179)	(0.0180)
Retained equity (%)				0.0623*	0.0616*
				(0.0356)	(0.0357)
Top-10 underwriter				-0.0136	-0.0132
				(0.0236)	(0.0236)
VC-backing dummy				0.0488**	0.0488**
				(0.0216)	(0.0216)
‘Hot’ market dummy					0.0113
					(0.0173)
Constant	0.129***	0.0329	0.0428	-0.226***	-0.230***
	(0.0117)	(0.0552)	(0.0678)	(0.0765)	(0.0768)
Observations	294	294	294	294	294
R-squared	0.025	0.041	0.070	0.215	0.216
Adjusted R-squared	0.022	0.031	0.050	0.187	0.185
F-statistic	7.43	4.09	3.59	7.74	7.06

Note. This table summarizes the regression results. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Unadjusted standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.

Table 8: Short-run regression results for Tobin's Q, by fraction of women directors

	Dependent variable: Tobin's Q				
Independent variable	Model 1	Model 2	Model 3	Model 4	Model 5
Women directors (%)	0.306	0.303	0.578	0.643	0.622
	(0.585)	(0.596)	(0.521)	(0.545)	(0.557)
Independent directors (%)		0.193	-0.355	-0.343	-0.343
		(0.286)	(0.267)	(0.260)	(0.260)
Board size		-0.0652*	0.0551	0.0595*	0.0597*
		(0.0342)	(0.0341)	(0.0359)	(0.0361)
Log of assets ($ Mil)			-0.315***	-0.266***	-0.265***
			(0.0415)	(0.0668)	(0.0664)
Log of firm age (years)			0.0875	0.0820	0.0807
			(0.0827)	(0.0872)	(0.0872)
High-tech dummy			-0.0481	-0.0276	-0.0268
			(0.104)	(0.101)	(0.101)
Log of issue size ($ Mil)				-0.0742	-0.0754
				(0.114)	(0.114)
Retained equity (%)				-0.00680	-0.00870
				(0.213)	(0.215)
Top10 underwriter				-0.114	-0.114
				(0.189)	(0.190)
VC-backing dummy				0.0456	0.0458
				(0.142)	(0.143)
'Hot' market dummy					0.0324
					(0.102)
Constant	1.452***	1.799***	2.592***	2.727***	2.715***
	(0.0662)	(0.331)	(0.390)	(0.583)	(0.584)
Observations	294	294	294	294	294
R-squared	0.001	0.015	0.227	0.231	0.231
F-statistic	0.27	1.45	11.03	8.12	7.39

Note. This table summarizes the regression results. The dependent variable is Tobin's Q. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.

Table 9 shows the regression results based on different fractions of women directors (WD) on boards. For example, the regression in the third column (WD = 5%) compares the difference in underpricing between those firms that have a fraction of women directors higher than 5% to those that have a fraction of women directors below 5%. This model provides a couple of interesting results. First, the second column shows that going public without any woman on board decreases underpricing. This relationship is significant at the 5% level and implies that going public with an all-male board reduces underpricing by 0.41%. Having women directors on board then shows to have a positive and significant effect on underpricing but only when this fraction is below 15%. Considering that the average number of board members in the sample was 7, this fraction roughly translates to having one woman on board. This outcome is further confirmed when performing similar regressions using the number of women on board as the independent variable of interest. For readability and clarity, these findings are not reported in the main text but in Appendix B. Moreover, the results show that the positive effect of gender diversity on underpricing diminishes as gender diversity increases. As for the other included variables, both the sign, size and significance of the relationships remain roughly equal to Model 5 presented in Table 7. Note that the percentage of retained equity no longer has a significant effect when examining firms with a fraction of women directors larger than 15%, which may point towards the possibility of a moderating effect.

Table 9: Short-run regression results, grouped by fraction of women on board

	Dependent variable: Initial returns (%)				
Independent variable	WD (0%)	WD (5%)	WD (10%)	WD (15%)	WD (20%)
Women directors (%)	-0.0406**	0.0406**	0.0360**	0.00710	0.00146
	(0.0176)	(0.0176)	(0.0176)	(0.0223)	(0.0255)
Independent directors (%)	0.0338	0.0338	0.0352	0.0403	0.0403
	(0.0510)	(0.0510)	(0.0511)	(0.0514)	(0.0515)
Board size	-0.00507	-0.00507	-0.00448	-0.00388	-0.00417
	(0.00582)	(0.00582)	(0.00582)	(0.00596)	(0.00592)
Log of assets ($ Mil)	-0.0333***	-0.0333***	-0.0341***	-0.0356***	-0.0357***
	(0.0106)	(0.0106)	(0.0106)	(0.0106)	(0.0107)
Log of firm age (years)	-0.0146	-0.0146	-0.0143	-0.0137	-0.0134
	(0.0153)	(0.0153)	(0.0154)	(0.0155)	(0.0155)
High-tech dummy	0.0359**	0.0359**	0.0350*	0.0325*	0.0327*
	(0.0179)	(0.0179)	(0.0179)	(0.0180)	(0.0180)
Log of issue size ($ Mil)	0.101***	0.101***	0.102***	0.106***	0.106***
	(0.0179)	(0.0179)	(0.0179)	(0.0180)	(0.0181)
Retained equity (%)	0.0594*	0.0594*	0.0588*	0.0526	0.0518
	(0.0354)	(0.0354)	(0.0355)	(0.0357)	(0.0360)
Top-10 underwriter	-0.0118	-0.0118	-0.0121	-0.0107	-0.0105
	(0.0235)	(0.0235)	(0.0236)	(0.0237)	(0.0238)
VC-backing dummy	0.0479**	0.0479**	0.0478**	0.0483**	0.0483**
	(0.0216)	(0.0216)	(0.0216)	(0.0218)	(0.0219)
‘Hot’ market dummy	0.0114	0.0114	0.0124	0.0151	0.0156
	(0.0172)	(0.0172)	(0.0172)	(0.0174)	(0.0175)
Constant	-0.181**	-0.222***	-0.226***	-0.229***	-0.228***
	(0.0792)	(0.0767)	(0.0768)	(0.0774)	(0.0774)
Observations	294	294	294	294	294
R-squared	0.219	0.219	0.216	0.205	0.205
Adjusted R-squared	0.189	0.189	0.186	0.174	0.174
F-statistic	7.20	7.20	7.08	6.61	6.60

Note. This table summarizes the regression results. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * p < 0.1; ** p < 0.05; *** p < 0.01. Unadjusted standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.

5.3.3. Long-term performance

Table 10: Long-run regressions results, by fraction of women directors

	Dependent variable: Cumulative abnormal returns (%)				
Independent variable	3-months	6-months	12-months	24-months	36-months
Women directors (%)	0.127*	0.0988	0.158	0.112	0.378
	(0.0698)	(0.0829)	(0.132)	(0.152)	(0.277)
Independent directors (%)	0.0138	-0.0494	-0.0210	-0.0169	-0.0816
	(0.0423)	(0.0591)	(0.0848)	(0.125)	(0.188)
Board size	0.00739	0.00670	0.00305	-0.00977	0.00840
	(0.00487)	(0.00659)	(0.00925)	(0.0149)	(0.0229)
Log of assets ($ Mil)	-0.00851	-0.00985	-0.00276	0.0101	0.0280
	(0.00922)	(0.0102)	(0.0180)	(0.0239)	(0.0398)
Log of firm age (years)	0.00653	0.0120	0.0425*	-0.00587	0.0322
	(0.0126)	(0.0173)	(0.0235)	(0.0310)	(0.0513)
High-tech dummy	-0.0142	0.0256	0.0283	0.0122	0.0186
	(0.0165)	(0.0210)	(0.0314)	(0.0376)	(0.0669)
Log of issue size ($ Mil)	0.00494	0.00554	0.00641	0.0578	-0.0166
	(0.0152)	(0.0189)	(0.0298)	(0.0417)	(0.0576)
Retained equity (%)	0.0308	0.0478	0.0423	0.171*	0.306**
	(0.0318)	(0.0444)	(0.0689)	(0.0935)	(0.146)
Top10 underwriter	-0.0127	-0.0240	-0.0499	-0.0938	-0.123
	(0.0237)	(0.0268)	(0.0459)	(0.0611)	(0.101)
VC-backing dummy	-0.0274	-0.0290	0.0445	0.0342	0.0886
	(0.0232)	(0.0258)	(0.0423)	(0.0531)	(0.0906)
'Hot' market dummy	-0.0129	-0.0363*	-0.0580*	-0.0706*	-0.147**
	(0.0164)	(0.0189)	(0.0305)	(0.0363)	(0.0626)
Constant	-0.0606	-0.0262	-0.177	-0.312	-0.324
	(0.0609)	(0.0894)	(0.150)	(0.223)	(0.308)
Observations	294	294	294	294	294
R-squared	0.029	0.035	0.030	0.049	0.045
F-statistic	0.88	1.33	0.96	1.18	1.19

Note. This table summarizes the regression results. The dependent variable is CAR. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.

Next, I turn to long-term stock performance. First, the results in Table 9 show that the fraction of women directors on board has a positive and significant increase on 3-month stock returns. More specifically, a 10% increase in women directors increases stock performance by 1.27%. However, this relationship becomes insignificant as time goes by. The results indicate that gender diversity does not have a significant effect on long-term stock performance. Nevertheless, it is interesting to note that the coefficient increases over time. This implies that the positive effect of gender diversity is larger when the after-market period is longer. However, there is one caveat: when testing for the long-term performance, the effect of gender diversity on CAR-36 is positive and significant at the 10% level. Here, the results as presented in Table B.4 in Appendix B show that having an additional woman on the board increases the 3-year stock performance by 5.91%. Because this is the longest after-market period I test for, I cannot provide insight into whether this relationship is significant by chance or that gender diversity starts to have a significant effect on long-run performance *after* the three-year mark.

Out of all the other variables only two display a significant effect on long-term stock performance. The percentage of retained equity has a positive effect starting at the three-month event window, but only becomes significant after 24 months. Interestingly, the coefficient also increases with time, up to a value of 0.306. This coefficient tells us that a 10% increase in retained equity leads to a 3.06% increase in 3-year stock performance. The 'hot' market dummy displays a similar relationship. After the 6-month mark, the relationship becomes significant and the coefficient increases over time. Where going public during a hot period decreases 6-month stock performance by 3.63%, this effect increases to a staggering 14.7% for 3-year stock performance, significant at the 5% level. Note that the low R-squared of the model implies that not a lot of the variability in the long-term stock returns can be explained by the model.

5.4. Endogeneity

As an additional robustness check, I repeat my regression analyses with the number of women as the independent variable rather than the fraction of women directors. The corresponding regression output can be found in Appendix B. Overall, the direction of the coefficients and the significance levels do not change and the outcomes confirm my previous findings.

Next, I perform a two-stage-least-squares (2SLS)-regression to account for the possibility of endogeneity. According to Adams & Ferreira (2009), endogeneity issues can arise when examining the effects of gender diversity and firm performance due to possible omitted variables. A second concern is the possibility of reverse causality, where board diversity influences firm value, but firm value can have an impact on board diversity too. If reverse causality exists, the OLS regression method can create biased estimates of the coefficients (Carter et al., 2003). To perform my 2SLS-regression, I make use of an instrumental variable (IV) (Adams & Ferreira, 2009). In the first stage of the 2SLS, this instrumental variable is used to created predicted values for the endogenous variable, in this case gender diversity. Next, these predicted values are used as the instrumental variable in the OLS regression (Bruton et al., 2010). To function as a valid IV, two criteria must be met. First, the instrument and the endogenous variable should be correlated. Next, the instrument should be uncorrelated with the error terms of the dependent variable (McGuinness, 2018). The first assumption can be tested, while the second one cannot be tested. Finding a valid IV is hard and prior literature has used different instruments. Examples are the percentage of male directors that have connections with women directors (Adams & Ferreira, 2007), the proportion of women managers within a firm (Low et al., 2005) and the percentage of women in the industry (Lu & Bao, 2018). I build upon this IV and that of Low et al. (2005) and I use the country-wide yearly share of women working in middle and senior management (The World Bank, 2020). I hypothesize that this variable can reflect both a pool of suitable candidates for board positions as well as a general attitude towards women in top management positions (Low et al., 2005). Furthermore, as it is a country-wide statistic, it is unlikely to influence individual firm performance. The 2SLS regression results for both the short-term and long-term are presented in Table 10. The estimates for the effect of gender diversity on stock returns are presented for both the short-run and the long-run. Overall, the results of the OLS and 2SLS regressions are similar. Note that the coefficients remain statistically significant and do not change sign. For the short run, the estimated coefficient for the fraction of women directors on the initial returns is 0.441 (p = 0.022), whereas the estimate for the fraction of women on board is significant and has the expected sign. The coefficient is 3.835 (p = 0.000). These outcomes confirm that there is strong evidence for the established relationship between gender diversity and the initial returns. Similarly, the coefficient for the long run shows that gender diversity has a positive effect on long-term stock performance. However, this relationship remains insignificant. Testing shows that the instrument used is strong: the eigen value statistic is high (F = 23.947) and there are no overidentifying restrictions. Nevertheless, the Hausman test does not reject the null at the 5% level, so the null hypothesis of no endogeneity is not rejected for both time periods. I thus conclude that the OLS estimators are consistent and that it is the appropriate regression method.

Table 11: Comparison of the OLS and 2SLS regression results

	Dependent variable: Initial returns (%)		Dependent variable: CAR-36 (%)	
Independent variable	OLS	2SLS	OLS	2SLS
Women directors (%)	0.174**	0.738**	0.378	0.441
	(0.0860)	(0.323)	(0.277)	(1.121)
Independent directors (%)	0.0352	0.0181	-0.0816	-0.0835
	(0.0511)	(0.0545)	(0.188)	(0.189)
Board size	-0.00384	-0.00262	0.00840	0.00854
	(0.00583)	(0.00616)	(0.0229)	(0.0214)
Log of assets ($ Mil)	-0.0337***	-0.0271**	0.0280	0.0288
	(0.0106)	(0.0117)	(0.0398)	(0.0406)
Log of firm age (years)	-0.0135	-0.0141	0.0322	0.0321
	(0.0154)	(0.0161)	(0.0513)	(0.0560)
High-tech dummy	0.0344*	0.0400**	0.0186	0.0193
	(0.0179)	(0.0190)	(0.0669)	(0.0660)
Log of issue size ($ Mil)	0.102***	0.0870***	-0.0166	-0.0183
	(0.0180)	(0.0206)	(0.0576)	(0.0715)
Retained equity (%)	0.0616*	0.0947**	0.306**	0.310**
	(0.0357)	(0.0417)	(0.146)	(0.145)
Top-10 underwriter	-0.0132	-0.0224	-0.123	-0.124
	(0.0236)	(0.0253)	(0.101)	(0.0878)
VC-backing dummy	0.0488**	0.0507**	0.0886	0.0889
	(0.0216)	(0.0228)	(0.0906)	(0.0790)
'Hot' market dummy	0.0113	-0.00361	-0.147**	-0.149**
	(0.0173)	(0.0199)	(0.0626)	(0.0690)
Constant	-0.230***	-0.239***	-0.324	-0.325
	(0.0768)	(0.0809)	(0.308)	(0.281)
Observations	294	294	294	294
R-squared	0.216	0.096	0.045	0.045
Test statistic	7.06	71.78	1.19	11.97

Note. In this table, the results for both the OLS and the 2SLS regressions are presented. The dependent variables are IR and CAR-36 (%). The independent variable is the yearly percentage of women working in middle and senior management. Both models for the CAR-36 are corrected for heteroskedasticity. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Unadjusted or robust standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.

6. Discussion

In this section, I will discuss the presented results and their relation to prior literature. Furthermore, I will provide insight into the practical implications of my research.

All in all, my research seems to indicate that gender bias exists in the U.S. technology sector. If men and women were perceived equal, no relationship between diversity and IPO performance should exist, and my results thus indicate that this is not the case. Next, my results confirm the propositions of Certo (2003) and Khoury et al. (2013) that board characteristics function as a signal of firm quality and that this is prevalent when going public. Indeed, my research shows that a relationship between gender diversity and IPO underpricing exists. In line with the research of Reutzel & Belsito (2015), I find that the fraction of women directors has a significant and positive effect on underpricing in the United States. Hence, I conclude that there is enough evidence to reject Hypothesis 1A that proposes that gender diversity does not have an effect on underpricing. Specifically, the results show that a 10% increase in gender diversity, measured by the fraction of female directors, results in an absolute increase in underpricing of 1.74%. As the average underpricing in my sample is 14.7%, this implies a relative increase of over 10%. In an attempt to provide further insight into the causes of the initial returns, I observe short-term Tobin's Q, measured with the first-day closing price. I find that Tobin's Q increases with 8.63% for every 10% increase in gender diversity. These results confirm prior findings of McGuinness (2018) and Welbourne et al. (2009), who find that female board representation increases the initial IPO valuation. Next I examine the differences in underpricing between groups of firms, based on the fraction of women on boards. Here, my results show that the established positive relationship between women on boards and underpricing becomes insignificant at the 15% mark or with more than one woman on board. In addition, my results show that if gender diversity increases, the positive effect on underpricing becomes smaller. If the magnitude of the coefficient decreases, this seems to indicate that gender diversity becomes of less importance to underpricing if the balance between male and female board members is more equal. These findings seem to confirm the proposition of tokenism by Kanter (1977), who argues that firms may add a single woman on the board to function as a token of diversity rather than due to her skills. If this is the case, having a woman serve on the board may not be beneficial to board- or firm performance, either due to a lack of skills or due to the inability to change current board and firm processes. If investors value this line of reasoning and thus doubt the abilities of a single woman director on the board, this may be a clear explanation of the established positive relationship. Moreover, the threshold level after which the relationship becomes insignificant seems to indicate that investors do not perceive gender diversity to increase uncertainty if more than one woman serves on the board.

Furthermore, Dobbin & Jung (2011) argue that the scarce prior literature on the impact of gender diversity on IPO performance has focused mostly on the short-term effects, whereas effects may be spurious and dependent on too few data points. To shed further insight into the relationship between gender diversity and IPO performance, I expand my research to include the 3-year aftermarket period. While my findings confirm that, on average, return reversal occurs in the aftermarket period (Ritter, 1991), my results indicate that gender diversity has a positive, although insignificant, effect on long-term stock performance. Hence, I conclude that there is not enough evidence to reject Hypothesis 2A that states that gender diversity does not have an effect on long-run IPO performance. If gender diversity does not have a negative effect on long-term stock performance, this outcome calls into question whether the positive effect on underpricing can truly be explained by increased uncertainty, as proposed by prior literature (Ljungqvist, 2007; Loughran & Ritter, 2004). Moreover, the positive effect of gender diversity on Tobin's Q indicates that the market seems to value gender diversity when going public. While my models do not allow me to determine the extent to which investors incorporate uncertainty in their valuation, these outcomes indicate that the market perceives the benefits to *at least* outweigh the risks. Hence, my results point towards the possible role of behavioural, institutional and control theories, but more research is required to determine these possible effects.

So, what are the practical implications of my findings? First, increased underpricing, due to gender diversity, implies higher amounts of 'money left on the table' for issuing firms. My research indicates that this increase in underpricing may be explained by a discrepancy between the firm's own valuation and its valuation by the market. Following this line of reasoning, my findings indicate that investors positively value gender diversity, whereas firms fail to (fully) incorporate this beneficial effect in their valuation. To reduce underpricing, firms going public should thus adjust their valuation for the gender diversity on their boards. Note, that the cause of this misvaluation may not necessarily lie with the issuing firm itself but that it is also possible that other parties, such as the underwriter, fail to account for gender diversity in the IPO process. Moreover, it may be the case that the positive effect of gender diversity on Tobin's Q is dependent on the involved investors. For example, it may be the case that institutional investors value gender diversity more than individual investors due to certain ESG criteria for their portfolio. Hence, more research is necessary to incorporate the possible moderating effects of stakeholder perceptions when researching the relationship between gender diversity and IPO performance. As for investors, my results indicate that, on average, firms going public with more gender diverse board experience higher underpricing. So, by investing in technology IPOs with more women on board investors can obtain larger initial returns. All in all, this research provides evidence in favour of the notion that diversity has a positive effect on the IPO returns and the valuation in the short run. Hence, my results can support regulators and other stakeholders in their quest for increasing diversity in the technology sector.

7. Conclusion

In this last section of my research, I will present the answer to the initial research question and provide the concluding remarks. Furthermore, I will discuss the limitations of my research and provide the subsequent recommendations for future research.

7.1. Conclusion

The aim of this research was to examine whether a possible relationship between gender diversity on boards and IPO performance in the technology sector exists. By doing so, I make a twofold contribution to prior literature. First, the outcomes of this research can contribute to the wider societal debate on the relationship between board diversity and firm performance as well as the mixed empirical evidence that has been reported so far. Moreover, most of the prior research is focused on publicly listed firms and stock performance of large-cap stocks and there is less insight into the impact of board diversity in the context of unseasoned IPOs. Hence, this research also contributes to the scarce prior evidence on the relationship between gender diversity and firm performance in the IPO context. I specifically focus on technology stocks as this sector has been heavily criticized for the underrepresentation of women. To answer my research question and underlying hypotheses, I make use of linear regression models based on the Ordinary Least Squares (OLS) method. The sample consists of 297 U.S. technology IPOs that have taken place in the period 2009-2019. For the short-run, I test for the effects of gender diversity on underpricing and Tobin's Q. In addition, I expand my research to include long-run performance by testing for the impact of gender diversity on 3-year stock performance.

So, was Goldman Sachs' CEO David Solomon (Son, 2020, para. 5) right when he proposed that board diversity generates premium returns for shareholders? My findings provide evidence to support his opinion. To start, my research establishes a clear and positive effect of gender diversity on initial returns. This translates into higher gains for investors and higher amounts of 'money left on the table' for issuing firms. In addition, gender diversity also leads to an increase in Tobin's Q which implies that gender diversity is positively valued by the market. Furthermore, by examining differences in board composition, my results show that the established positive relationship between women on boards and underpricing becomes insignificant at the 15% mark. Put differently, if firms have more than one woman on board, the relationship between underpricing and gender diversity becomes insignificant. This is an interesting result, considering the propositions of token theory by Kanter (1977). She argues that firms may add a single woman on the board to function as a token of diversity rather than because of her skills. If this is the case, a woman on board may not be beneficial to board or firm performance, either due to a lack of skills or due to the inability to change current board and firm processes. In line with these propositions, my findings seem to indicate that investors acknowledge the possible existence and effects of tokenism if one woman serves on the board. However, the fact that this relationship becomes insignificant at the

15% mark shows that it is unlikely that investors perceive gender diversity to be a contributor to uncertainty *if* the firm has more than one woman on board.

Moreover, the fact that my research fails to confirm that a negative relationship between gender diversity and 3-year stock performance exists calls into question whether underpricing can be explained by uncertainty regarding the effects of gender diversity on future stock performance. In addition, the positive effect of diversity on Tobin's Q shows that the market positively values gender diversity. Although my research cannot provide conclusive evidence on what is the cause of this relationship, my results point toward a possible discrepancy in the valuation by the market and the issuing firm itself.

However, it is important to be cautious when drawing conclusions. First, one should acknowledge that underpricing remains a puzzling phenomenon. As discussed in the literature review, it is likely that underpricing is based on a complicated interplay of institutional, behavioral, control and uncertainty theories. These theories include different elements not incorporated in this research (and much of prior literature) such as investor irrationality and marketplace features. Hence, it is hard to make any definitive conclusions on the matter following a single theory, so further research is required to provide further insights. A second caveat of my research is that my findings may be affected by the general underrepresentation of women in the technology sector. Theories of groupthink propose that homogeneity in teams, here defined as the high number of men workers in the tech sector, may influence group processes. In turn, this may affect the way a woman in the tech sector is perceived or her ability to make a lasting impact on board processes as well as firm performance. Furthermore, the relatively low number of women working in tech may also have its own impact on the suitable pool of female candidates for board positions.

Nevertheless, my research clearly shows that a gender bias in the technology industry still exists. And although progress has been made throughout the years, the division of board positions based on gender is also still far from equal. If policy makers strive for equality in the top management teams, these results by itself should indicate how much progress is yet to be made and hence my research confirms the prior findings of those that have denounced the gender diversity issues in the technology sector. But more importantly, my results show that gender diversity does indeed influence IPO performance. More specifically, I establish that gender diversity has a positive effect on underpricing and short-run Tobin's Q. Hence, I hope that my findings can contribute to the current debate on the importance of diversity and provide ground to further stimulate gender diversity in the technology sector.

7.2. Limitations & recommendations

Finally, I will discuss the limitations of the research. These limitations may serve as a starting point for further research on the topics of gender diversity and IPO performance. More specifically, I make two recommendations for future research: the inclusion of personal characteristics of board members and the inclusion of the investors' perspective.

To start, a general limitation of this study may be the focus on a single sector. It may be the case that the unique characteristics of the technology sector have influenced the outcomes of this research, which may limit the generalizability of my findings to other industries and firms. In addition, the technology sector has proven to have relatively few women workers. If the average percentage of women working in tech is below average, this may automatically lead to fewer women on boards simply due to the limited availability of potential female board members. Furthermore, the fact that the technology sector is male dominated may, by itself, cause a change in dynamics due to homogeneity and groupthink, which could influence the outcomes of my research. Having mentioned these points, future research could examine a wider variation of sectors to determine if any inter-sectoral differences exists or that similar patterns are present in other sectors too. In addition, my research focuses on unseasoned equity offerings. Considering the prior findings of a positive relationship between gender diversity and firm performance in listed firms, it may be the case that outcomes are different when researching seasoned equity offerings (SEOs). Another limitation of this research is the focus on firms trading on U.S. stock exchanges. General differences in gender equality between countries as well as country-specific regulations could be of influence when researching the effects of gender diversity. Also, it is possible that inter-state differences exist in the United States. Similar to examining a wider variety of sectors, future research could examine IPOs in different countries to determine whether any country-specific factors influence the relationship between gender diversity and IPO performance or control for possible state differences within the United States.

Next, I would like to point out that this study does not control for other personal characteristics of board members apart from gender. Unobserved differences in personal backgrounds and characteristics may influence the outcomes of this research. For example, personal attributes and skills may impact board effectiveness and firm performance. It may thus be of interest to explore if other personal characteristics, such as age and professional background, mediate the relationship between gender diversity and IPO performance. Hence, future research could incorporate additional personal characteristics of directors to provide more detailed insights into the relationship established in my research.

These personal characteristics may also play an important role in investors' assessments of the company. Prior research in an experimental setting has shown that, after controlling for other factors, women CEOs are perceived as less capable than their male counterparts and that IPOs led by women are considered to be less attractive investment opportunities (Bigelow et al., 2012). This calls into question how investors perceive gender diversity on boards of firms going public and hence it is interesting to explore which attributes and/or characteristics investors use to assess the value of a firm going public. The outcomes of the research by Bigelow et al. (2012) and Cook & Glass (2011) seem hard to align with the fact that investors and other stakeholders increasingly express the need for more diversity and quality within boards. Moreover, my findings seem to indicate that the market does positively value gender diversity. Considering the importance of the role of investors in the IPO process, it seems rather puzzling that their role in the IPO process has remained relatively unexplored. After all, investor behaviour determines the valuation process and the level of interest can affect crucial activities in the IPO process such as the allocations, the offer price and the syndicate composition (Lamont & Thaler, 2003; Ljungqvist, Nanda, & Singh, 2006; Loughran & Ritter, 2002). Moreover, after going public, investor behaviour determines market prices and thus the extent of underpricing. Hence, it would be interesting to incorporate the investor's perspective into the research on IPO performance and to research whether different types of investors value gender diversity differently.

8. References

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Appendix A: The classification of technology stocks

To identify the list of firms relevant to my study, I follow the classification of technology stocks as proposed by Loughran & Ritter (2004) who define technology stocks as all internet-related stocks and any other technology stocks, excluding the biotechnology sector. In Appendix D of their paper, they present an index of 4-digit Standard Industrial Classification (SIC) codes that can be used for the identification of technology stocks. This index includes the following SIC codes: 3571, 3572, 3575, 3577, 3578, 3661, 3663, 3669, 3671, 3672, 3674, 3675, 3677, 3678, 3679, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7371, 7372, 7373, 7374, 7375, 7378, and 7379.

Professor Jay R. Ritter updated this definition of technology stocks in 2016. Subsequently, the SIC codes 3556, 3576 and 7389 are added. Another addition is made for the computer communications equipment code 3576. This is not an official SIC code, but a classification code used by the SEC for filings-review responsibility.

Professor Jay R. Ritter has a personal website with an extensive database for IPO data. The link to his webpage is: https://site.warrington.ufl.edu/ritter/.

Appendix B: Regression results using the number of women

Table B1: Short-run regression results, by number of women directors

	Dependent variable: Initial returns (%)				
Independent variable	Model 1	Model 2	Model 3	Model 4	Model 5
No. of women directors	0.0389***	0.0373***	0.0389***	0.0284**	0.0275**
	(0.0118)	(0.0120)	(0.0119)	(0.0113)	(0.0114)
No. of independent directors		0.0145**	0.0138**	0.00679	0.00673
		(0.00647)	(0.00670)	(0.00651)	(0.00652)
Board size		-0.00987	-0.0101	-0.0108	-0.0106
		(0.00726)	(0.00810)	(0.00753)	(0.00755)
Log of assets ($ Mil)			0.00604	-0.0332***	-0.0328***
			(0.00680)	(0.0105)	(0.0105)
Log of firm age (years)			-0.0244	-0.0137	-0.0141
			(0.0159)	(0.0153)	(0.0153)
High-tech dummy			0.0479**	0.0351**	0.0353**
			(0.0188)	(0.0178)	(0.0178)
Log of issue size ($ Mil)				0.101***	0.101***
				(0.0179)	(0.0179)
Retained equity (%)				0.0617*	0.0612*
				(0.0354)	(0.0354)
Top10 underwriter				-0.0143	-0.0140
				(0.0234)	(0.0235)
VC-backing dummy				0.0462**	0.0463**
				(0.0215)	(0.0215)
'Hot' market dummy					0.00993
					(0.0172)
Constant	0.126***	0.124***	0.128**	-0.184***	-0.188***
	(0.0115)	(0.0426)	(0.0540)	(0.0694)	(0.0698)
Observations	294	294	294	294	294
R-squared	0.036	0.052	0.083	0.222	0.223
Adjusted R-squared	0.032	0.042	0.064	0.195	0.193
F-statistic	10.81	5.32	4.34	8.08	7.35

Note. This table summarizes the regression results. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Unadjusted standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.

Table B2: Short-run regression results for Tobin's Q, by number of women directors

	Dependent variable: Tobin's Q				
Independent variable	Model 1	Model 2	Model 3	Model 4	Model 5
No. of women directors	0.0528	0.0755	0.116*	0.128*	0.125*
	(0.0731)	(0.0767)	(0.0673)	(0.0703)	(0.0720)
No. of independent directors		0.0296	-0.0512	-0.0497	-0.0498
		(0.0359)	(0.0345)	(0.0331)	(0.0332)
Board size		-0.0914**	0.0817*	0.0844*	0.0849*
		(0.0412)	(0.0444)	(0.0438)	(0.0440)
Log of assets ($ Mil)			-0.319***	-0.263***	-0.262***
			(0.0418)	(0.0673)	(0.0669)
Log of firm age (years)			0.0806	0.0758	0.0747
			(0.0820)	(0.0867)	(0.0867)
High-tech dummy			-0.0490	-0.0279	-0.0273
			(0.103)	(0.101)	(0.101)
Log of issue size ($ Mil)				-0.0891	-0.0900
				(0.115)	(0.114)
Retained equity (%)				0.00452	0.00317
				(0.213)	(0.214)
Top10 underwriter				-0.104	-0.104
				(0.189)	(0.190)
VC-backing dummy				0.0432	0.0435
				(0.141)	(0.141)
'Hot' market dummy					0.0271
					(0.102)
Constant	1.445***	1.953***	2.421***	2.595***	2.584***
	(0.0660)	(0.259)	(0.322)	(0.544)	(0.546)
Observations	294	294	294	294	294
R-squared	0.002	0.018	0.232	0.237	0.237
Adjusted R-squared	-0.002	0.008	0.216	0.210	0.207
F-statistic	0.56	1.82	14.48	8.78	7.96

Note. This table summarizes the regression results. The dependent variable is Tobin's Q. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.

Table B3: Short-run regression results, grouped by number of women on board

	Dependent variable: Initial returns (%)		
Independent variable	No women	One or more women	Two or more women
No. of women directors	-0.0399**	0.0399**	0.0272
	(0.0176)	(0.0176)	(0.0295)
No. of independent directors	0.00681	0.00681	0.00774
	(0.00653)	(0.00653)	(0.00656)
Board size	-0.00986	-0.00986	-0.0102
	(0.00755)	(0.00755)	(0.00762)
Log of assets ($ Mil)	-0.0330***	-0.0330***	-0.0346***
	(0.0105)	(0.0105)	(0.0106)
Log of firm age (years)	-0.0141	-0.0141	-0.0133
	(0.0153)	(0.0153)	(0.0154)
High-tech dummy	0.0363**	0.0363**	0.0335*
	(0.0178)	(0.0178)	(0.0179)
Log of issue size ($ Mil)	0.102***	0.102***	0.104***
	(0.0179)	(0.0179)	(0.0181)
Retained equity (%)	0.0581	0.0581	0.0540
	(0.0353)	(0.0353)	(0.0357)
Top10 underwriter	-0.0124	-0.0124	-0.0128
	(0.0235)	(0.0235)	(0.0237)
VC-backing dummy	0.0461**	0.0461**	0.0460**
	(0.0215)	(0.0215)	(0.0217)
‘Hot’ market dummy	0.0111	0.0111	0.0138
	(0.0172)	(0.0172)	(0.0173)
Constant	-0.160**	-0.200***	-0.191***
	(0.0720)	(0.0697)	(0.0711)
Observations	294	294	294
R-squared	0.221	0.221	0.209
Adjusted R-squared	0.191	0.191	0.179
F-statistic	7.28	7.28	6.79

Note. This table summarizes the regression results. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * p < 0.1; ** p < 0.05; *** p < 0.01. Unadjusted standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.

Table B4: Long-run regressions results, by number of women directors

	Dependent variable: Cumulative abnormal returns (%)				
Independent variable	3-months	6-months	12-months	24-months	36-months
No. of women directors	0.0145*	0.0161	0.0223	0.0182	0.0591*
	(0.00859)	(0.00996)	(0.0162)	(0.0188)	(0.0326)
No. of independent directors	0.00258	-0.00917	-0.00269	0.000720	-0.00842
	(0.00522)	(0.00797)	(0.0109)	(0.0160)	(0.0236)
Board size	0.00479	0.0115	0.00349	-0.0113	0.00937
	(0.00680)	(0.00984)	(0.0143)	(0.0230)	(0.0347)
Log of assets ($ Mil)	-0.00747	-0.00940	-0.00074	0.0141	0.0340
	(0.00902)	(0.0103)	(0.0184)	(0.0246)	(0.0409)
Log of firm age (years)	0.00468	0.0119	0.0397*	-0.00913	0.0285
	(0.0129)	(0.0173)	(0.0234)	(0.0311)	(0.0502)
High-tech dummy	-0.0138	0.0264	0.0300	0.0146	0.0233
	(0.0164)	(0.0210)	(0.0316)	(0.0373)	(0.0666)
Log of issue size ($ Mil)	0.00404	0.00312	0.00232	0.0526	-0.0268
	(0.0149)	(0.0193)	(0.0298)	(0.0415)	(0.0573)
Retained equity (%)	0.0321	0.0399	0.0391	0.169*	0.286*
	(0.0303)	(0.0455)	(0.0704)	(0.0930)	(0.148)
Top10 underwriter	-0.0118	-0.0234	-0.0486	-0.0932	-0.123
	(0.0239)	(0.0272)	(0.0464)	(0.0620)	(0.104)
VC-backing dummy	-0.0293	-0.0251	0.0442	0.0315	0.0894
	(0.0226)	(0.0260)	(0.0422)	(0.0524)	(0.0913)
‘Hot’ market dummy	0.000129	-0.000309	-0.000040	0.000008	-0.000557
	(0.000178)	(0.000246)	(0.000382)	(0.000427)	(0.000799)
Constant	-0.0605	-0.0225	-0.191	-0.336*	-0.320
	(0.0599)	(0.101)	(0.153)	(0.198)	(0.287)
Observations	294	294	294	294	294
R-squared	0.030	0.035	0.020	0.038	0.032
F-statistic	0.45	0.20	0.66	0.49	0.54

Note. This table summarizes the regression results using robust standard errors. Coefficients are displayed within this table under the effect columns without parentheses. The significance, sign and the magnitude can be interpreted. The stars indicate significance levels of either * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors are displayed within the parentheses under the coefficients. The total number of firms is 294. The sample consists of IPOs issued between 2009-2019 on U.S. stock exchanges. Closed-end funds, unit issues, follow-ons, best efforts & non-common stock transactions, depositary issues & limited partnerships, stocks with an offer price below $5 and outliers are excluded.