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Share repurchases in the context of board gender diversity and Covid-19

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Abstract

Using unique monthly data, I research the relation between board gender diversity and actual share repurchases for a sample of US listed firms during 2004-2020. I find that firms with more gender diverse boards repurchase more frequently than firms with less gender diverse boards, consistent with a higher quality of corporate governance induced by female director presence. Interestingly, the effect reverses during Covid-19, as firms with more gender diversity are less likely to repurchase than less gender diverse firms. Moreover, firms with more gender diverse boards pay a significantly higher price for their shares when repurchasing than firms with less gender diverse boards, due to richer public information disclosure resulting from greater gender diversity. During Covid-19 market timing ability persists, however I no longer find evidence of a significant gender discrepancy.

Keywords: Gender diversity, Share repurchases, Corporate governance, Pay-out policy, Market timing

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1 Introduction

Companies engaging in repurchases of their own stock reacquired around $1.5 trillion worth of shares over the combined years 2018 and 2019, just in the United States. Listed firms are again increasingly buying back shares since the financial crisis of 2007-2009. However, with the outbreak of the Covid-19 pandemic uncertainty increased and economic risks of a pandemic are all but trivial (Bloom, Cadarette, and Sevilla, 2018). With the possibility of a prolonged depression, companies retained more liquidity than before. In addition, companies were temporarily suspending nonessential cash outflows like share repurchases to remain prudent with available funds. The US government provided a supportive package for financial aid to companies, conditional on the fact that recipient companies are prohibited from conducting share repurchases during the year after full repayment of the financial aid. The impact of Covid-19 is therefore likely profound on the mere volume of share repurchases in the US. On the other hand, the observed stock market crash may have been a reason for companies to repurchase shares, as Jagannathan, Stephens, and Weisbach (2000) document that firms tend to conduct repurchases following a share price run down.

Executives of US companies overwhelmingly (86.4%) state that undervaluation is the primary reason to repurchase shares (see Brav et al., 2005). More recently, Fields (2016) surveyed board members and confirmed that undervaluation is still a prevailing rationale for a company to repurchase shares. Stock repurchases are a flexible pay-out alternative to dividends and the flexibility provided is a possible tool to exploit (perceived) underappreciation by the market (Jagannathan, Stephens, and Weisbach, 2000). If executives are capable of assessing whether their stock is valued correctly (i.e., 'time' the market), then firms are expected to obtain substantially lower repurchase prices than the average market price.

In general, the board of directors in a firm sets and authorises pay-out policies, including share repurchase programs. The quality of the board of directors is a key part of corporate governance, therefore the composition of the board influences decision making involving share repurchases. Boards with female members appear to have a significant positive impact on governance quality compared to historically male dominated boards, as gender diversity brings in different points of view leading to higher quality boardroom discussion of important decisions (Gul, Srinidhi, and Ng, 2011). As Adams and Ferreira (2009) show, female directors have better attendance records than their male counterparts and their presence leads to increased attendance levels of fellow male directors. In addition, more gender diverse boards allocate more effort to monitoring managerial actions and reports, and female directors are more likely to sit on monitoring committees. Gul, Srinidhi, and Ng (2011) show that the higher quality of corporate governance achieved through board gender diversity results in richer information provision to the public, improving the stock price informativeness. Chen, Leung, and Goergen (2017) show that firms with more female independent board members pay higher dividends. The increased pay-outs mitigate agency costs surrounding inefficient free cash flow usage

(Jensen, 1986). Therefore dividends, and consequently share repurchases, fulfil a corporate governance role.

Besides the increased governance quality of gender diverse boards, research shows that in financially related areas women are less prone to exhibiting overconfident behaviour than men (ranging from security trading to merger activity (Barber and Odean, 2001; Levi, Li, and Zhang, 2014)). The question arises whether less gender diverse boards' hypothetical overconfidence also affects repurchasing activity and perceptions of the company's undervaluation.

Prior research on the topic of timing of repurchases primarily focuses on two ways of addressing managerial ability to time the market. The first prevailing approach researches abnormal returns following the public announcement of a stock repurchase program (Lakonishok and Vermaelen, 1990; Ikenberry, Lakonishok, and Vermaelen, 1995; Chan, Ikenberry, and Lee, 2007; Manconi, Peyer, and Vermaelen, 2015). However, the timing of the announcement and the timing of the actual repurchases can be very different, as the period between announcement and actual completion of repurchases can span several years (Ikenberry and Vermaelen, 1996; Stephens and Weisbach, 1998). Moreover, the quantity repurchased deviates substantially during the lifetime of a repurchasing program. Previously, data limitations as to precise timing obstructed research on actual repurchases. With amendments to Securities and Exchange Commission (SEC) Rule 10b-18 firms are required to publish detailed information regarding open market share repurchases, on a monthly basis, in their quarterly financial reports. As of 2004, both the average price paid per share repurchased and the quantity repurchased in the open market are mandated disclosures. Following the implementation of the SEC amendment, the second prevalent approach in existing literature utilises monthly actual share repurchases made available through the SEC amendment (for example: Ben-Rephael, Oded, and Wohl, 2014; Dittmar and Field, 2015). With the current global situation around Covid-19, research opportunities on the timing of share repurchases during Covid-19 present itself.

Existing literature appears rather conclusive that companies are indeed able to time the market when conducting actual repurchases. Therefore, I take a more distinct point of view in this research, focusing on currently relevant topics: the effect of board gender diversity on repurchasing activity, the timing ability in relation to board gender diversity, and repurchases during Covid-19 in relation to board gender diversity. More specifically, I am particularly interested in addressing the following main questions: i) whether more gender diverse boards differ in terms of repurchase frequency and timing ability from less gender diverse boards; ii) whether repurchasing frequency and timing ability during the Covid-19 pandemic differ in relation to board gender composition. To construct a measure for market timing, I calculate the relative repurchase price as in Dittmar and Field (2015), defined as the relative difference between the average reported monthly repurchase price and to the average daily closing price. If repurchasing firms are able to time the market, then the relative repurchase price is significantly less than zero.

The first main question is twofold as it aims to reach a conclusion on both repurchasing frequency and timing ability. Regarding the frequency of repurchases, under the assumption that pay-outs are indeed a form of good corporate governance (Chen, Leung, and Goergen, 2017), it is expected that increased gender diversity on boards is associated with more frequent repurchases. Concerning the timing ability, under the assumption that the stock price is more informative in firms with a more gender diverse board, it is expected that the lower information asymmetry between the market and the board leads to reduced market timing opportunity. Alternatively, overconfidence on less gender diverse boards regarding the fair value of the share price can result in payment of a higher relative repurchase price. I research the dominant effect for the timing of repurchases through investigation of gender driven discrepancies in the relative repurchase price. Next, to address the second main question, as gender diverse boards are expected to be less risk taking due to the presence of female directors (Faccio, Marchica, and Mura, 2016), I hypothesise that in an uncertain period like the Covid-19 crisis, repurchasing activity is lower relative to less gender diverse boards. Finally, I research the relation between timing ability and board gender composition once more in the specific context of Covid-19.

I use data available through the SEC Rule 10b-18 amendment, reported in 10-K and 10-Q filings between the period from 2004 to 2020 from the SECs Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database. The data comprises actual monthly US share repurchases and is provided by the supervisor of this thesis Y. Li. I manually modify the repurchase dataset where adjustments are necessary. To extend the dataset, I obtain stock price information from the Center for Research in Security Prices (CRSP), used for examining the repurchase price paid by a firm in relation to the price paid for the same stock by an investor. Furthermore, I retrieve the cross-sectional firm level data from Compustat. I use BoardEx for data on board gender composition.

In terms of methodology, I employ univariate analysis to assess initially visible associations. During the univariate analysis, I make comparisons between subsamples which I split based on the degree of gender diversity to test for discrepancies regarding share repurchasing. Furthermore, to extend the prior analysis and provide definitive conclusions on the hypotheses, I present multivariate regression models that test for differences in both repurchasing behaviour and market timing discrepancies between more and less gender diverse boards.

I find conclusive evidence that firms are able to time the market during the entire sample period as the relative repurchase price is on average -1.01%, during January 2004 up until December 2020. More importantly, in the context of gender diversity I find that more gender diversity results in a significantly higher likelihood of performing a share repurchase under a publicly announced program, ceteris paribus, statistically significant at the 1 percent confidence level. The higher frequency of share repurchases is consistent with the provision of higher quality corporate governance through capital pay-outs. Moreover, I show that more gender diversity on the board results in a decreased ability to time the market, as firms with a theoretically maximised degree of gender diversity on the board

realise a 0.69% higher relative repurchase price than boards with exclusively male directors, controlling for firm characteristics and year and industry fixed effects. I reason that the decreased market timing ability is conditional on the increased level of information provision to the public, induced by a higher degree of gender diversity. In addition, restricting the observed period to the months during and after which Covid-19 was recognised as a pandemic, results in an interesting phenomenon; namely a reversal of the originally established positive association between gender diversity and repurchasing likelihood. Firms with a higher level of gender diversity appear to be more withholding in conducting repurchases in times of great uncertainty, which I argue originates from gender inherent risk attitudes (Faccio, Marchica, and Mura, 2016; Halton, 2020). The observed reversal is significant at the 1 percent confidence level, which provides robust evidence for the reduced likelihood to repurchase if the board is more gender diverse. Finally, I research the ability to time the market during the Covid-19 pandemic, where I again observe a different association than the previously drawn conclusion for the full sample. Here, I do not find a significant difference between more and less gender diverse boards in terms of timing ability during Covid-19, however on average firms were able to time the market, as firms repurchased at an average discount of -1.80% compared to other investors.

This paper extends literature in several ways. First, my research is relevant for the consequences of gender-based policy. In the current century, gender diversity and equal chances are receiving growing attention and several countries have adopted legislation requiring companies to achieve gender quotas on corporate boards. In 2003, Norway was among the first by mandating at least 40% female board representation for all publicly listed companies by the end of 2008. More recently in the US, California passed legislation that requires listed companies in the state to have at least one female board member by year-end 2019. My research is therefore key to research the consequences of gender diversity for corporate finance decisions like share repurchases. I contribute to literature by showing that gender diversity and female directors improve corporate governance quality. Second, I conduct topical and currently relevant research on the frequency and timing of share repurchases during Covid-19. Studying the effects of the Covid-19 crisis on publicly listed firms and repurchasing behaviour sheds light on corporate finance decisions in times of crisis. To the best of my understanding, little to no research has been conducted on this topic in the context of Covid-19, especially in relation to timing (Mazur, Dang, and Vo (2020) research repurchases during the Covid-19 crisis, however their paper does not cover timing and primarily investigates dividend policy). Last, I contribute to the existing literature on timing of share repurchases. Share repurchases have surpassed dividends in terms of total pay-out value (Yardeni, Abbott, and Quintana, 2020) and therefore repurchases are of increasing importance for corporate finance and governance. I extend literature by investigating the development in the context of board gender diversity.

In Section 2, I provide an overview and discussion of existing literature on gender diversity and the timing of share repurchases. Section 3 describes the data collection process, the methodology

and a sample description. Section 4 discusses the results of the impact of board gender composition on share repurchases, also in the context of Covid-19. Section 5 provides an overview and the concluding remarks to this paper including possible limitations and a discussion of alternative explanations.

2 Literature Review

Corporate pay-outs are a form of self-imposed discipline (Brav et al., 2005). By minimising the cash and cash equivalents on hand controlled by management, opportunities to invest or spend cash on suboptimal projects are reduced. One way to remove unneeded cash from the firm, lowering agency costs arising from free cash flows, is to increase the pay-outs to shareholders (Jensen, 1986). In addition, Rozeff (1982) argues that high pay-out ratios make firms more reliant on external financing. Every time the firm returns to the market for additional external capital, the firm is subject to scrutiny of institutional investors, financial analysts, and the press where the attention serves as a corporate governance mechanism. Thus, both the reduced opportunity to misuse free cash flows and the extra attention contribute to a higher quality of corporate governance.

Women in the boardroom tend to introduce different values and perspectives compared to their male counterparts which can influence certain decisions, but also create space for a wider range of issues to be discussed (Nielsen and Huse, 2010). Such a broadened focus can improve decision-making quality by considering a wider range of aspects before making a final decision. Adams and Ferreira (2009) show that gender diverse boards result in more effective corporate governance. Subsequently, the higher quality of corporate governance from a gender diverse board contributes to higher dividend pay-out ratios (Chen, Leung, and Goergen, 2017). Under the assumption that higher pay-outs in general are indeed a form of good corporate governance, then more gender diverse boards are intuitively associated with higher pay-outs via share repurchases. Thus, linking the existing evidence on female directors performing increased monitoring over male directors, to the corporate governance role served by pay-outs, I formalise my first hypothesis:

H1. *Firms with a more gender diverse board are more likely to repurchase shares than firms with a less gender diverse board.*

The decision of paying out via a share repurchase is closely related to the concept of market timing. Market timing refers to managerial private information on the underlying value of the stock, where the information can be used to decide on repurchases when the stock price is low. Whether firms are actually timing their repurchases is interesting as a repurchase below the fundamental value of a share can be regarded as a wealth transfer among investors, namely from selling to non-selling shareholders (Barclay and Smith, 1988). The idea here is that if firms repurchase below the fundamental share value, wealth is expropriated from uninformed investors willing to sell and proportionally transferred to retaining shareholders.

The notion of whether firms time open market share repurchases has received attention in preceding studies. Studies on the timing of actual open market repurchases include Bozanic (2010), De Cesari et al. (2012), Ben-Rephael, Oded, and Wohl (2014), and Dittmar and Field (2015). Ben-

Rephael, Oded, and Wohl (2014) use the regulation amendment to collect information about monthly actual share repurchases in the US from 10-K and 10-Q filings for the years 2004 to 2009. The authors find clear evidence that firms are able to repurchase their stock at a lower price than other investors. In addition, they find that the discount is especially pronounced for small firms and for growth firms (high market-to-book), compared to respectively large and value firms (low market-to-book). Also, they find that the repurchasing frequency is negatively related to the price discount obtained for repurchasing firms. Bozanic (2010) investigates the sample period of 2004-2006 and concludes that repurchasing firms are jointly timing the transaction and the availability of discretionary cash flows. In addition, the author shows that firms in competitive industries repurchase less compared to firms operating in less competitive environments. Alongside Bozanic (2010), De Cesari et al. (2012) uses the SEC amendment for research, studying repurchase transactions from February 2004 to July 2006. The authors investigate whether companies time open market repurchases and posit that, on average, repurchase prices are lower than comparable market prices. Similarly, Dittmar and Field (2015) conduct research on monthly actual repurchases, but for a larger sample of US firms covering an extended period from 2004 to 2011. They examine the characteristics of frequent and infrequent repurchasers and show that the repurchasers' characteristics differ significantly. Firms repurchasing more frequently appear to be larger, more profitable, and have a higher market-to-book ratio. The ability to time the market is negatively related to the frequency at which a firm repurchases. The authors suggest that firms repurchasing more frequently are probably repurchasing for reasons other than inaccurate valuation, considering that infrequent repurchasers realise the largest relative discount. Conclusively, studies on the topic of open market share repurchases are congruent in the sense that companies appear to possess timing ability for repurchases in the open market.

Brav et al. (2005) show that stock repurchases are conducted primarily to exploit undervaluation of the stock. The undervaluation is based on information asymmetry between insiders and shareholders which causes a firm's value to be wrongly appreciated in the market (Dittmar, 2000). Critically, the undervaluation is perceived and with that can be merely subjective and wrong, as managers may hold inaccurate beliefs surrounding the valuation of their employer's stock (Baker, Powell, and Veit, 2003). As such, attempted timing of share repurchases does not per definition result in the realisation of repurchases at a relative discount.

As the undervaluation of the share price is not per definition objective, gender driven overconfidence may be a leading determinant of market timing in repurchasing activity. In general, women are found to be less overconfident than men. In the context of finance, Barber and Odean (2001) are among the first to show the discrepancy, for a sample of male and female security traders. Based on their dataset comprising a sample of retail investors, men trade more than their female counterparts, engaging in more value destroying trades which are ex-ante perceived to be value adding. The authors posit that overconfidence in male trading behaviour is the leading factor resulting in value destroying trading behaviour. Adding to the literature on diversity, Levi, Li, and Zhang

(2014) conduct research on the topic of mergers in relation to director gender. They hypothesise that female board directors are less overconfident than their male counterparts and therefore there is arguably are greater likelihood that male directors overestimate merger gains. The results confirm their expectations, showing both higher frequency of merger bids and higher bid premiums for less gender diverse boards. Overall, their findings show that more gender diverse boards create shareholder value in relation to merger activity. As undervaluation is the most prevalent motivation to repurchase shares, I reason that overconfidence may result in higher actual relative repurchase prices for less gender diverse boards, as less gender diverse boards are more likely perceive their stock to be undervalued.

Besides the apparent overconfidence discrepancy, Gul, Srinidhi, and Ng (2011) find that gender diverse boards improve the quality of public information disclosure through the increased monitoring. As a result, gender diverse boards provide richer information to the public, improving the stock price informativeness. Intuitively, with more information publicly provided, timing opportunities for more gender diverse boards are reduced, making it more challenging for managers to time the market when repurchasing shares.

I hypothesise that overconfidence and information asymmetry are both possible factors driving discrepancies in timing ability in relation to gender diversity on boards. As stated, undervaluation is the most frequently cited reason for actual share repurchases. Reasoning from overconfidence, more gender diversity is expected to result in reduced overconfidence, translating into a lower likelihood of perceived share undervaluation by the board. Assuming that less gender diverse boards are more likely to overestimate the fair value of their own stock, then the discount realised on share repurchases is expected to be higher for more gender diverse boards as more gender diversity results in a lower likelihood of perceived undervaluation. Alternatively, more gender diversity reduces timing opportunity through richer public information provision. Thus, considering both conflicting influences, I do not make a clear prediction of the expected effect's direction from gender diversity on timing ability. This results in the second hypothesis:

H2. *Boards with more gender diversity realise a significantly different relative repurchase price from boards with less gender diversity.*

Recently the Covid-19 crisis led to a unique shock which triggered governments to shut down parts of the economy, when uncertainty existed around the profoundness of the impact. In response to the first phase of the crisis, which was characterised by the highest degree of uncertainty, firms drew down bank credit lines and raised cash levels (Acharya and Steffen, 2020). In addition to piling up and securing cash, companies became more prudent with existing funds and capital projects. Uncertainty around a prolonged effect caused firms to engage in a string of actions aimed at reducing cash outflows. Intuitively, a prime candidate for cash savings would be the suspension of share repurchases, as repurchases are flexible and less sticky than dividends (Ikenberry and Vermaelen, 1996). Firms can

suspend cash outflows on share repurchases without hurting investor expectations up to the extent suspension of dividends would. Pettenuzzo, Sabbatucci, and Timmermann (2021) estimate that between March and December of 2020 firms suspended $140bn worth of share buybacks (and $86bn worth of dividends) in response to the pandemic. Interestingly, the authors show that firm size is not a primary driver of pay-out policy suspension, whereas Dittmar and Field (2015) show that larger firms are significantly more likely to repurchase shares. Firm size only appears to play a small role in explaining cross-sectional repurchase suspension variation.

Uncovered in the context of Covid-19 remains the effect of gender diversity. Corporate reactions to a high degree of uncertainty around future cash flows and limited access to financial markets, are likely influenced by the quality of corporate governance. As reasoned before, board gender composition is expected to influence corporate governance quality, however also the degree of risk-taking behaviour. Faccio, Marchica, and Mura (2016) show that female CEOs are in general more inclined to avoid risky options in capital allocation decisions. Moreover, Halton (2020) shows that female directors often delve deeper into the details, examining the risks that are inherent to a decision, while also considering the way in which these risks can be mitigated or managed. Therefore, the general presence of female directors is expected to result in a lower degree of risk-taking behaviour. I hypothesise that companies with a gender diverse board are less likely to repurchase shares in the first phase of the Covid-19 crisis due to the prevailing uncertainty in relation to gender risk attitudes. More specifically, this results in the third hypothesis:

H3. *Boards with more gender diversity are significantly less likely to repurchase shares during the first phase of the Covid-19 crisis compared to boards with less gender diversity.*

Finally, I research the second hypothesis for a limited period covering the Covid-19 crisis. More specifically, I investigate the relation between board gender diversity and timing ability in the context of Covid-19 resulting in the fourth and final hypothesis:

H4. *Boards with more gender diversity realise a significantly different relative repurchase price during the first phase of the Covid-19 crisis compared to boards with less gender diversity.*

3 Data and Methodology

3.1 Data

The supervisor provided a newly collected dataset of monthly US actual share repurchases spanning the period between 2004 and 2020. In 2003, the SEC amended Rule 10b-18 and included additional reporting requirements to enhance transparency of share repurchases. Since 2004, firms are required by the SEC to disclose data on monthly actual share repurchases when filing forms 10-K and 10-Q. The disclosure requirement concerns all repurchases of equity securities in the last fiscal quarter and comprises the following information: the total number of shares repurchased, the average repurchase price per share, the number of shares repurchased as part of a publicly announced program, and the number of shares remaining available for repurchase under the announced repurchase program(s). The repurchase data is obtained from the SEC EDGAR database, more precisely from firms' 10-K and 10-Q filings. The firms included in the dataset are firms that had ordinary shares trading during (part of) the sample period on either the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX), or the National Association of Securities Dealers Automated Quotations (NASDAQ).

Henceforth, I distinguish between the total number of shares repurchased and the number of shares repurchased as part of a publicly announced program. The total number of shares repurchased occasionally includes share transactions that are not performed through the open market nor are they intended repurchases. For example, firms record shares surrendered to satisfy tax withholding obligations in connection with the vesting of restricted stock as a repurchase. Such withheld shares are not actual repurchases nor are they open market transactions; thus, such transactions are not indicative of corporate governance quality provision through gender diversity, nor do they provide any market timing opportunities. On the other hand, shares repurchased as part of a publicly announced program, are virtually always open market transactions, driven by a conscious decision whether to repurchase or not.

The sample consists of monthly observations and covers 204 months between January 2004 and December 2020. I manually inspect and record data from the 2020 filings where the desired information cannot be extracted by means of an algorithm. In addition, I use the filings' footnotes to exclude tender offer repurchases and privately negotiated repurchases from shares repurchased as part of a publicly announced program, as such repurchases at special prices are not performed through the open market. Moreover, I eliminate accelerated share repurchases as accelerated share repurchases are not performed at the time of reporting, but in the open market during several months (Michel, Oded, and Shaked, 2010). The transaction's average repurchase price is also adjusted for the excluded abovementioned transactions.

To complement the sample, I obtain data from BoardEx on board gender composition which is available on an annual basis sourced from annual report publications. I use the most recent annual

board composition information at each monthly repurchase observation in my analysis. I obtain data on trading volume, monthly prices, outstanding shares, and industry classification (SIC codes) from the CRSP Monthly database accessed via Wharton Research Data Services (WRDS). I use data on daily stock trading information from CRSP Daily. I use the daily data to construct monthly measures for six-month prior returns, price volatility, and average prices. From the daily data I eliminate observations that concern a delisting, as stock price performance for delisted returns is generally suffering from an upward bias (Shumway, 1997). Furthermore, I obtain annual data on accounting variables from Compustat. Similar to the treatment of data on board gender diversity, I use the most recently available fiscal-year end accounting data for the following firm-months. Based on the Central Index Key (CIK) and CUSIP codes I merge the cross-sectional data with the repurchase data provided by the supervisor.

3.2 The relative repurchase price

As a proxy for managerial timing ability, I use the relative repurchase price (RRP). If managers are able to time the market, it is expected that firms pay a significantly lower price than investors during that same period. Thus, the relative repurchase price is defined as the average price paid during the repurchase month (from the 10-K report) divided by the comparison price, following the definition from Dittmar and Field (2015). For the comparison price, I use the average closing price in the market for a certain interval surrounding the firm's share repurchase. For each monthly observation, I calculate the average closing price using daily stock price information. Based on the comparison price, I calculate the relative repurchase price for both shares repurchased as part of a publicly announced program and total shares repurchased.

In practice, the executives decide when a repurchase of shares occurs. Jagannathan, Stephens, and Weisbach (2000) show that firms are more likely to repurchase after a price rundown. If executives are attempting to time the market, logically they will buy not only at a price that is low compared to the preceding months, but also compared to the future from their point of view. Therefore, to arrive at a more comprehensive conclusion on timing ability surrounding share repurchases, I calculate the relative repurchase price in relation to both backward-looking and forward-looking comparison price windows. More specifically, I estimate the relative repurchase price for one-, three-, and six-month windows surrounding the repurchase firm-month, and before the repurchase firm-month. The rationale for the measure that is both forward- and backward-looking, is that executives are the people deciding during which windows to repurchase and, if they are timing the market, executives will choose to repurchase when share prices are low within that window. Thus, if a manager is attempting to time the market, (s)he can use private information to decide whether the current moment is a good option to repurchase shares, which would be reflected in the relative repurchase price for both forward-looking and backward-looking estimates.

3.3 Methodology

More and less gender diverse boards are hypothesised to exhibit differing share repurchasing behaviour in terms of both frequency and timing ability. I use two measures for board gender diversity throughout this research namely the previously mentioned gender ratio, and an additional binary variable indicating whether a firm has one or more female directors on the board, or none. I employ the binary indicator in addition to the proportional gender division, as a single female director on a board can already have a profound impact by bringing an additional dimension of perspectives to the table (Halton, 2020). Moreover, female directors tend to adopt a collaborative and open discussion style that actively aims to build mutual understanding. Such influences are present on boards with at least a single female director but absent on boards lacking any gender diversity. In addition, Chen, Crossland, and Huang (2016) argue that even a single female board member results in more thorough board discussion compared to boards with exclusively male members, reasoning from social identity theory. A binary variable for the presence of female directors is therefore a solid measure that can support my assessment of the effects of gender diversity on decision making.

To formulate a conclusion on *H1* and *H2*, I research the dependency of repurchasing activity on board gender composition. First, to investigate *H1* I create subsamples of firms, split based on the presence or absence of any female board members. Subsequently, the subsamples are tested for the existence of a statistically significant difference in terms of repurchasing frequency. To complement the univariate analysis, I perform multivariate analysis where I utilise a probit model to test for a firm's decision to repurchase in relation to gender diversity while controlling for firm characteristics. Second, to test *H2* I research the association between board gender diversity and market timing ability, where I regress the relative repurchase price on the measures for gender diversity, also including controls for firm characteristics. The (probit) regressions include controls for year fixed effects and industry fixed effects based on two-digit SIC codes, with clustered standard errors at the firm level. Subsequently, I conduct further analysis of the effect of board gender diversity on share repurchase frequency and timing ability for a smaller interval surrounding the Covid-19 pandemic. The hypotheses related to Covid-19, *H3* and *H4*, are researched using the same methodology applied for researching *H1* and *H2*. For *H3*, I initially refer to the sample splitting methodology performed for *H1* to assess how repurchase frequency differs in relation to board gender composition during Covid-19. Besides, to extend the univariate results, I once more employ a probit regression where the details are similar to the setting described in the prior paragraph. Last, to finalise my research and form a conclusion on *H4*, I perform multivariate regressions of the relative repurchase price surrounding repurchases during Covid-19. Here I regress the relative repurchase price on board gender diversity and other firm characteristics, similar to the approach taken to investigate board gender diversity and timing ability during the full sample period. Ultimately, the analysis of the relative repurchase price during the pandemic leads to a conclusion on whether companies are able to time the market via share repurchases during the Covid-19 crisis in the context of board gender diversity.

TABLE 1

Descriptive statistics by female director presence

	Full sample	Female director		Difference
		No	Yes	
	(1)	(2)	(3)	(4)
Total assets (millions)	9,124	1,267	15,207	13,940***
	(602)	(210)	(1,363)	
Market-to-book	1.828	2.037	1.667	-0.370***
	(1.116)	(1.165)	(1.079)	
Return on assets	-7.78%	-13.88%	-3.10%	0.108***
	(1.49%)	(0.81%)	(2.17%)	
Leverage	22.54%	21.36%	23.45%	0.021***
	(15.53%)	(11.37%)	(18.26%)	
Cash-to-assets	14.68%	17.52%	12.48%	-0.050***
	(7.56%)	(9.80%)	(6.17%)	
Stock volatility	3.68%	4.33%	3.21%	-0.011***
	(2.59%)	(3.04%)	(2.26%)	
Prior six-month return	4.42%			
	(5.55%)			
Gender ratio	0.901	1.000	0.823	-0.177***
	(0.900)	(1.000)	(0.857)	
Female directors	0.916	0.000	1.636	1.636***
	(1.000)	(0.000)	(1.000)	
Number of directors	8.343	7.006	9.395	2.390***
	(8.000)	(7.000)	(9.000)	
N observations	677,324	298,700	378,624	

Table 1 reports descriptive statistics for the full sample and two subsamples categorised based on the presence of at least a single female director. Means of each subsample are displayed, with between brackets the median values for the specified statistic. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables, except for measures for gender diversity, are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. The descriptive statistics are based on monthly data covering the period between January 2004 and December 2020. I only present the average and median yet do not present the split for characteristic Prior six-month return, as the difference is not based on firm-level data but the aggregated market, therefore for a given month the data is exactly the same for every firm.
*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively, using Welch's t-test.

3.4 Sample statistics

Table 1 reports the descriptive statistics on firms included in the sample. The table reports separate statistics for the full sample, a sample of firms without a female director, and a sample of firms with at least a single female director on the board. Each of the differences between firm characteristics for firms with and without a female director is statistically significant as shown by Welch's t-test. I use Welch's t-test, as it is more robust than Student's t-test. Welch's t-test can be employed regardless of the presence of equal variances and balanced sample sizes, which makes application easier and more direct. Even when the samples' variances are equal and the sizes are balanced, the power of Welch's t-test is comparable to that of Student's t-test. As such, Welch's t-test does not require pretesting of equal variances, and application is without any large disadvantages compared to Student's t-test. In addition, Welch's t-test remains robust for large sample sizes (Welch, 1947). The significant difference across all descriptive statistics implies that firms with and without female directors differ substantially across all the shown firm characteristics.

One of the main variables of interest in Table 1 is the gender ratio. Gender ratio is defined as the number of male directors to total board size and, as such, lower values indicate a higher degree of gender diversity (that is, up until the point where the ratio equals 0.5 where theoretically the maximum level of gender diversity is realised; only for 3,567 observations this variable takes a value of 0.5 or lower, so generally speaking a lower ratio will result in a higher degree of gender diversity, for the observations in the sample). The mean value of 0.901 shows that between 2004 and 2020 the average percentage of female directors on boards is approximately 10%.

For the full sample, the mean of total assets is substantially higher than the median, implying that there is positive skewness present in this variable. To mitigate possible concerns around the influence of outliers, I use the natural logarithm of total assets in the analysis to follow. Overall, Table 1 shows that firms with at least one female director are significantly larger as measured by assets, have a lower market-to-book ratio, a higher return on assets, a lower share of assets as cash, and a lower stock price volatility. As there exists a statistically significant difference between more and less gender diverse firms across every statistic, there may be multicollinearity issues, i.e., the control variables may be highly correlated with the measures for gender diversity. To investigate possible concerns regarding redundancy of information in the multivariate analysis, I generate a correlation matrix containing both Pearson and Spearman correlations in Table 2.

Based on the correlation coefficients between the control variables and the measures for board gender diversity (Gender ratio and Female dummy), there is no multicollinearity present when either of the gender diversity measures is included alongside any control variable. The non-existence of high correlations implies that there is no redundancy of information by simultaneously adding any of the variables to a multivariate specification. The different windows for the relative repurchase price exhibit high correlation among one another, similar to the two measures for board gender diversity, however multiple variables from either of the two groups are not included simultaneously in any regression.

Besides, an interesting inference from Table 2 in relation to the hypotheses, is the consistent negative sign of the correlations between gender ratio and all measures for marketing timing (i.e., the relative repurchase price). The consistent negative sign of the correlation with gender ratio implies that firms with a higher proportion of male directors on the board are associated with a lower relative repurchase price. In addition, the positive Spearman correlations between the female director dummy and all windows of the relative repurchase price shows that having at least a single female director on the board is associated with higher relative repurchase prices. With that, the correlations provide some evidence for the existence of a negative association between gender diversity and market timing ability.

To wrap this section up, I provide some descriptive statistics on the relative repurchase price in Table 3. I find that on average the relative repurchase price is negative for the full sample period, which provides evidence for the existence of market timing. The table distinguishes between firm-

TABLE 2

Correlation matrix

	Gender ratio	Female dummy	Ln Assets	Market-to-book	Return on assets	Leverage	Cash-to-assets	Prior six-month return
Gender ratio		-0.7649*	-0.3458*	-0.0449*	-0.0805*	-0.1257*	0.0568*	-0.0443*
Female dummy	-0.8098*		0.4076*	-0.0117*	0.0546*	0.1424*	-0.1139*	0.0459*
Ln Assets	-0.3344*	0.4077*		-0.1414*	0.0100*	0.3441*	-0.2934*	0.0496*
Market-to-book	0.0325*	-0.0686*	-0.3554*		-0.6847*	0.0394*	0.4457*	0.0433*
Return on assets	-0.0924*	0.1223*	0.4331*	-0.5181*		-0.0695*	0.2872*	-0.0075*
Leverage	-0.0377*	0.0384*	0.0551*	0.1632*	-0.2573*		-0.3193*	0.0267*
Cash-to-assets	0.0840*	-0.1350*	-0.4366*	0.3676*	-0.3273*	-0.1553*		0.0082*
Prior six-month return	-0.0256*	0.0205*	0.0090*	0.0347*	-0.0034*	0.0061*	0.0066*	
Volatility	0.0544*	-0.0731*	-0.1869*	0.0108*	-0.2326*	0.0409*	0.1107*	-0.0553*
RRP	-0.0158*	0.0243*	0.0230*	-0.0422*	-0.0446*	0.0252*	-0.0198*	-0.0349*
RRP+1	-0.0062*	0.0098*	0.0130*	-0.0295*	-0.0529*	0.0240*	-0.0181*	0.1338*
RRP+3	0.0006	-0.0044	0.0026	-0.0228*	-0.0625*	0.0254*	-0.0192*	0.2716*
RRP+6	0.0064*	-0.0145*	-0.0031	-0.0229*	-0.0545*	0.0268*	-0.0224*	0.3885*
RRP±1	-0.0225*	0.0300*	0.0321*	-0.0275*	-0.0433*	0.0303*	-0.0213*	0.0410*
RRP±3	-0.0337*	0.0406*	0.0454*	0.0104*	-0.0373*	0.0300*	-0.0271*	0.1556*
RRP±6	-0.0395*	0.0469*	0.0558*	0.0452*	-0.0002	0.0205*	-0.0312*	0.2468*

	Volatility	RRP	RRP+1	RRP+3	RRP+6	RRP±1	RRP±3	RRP±6
Gender ratio	0.2268*	-0.0240*	-0.0182*	-0.0115*	-0.0082*	-0.0343*	-0.0423*	-0.0485*
Female dummy	-0.2643*	0.0313*	0.0241*	0.0138*	0.0080*	0.0437*	0.0527*	0.0581*
Ln Assets	-0.4343*	0.0261*	0.0195*	0.0107*	0.0089*	0.0493*	0.0681*	0.0788*
Market-to-book	-0.0543*	-0.0599*	-0.0413*	-0.0364*	-0.0344*	-0.0300*	0.0139*	0.0484*
Return on assets	-0.1486*	-0.0659*	-0.0598*	-0.0547*	-0.0500*	-0.0530*	-0.0317*	-0.0085*
Leverage	-0.1366*	0.0283*	0.0199*	0.0119*	0.0083*	0.0409*	0.0428*	0.0421*
Cash-to-assets	0.1999*	-0.0374*	-0.0371*	-0.0414*	-0.0471*	-0.0413*	-0.0418*	-0.0424*
Prior six-month return	-0.2473*	-0.0107*	0.1264*	0.2442*	0.3602*	0.0577*	0.1537*	0.2240*
Volatility		-0.0241*	-0.0141*	-0.0031	0.0016	-0.0652*	-0.1251*	-0.1859*
RRP	0.0284*		0.6714*	0.4204*	0.3019*	0.6782*	0.4508*	0.3294*
RRP+1	0.0395*	0.7909*		0.7950*	0.6042*	0.7930*	0.6212*	0.4762*
RRP+3	0.0503*	0.5235*	0.8384*		0.8742*	0.6110*	0.7091*	0.6257*
RRP+6	0.0427*	0.3792*	0.6573*	0.9001*		0.4649*	0.6228*	0.6945*
RRP±1	0.0411*	0.8154*	0.8356*	0.6578*	0.5091*		0.7971*	0.6063*
RRP±3	0.0299*	0.5944*	0.6879*	0.7183*	0.6288*	0.8586*		0.8744*
RRP±6	-0.0009	0.4423*	0.5316*	0.6333*	0.6784*	0.6781*	0.9016*	

Table 2 reports the Pearson (Spearman) correlations below (above) the diagonal. I use the Spearman correlations in addition to the Pearson correlations to account for nonlinearity in the correlations of variables that tend to change together but no necessarily at a constant rate (e.g., the dummy variable for the presence of female directors or not). All variables, except for measures for gender diversity and the natural logarithm of assets, are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers.
* Indicates that the correlation coefficient is significantly different from zero, at the 5 percent confidence level.

month observations where there is at least a single female director present on the board, and observations without any female directors present. The percentage point difference between these two groups is displayed in Column (4), which provides conclusive evidence of a statistically significant difference between more and less gender diverse firms in terms of market timing ability. During the

TABLE 3

Relative repurchase price under a publicly announced program, by female director presence

	Full sample	Female director		Difference
		No	Yes	
	(1)	(2)	(3)	(4)
RRP	-1.01%	-1.22%	-0.93%	0.0029***
	(-0.31%)	(-0.51%)	(-0.26%)	
RRP+1	-1.27%	-1.78%	-1.09%	0.0070***
	(-0.43%)	(-0.89%)	(-0.31%)	
RRP+3	-1.55%	-2.65%	-1.15%	0.0150***
	(-0.50%)	(-1.50%)	(-1.78%)	
RRP+6	-1.47%	-3.31%	-0.82%	0.0249***
	(-0.24%)	(-1.96%)	(-0.29%)	
RRP±1	-1.36%	-1.72%	-1.23%	0.0049***
	(-0.72%)	(-1.18%)	(-0.60%)	
RRP±3	-1.88%	-2.63%	-1.61%	0.0103***
	(-1.17%)	(-1.99%)	(-0.93%)	
RRP±6	-2.25%	-3.48%	-1.81%	0.0167***
	(-1.53%)	(-2.77%)	(-1.17%)	

Table 3 reports descriptive statistics on the relative repurchase price for the full sample and two subsamples categorised based on the presence of at least a single female director. The displayed statistics are based on firm monthly data covering the period between January 2004 and December 2020. Means of each subsample are displayed, with between brackets the median values for the specified statistic. The relative repurchase price is the average price paid per share repurchased under a publicly announced program in a given month compared to the average price paid in the market during one, three, and six months before/before and after the given repurchase firm-month. All measures for market timing are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers.
*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively, using Welch's t-test.

full sample period, firms with a female director repurchase on average at a price that is 0.93% cheaper than the average daily closing price, whereas firms without a female director repurchase 1.22% cheaper, a significant difference of 0.29 percentage points. The ability to time the market becomes more profound when the comparison price is based on the average daily closing price during the months preceding repurchase. This finding is consistent with Jagannathan, Stephens, and Weisbach (2000) that also provide evidence of firms repurchasing shares after a stock price rundown. Moreover, the repurchase price compared to both the prospective and retrospective price is lower than the retrospective relative repurchase price, which implies that managers are able to time the future market up to some extent as well.

4 Results

This section discusses the primary objective of this research, namely to test the hypotheses developed in Section 2. These hypotheses are aimed at exploring the link between share repurchasing behaviour and the gender composition of boards. Hereafter, I will discuss the hypotheses in separate subsections: in subsection 4.1, I test for discrepancies in repurchasing frequency; in subsection 4.2, I investigate the market timing ability of share repurchases in relation to board gender composition; and in subsection 4.3, I discuss the same topics as in the prior two subsections, specifically in the context of the Covid-19 pandemic.

4.1 Repurchasing decisions and gender diversity

H1. *Firms with a more gender diverse board are more likely to repurchase shares than firms with a less gender diverse board.*

In this subsection I investigate the relation between repurchasing frequency and board gender diversity. First, I create two subsamples that are split based on the presence of at least one female director in the observed firm-month. Next, to complement this analysis I utilise a probit model where the dependent variable takes the value of one in months where there is repurchasing activity and the value of zero for months where there is no repurchasing activity. The probit analysis uses two different specifications, covering both measures for gender diversity and is performed for separately shares repurchased as part of a publicly announced program and all share repurchases.

The findings for the subsample analysis are reported in Table 4 and Table 11. Table 11 is comparable in terms of methodology and findings to Table 4 except that it covers total repurchases instead of shares repurchased as part of a publicly announced program, and is included at the end of this manuscript for conciseness purposes. I calculate the number of repurchasing months as a percentage of the total months for the full sample (Column (1)), and for subsamples of firms with (Column (2)) or without (Column (3)) a female director. The table also contains a percentage gap (Column (4)) which measures the difference in repurchase activity between firms with and without a female director. As shown in Column (4), the percentage gap is consistently positive which means that firms with a female director repurchase more often than firms without a female director. The difference is significant across all years as shown by Welch's t-test. Importantly, the analysis employs univariate tests, which do not control for other firm characteristics. Nevertheless, relating the table to *H1*, it appears that firms with female directors are associated with statistically significantly more frequent share repurchases than firms without. In addition, an interesting further conclusion from Table 4 is that the difference in repurchasing frequency between more and less gender diverse firms appears to be growing until 2008. However, the difference shrinks substantially in 2008 (during the global financial crisis) as firms with female directors repurchased less frequently, whereas firms without female directors actually increased repurchases to the highest level throughout the entire period. Perhaps the difference between the columns for 2008 may be indicative of the mentioned

TABLE 4

Repurchasing frequency (under a publicly announced program) in relation to female director presence

Year	Number of repurchase months / Total months (%)	Female director		Difference
		No	Yes	
	(1)	(2)	(3)	(4)
2004	4,768 / 39,418	1,545 / 20,827	3,223 / 18,591	
	(12.10%)	(7.42%)	(17.34%)	0.0992***
2005	6,354 / 45,428	2,103 / 23,780	4,251 / 21,648	
	(13.99%)	(8.84%)	(19.64%)	0.1079***
2006	6,713 / 47,657	2,176 / 24,845	4,537 / 22,812	
	(14.09%)	(8.76 %)	(19.89%)	0.1113***
2007	7,565 / 47,587	2,481 / 24,215	5,084 / 23,372	
	(15.90%)	(10.25%)	(21.75%)	0.1151***
2008	7,138 / 47,232	2,838 / 24,037	4,300 / 23,195	
	(15.11%)	(11.81%)	(18.54%)	0.0673***
2009	3,914 / 45,675	1,628 / 23,178	2,286 / 22,497	
	(8.57%)	(7.02%)	(10.16%)	0.0314***
2010	4,531 / 43,125	1,493 / 21,025	3,038 / 22,100	
	(10.51%)	(7.10%)	(13.75%)	0.0665***
2011	5,911 / 41,502	1,826 / 19,729	4,085 / 21,773	
	(14.24%)	(9.26%)	(18.76%)	0.0951***
2012	6,129 / 40,424	1,783 / 18,286	4,346 / 22,138	
	(15.16%)	(9.75%)	(19.63%)	0.0988***
2013	4,797 / 39,375	1,207 / 16,951	3,590 / 22,424	
	(12.18%)	(7.12%)	(16.01%)	0.0889***
2014	6,548 / 38,591	1,527 / 15,893	5,021 / 22,698	
	(16.97%)	(9.61%)	(22.12%)	0.1251***
2015	6,569 / 38,084	1,368 / 14,907	5,201 / 23,177	
	(17.25%)	(9.18%)	(22.44%)	0.1326***
2016	6,097 / 37,097	1,244 / 13,807	4,853 / 23,290	
	(16.44%)	(9.01%)	(20.84%)	0.1183***
2017	5,351 / 35,251	810 / 12,487	4,541 / 22,765	
	(15.18%)	(6.49%)	(19.95%)	0.1346***
2018	6,124 / 33,816	859 / 11,071	5,265 / 22,745	
	(18.11%)	(7.76%)	(23.15%)	0.1539***
2019	5,783 / 32,518	633 / 9,190	5,150 / 23,328	
	(17.78%)	(6.89%)	(22.08%)	0.1519***
2020	1,063 / 24,544	100 / 4,472	963 / 20,072	
	(4.33%)	(2.24%)	(4.80%)	0.0256***
Full sample	95,355 / 677,324	25,621 / 298,700	69,734 / 378,624	
	(14.08%)	(8.58%)	(18.42%)	0.0984***

Table 4 reports the difference in repurchasing frequency of repurchases, performed under a publicly announced program, by female director presence, based on firm-monthly observations between January 2004 and December 2020. If there is a single female director present the observation qualifies for Column (3) 'Yes', otherwise the observation is included in Column (2) 'No'. The table displays the number of months in which a repurchase under a publicly announced program occurred, compared to the total number of months included in the sample. The percentage of months during which a repurchase under a publicly announced program occurred is shown between the brackets. *, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively, using Welch's t-test.

lower risk tolerance of female directors (Faccio, Marchica, and Mura, 2016), resulting in conservative application of financial policy in times of crisis. After 2009, the percentage gap starts to increase once more, reflecting the recovering repurchasing activity which is primarily driven by firms with female directors. Again, it must be noted that it is difficult to draw any definitive conclusion as the results exclude other firm characteristics and as shown in Table 1, significant differences exist between firm observations with and without female directors. Table 11, included at the end of this manuscript for conciseness, exhibits a very similar pattern for the total share repurchases. Conclusively, there appears to be an association between gender diversity on boards and repurchasing decisions. To extend the univariate results, I model the effect of gender diversity in a probit setting.

TABLE 5

The decision to repurchase in relation to gender diversity

	Publicly announced program		Total repurchases	
	(1)	(2)	(3)	(4)
Gender ratio	-0.6818***		-0.8304***	
	(-6.17)		(-8.04)	
Female dummy		0.1121***		0.1765***
		(4.45)		(7.47)
Ln Assets	0.1647***	0.1664***	0.2197***	0.2176***
	(19.77)	(19.36)	(27.23)	(26.47)
Market-to-book	-0.0076	-0.0074	0.0106	0.0102
	(-1.03)	(-1.01)	(1.32)	(1.26)
Return on assets	2.3017***	2.3037***	1.0952***	1.1017***
	(18.61)	(18.66)	(6.45)	(6.49)
Leverage	-0.3209***	-0.3243***	-0.2470***	-0.2509***
	(-5.01)	(-5.07)	(-3.99)	(-4.07)
Cash-to-assets	0.3667***	0.3804***	0.2743***	0.2864***
	(4.43)	(4.55)	(3.50)	(3.63)
Prior six-month return	-0.6203***	-0.6181***	-0.2199***	-0.2193***
	(-11.93)	(-11.88)	(-7.31)	(-7.31)
Volatility	-8.1532***	-8.0971***	-2.2597***	-2.2351***
	(-6.97)	(-6.91)	(-4.77)	(-4.77)
Constant	-1.7326***	-2.4446***	-2.0964***	-2.9538***
	(-4.11)	(-6.06)	(-4.88)	(-7.14)
Pseudo R^2	0.1584	0.1575	0.1515	0.1512
Observations	582,632	582,632	582,945	582,945

Table 5 reports the results of the probit regressions on firm monthly observations covering the period between January 2004 and December 2020, where the dependent variable is a binary variable indicating whether a given firm repurchased shares in a given month. The binary variable equals 1 for repurchase firm-months, whereas the dependent variable equals 0 for no repurchase firm-months. Columns (1-2) include repurchases part of a publicly announced program and Columns (3-4) include all share repurchases. Columns (1) and (3) include Gender ratio as a measure for gender diversity and Columns (2) and (4) include Female dummy as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. z-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for year and industry (i.e., based on 2-digit SIC codes) fixed effects.
*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

The results of the probit regressions are presented in Table 5. The table contains the results of the relation between buyback probability and gender diversity. I use two different measures for gender diversity namely the gender ratio in Columns (1) and (3) and a dummy for the presence of a female director in Columns (2) and (4). For the results to be consistent with the conclusion from the prior univariate analysis, the coefficient for gender ratio would be negative (as gender ratio decreases for increasing gender diversity on boards) and the dummy coefficient for the presence of a female director positive.

The most important takeaway from Table 5 is that gender diversity results in a higher likelihood of share repurchases, which is documented for both measures for diversity and for both repurchases as part of a publicly announced program and total repurchases. The coefficients of interest are all statistically significant at the 1% level. Also, firms that are bigger, more profitable, and firms that have a higher proportion of their assets as cash are significantly more likely to perform a share repurchase. On the other hand, firms with a higher degree of debt financing and a volatile stock price development are significantly less likely to repurchase. Notably, firms are also significantly less (more) inclined to repurchase after a six-month period of increasing (decreasing) stock prices in the

market (i.e., as proxied by the S&P 1500 Composite Index). The findings support the previously documented association for the univariate analysis and provide conclusive evidence consistent with *H1*. Namely, that gender diversity on boards results in a higher likelihood of share repurchases. This conclusion is in line with Adams and Ferreira (2009) who show that female directors result in more effective corporate governance, under the line of reasoning that pay-outs are a form of good corporate governance. In addition, it extends the findings from Chen, Leung, and Goergen (2017) beyond a higher level of dividend pay-out rates in firms with gender diverse boards, to a higher likelihood of share repurchases.

4.2 Timing of share repurchases and gender diversity

H2. *Boards with more gender diversity realise a significantly different relative repurchase price from boards with less gender diversity.*

In this subsection I discuss *H2* regarding the timing of repurchases in the context of gender diversity on boards. I hypothesised that overconfidence and information asymmetry are factors that could drive discrepancies in timing ability in relation to gender diversity on boards. To test for the dominant effect and whether a statistically significant difference exists between more and less gender diverse boards, I employ multivariate regressions of the relative repurchase price. As stated in the methodology, I conduct the regressions for deviating windows before and surrounding the actual repurchase firm-month. Table 6 shows the results of the regressions of the repurchase price compared to the average price during the one, three, and six months before the repurchase month. The dependent variable is the relative repurchase price, and all regressions include controls for firm characteristics, and for year and industry fixed effects. Table 7 covers regressions of the repurchase price compared to the average price during the one, three, and six months before and after the repurchase month. The same multivariate regressions are performed for the total repurchases sample. The results of this analysis are qualitatively similar to the results I will discuss hereafter and are shown at the end of this manuscript, Table 12 and Table 13.

The first column in Table 6, repeated for comparison purposes in the first column of Table 7, contains the regressions with as dependent variable the relative repurchase price, where the comparison price is the average price in the same month as the given repurchase month. It shows clear evidence in favour of the existence of gender driven discrepancies in timing ability of repurchases. Firms with a higher degree of gender diversity on the board are associated with a significantly higher relative repurchase price as implied by the negative coefficient of gender ratio. On average, firms with exclusively male directors repurchase 0.69% of the average share price cheaper than firms with a theoretically maximised degree of gender diversity (i.e., when the gender ratio equals 0.5), statistically significant at the 1% level. With that, Column (1) provides convincing evidence for the existence of gender diversity-based timing ability discrepancies. Moreover, the other three columns in Table 6 show that for all retrospective measures for the relative repurchase price, gender diversity results in a

TABLE 6

Market timing in relation to gender diversity

	Relative repurchase price under a publicly announced program			
	Repurchase month	+1 month	+3 months	+6 months
	(1)	(2)	(3)	(4)
Gender ratio	-0.0139***	-0.0157***	-0.0170***	-0.0174**
	(-3.10)	(-3.11)	(-2.59)	(-2.01)
Ln Assets	0.0002	0.0006**	0.0020***	0.0036***
	(0.76)	(2.02)	(4.54)	(5.31)
Market-to-book	-0.0014***	-0.0014***	0.0022***	0.0075***
	(-3.18)	(-2.65)	(3.74)	(9.67)
Return on assets	-0.0104	-0.0034	-0.0215*	-0.0305*
	(-1.38)	(-0.40)	(-1.84)	(-1.74)
Leverage	0.0046*	0.0060**	0.0034	-0.0018
	(1.70)	(2.01)	(0.86)	(-0.33)
Cash-to-assets	0.0058	0.0032	-0.0095	-0.0273***
	(1.45)	(0.68)	(-1.37)	(-2.88)
Prior six-month return	-0.0030	0.1004***	0.2748***	0.5398***
	(-0.77)	(21.05)	(31.84)	(38.93)
Volatility	0.0053	-0.0422	-0.1134	-0.2543
	(0.12)	(-0.74)	(-0.93)	(-1.20)
Constant	0.0147**	0.0094	-0.0110	-0.0287**
	(2.37)	(1.42)	(-1.21)	(-2.30)
R^2	0.0115	0.0305	0.0954	0.1767
Observations	88,304	88,090	87,384	86,234

Table 6 reports the results of the multivariate regressions on firm monthly observations covering the period between January 2004 and December 2020, where the dependent variable is the relative repurchase price, which is the average price paid per share repurchased under a publicly announced program in a given month compared to the average price paid in the market during one, three, and six months before the given repurchase firm-month. Columns (1-4) include Gender ratio as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. t-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for year and industry (i.e., based on 2-digit SIC codes) fixed effects.

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

higher relative repurchase price, which implies that firms with more gender diverse boards pay relatively higher prices for their shares. The coefficient for gender diversity is also statistically significant at the 5 percent level for all three specifications. For the comparison price based on the average price paid in the preceding six-month period before a repurchase, the relative repurchase price is approximately 0.87 percentage point lower for firms with exclusively male directors, compared to firms with a theoretically maximised degree of gender diversity.

Overall, the results from Table 6 provide conclusive evidence consistent with the hypothesised significant difference under *H2*. To extend the findings to a period spanning also the months after a share repurchase, I investigate further timing associations in the context of diversity in Table 7. Again, I find that there exists a statistically significant positive association between the relative repurchase price and gender diversity, as shown by the first row in all columns. A higher gender ratio implies a lower degree of gender diversity, therefore lower diversity results in paying a higher price compared to other investors in the market. Interestingly, the difference in terms of market timing ability between more and less gender diverse boards increases if the comparison price includes a forward-looking component, as is implied by the higher magnitude of the coefficients in the first row of Table 7 compared to the effect the same variables had on the backward-looking relative repurchase price from

TABLE 7

Market timing in relation to gender diversity

	Relative repurchase price under a publicly announced program			
	Repurchase month	±1 month	±3 months	±6 months
	(1)	(2)	(3)	(4)
Gender ratio	-0.0139***	-0.0175***	-0.0228***	-0.0268***
	(-3.10)	(-3.35)	(-3.77)	(-3.73)
Ln Assets	0.0002	0.0007**	0.0016***	0.0026***
	(0.76)	(2.30)	(4.18)	(4.95)
Market-to-book	-0.0014***	-0.0009*	0.0013**	0.0041***
	(-3.18)	(-1.73)	(2.49)	(5.98)
Return on assets	-0.0104	-0.0148	-0.0289***	-0.0291**
	(-1.38)	(-1.59)	(-2.57)	(-1.98)
Leverage	0.0046*	0.0057*	0.0036	-0.0009
	(1.70)	(1.74)	(0.96)	(-0.20)
Cash-to-assets	0.0058	0.0058	-0.0017	-0.0110
	(1.45)	(1.05)	(-0.27)	(-1.40)
Prior six-month return	-0.0030	0.0648***	0.2097***	0.4056***
	(-0.77)	(13.60)	(28.49)	(35.56)
Volatility	0.0053	0.0799	0.0222	-0.1282
	(0.12)	(1.28)	(0.21)	(-0.75)
Constant	0.0147**	0.0117	0.0039	-0.0063
	(2.37)	(1.62)	(0.43)	(-0.48)
R^2	0.0115	0.0155	0.0445	0.1017
Observations	88,304	88,009	87,128	85,624

Table 7 reports the results of the multivariate regressions on firm monthly observations covering the period January 2004 and December 2020, where the dependent variable is the relative repurchase price under a publicly announced program, which is the average price paid per share repurchased in a given month compared to the average price paid in the market during one, three, and six months before and after the given repurchase firm-month. Columns (1-4) include Gender ratio as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. t-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for year and industry (i.e., based on 2-digit SIC codes) fixed effects.

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

Table 6. The increased difference implies that firms with a lower degree of diversity on the board pay lower prices compared to the future as well, in addition to the retrospective relative price.

Regarding the controls for firm characteristics, bigger firms as measured by total assets are associated with a higher relative repurchase price, whereas firms with a higher market-to-book ratio realise lower relative repurchase prices. Firms with a higher level of debt financing pay more when repurchasing shares than other investors in the market, whereas there is a statistically ambiguous association with more profitable firms as measured by return on assets and firms that have a higher proportion of their assets in cash. In the previous subsection, I established that firms are less (more) likely to repurchase after an increase (decrease) of stock prices in the whole market. However, the first Column in Table 6 and Table 7 shows that the effect of a change in six-month stock market prices is not resulting in a significantly different relative repurchase price in that same month. In addition, the volatility of a given firm's stock price does not appear to influence the timing ability in a significant way, whereas lower (higher) volatility did increase (decrease) the likelihood of a repurchase significantly.

The omitted year fixed effects show that firms repurchasing in 2008 realise a significantly worse price (i.e., the firm paid more than the average market price) relative to the excluded base year

2004, whereas there is no observed statically significant effect for the more recent global Covid-19 crisis. The absence of similar significance for the year fixed effects in 2020 may be caused by the fact that both the stock market's crash and recovery occurred during the same calendar year in 2020. Contrary to the market bouncing back in 2020, in 2008 there was not a single month during which the monthly return on the market was positive. Thus, as a slower stock market recovery took place during the global financial crisis, there were reduced opportunities to time the market.

Conclusively, relating the findings to *H2*, firms with a lower degree of gender diversity on the board realise a significantly lower relative repurchase price and therefore, more gender diversity is associated with decreased ability to time the market. In the context of finance decisions, men were more frequently exhibiting overconfidence leading to value destroying actions. Whether share repurchases are value creating or destroying is beyond the scope of this research, however male overconfidence is not found to be the dominant effect based on the findings. In this case, less gender diversity leads to a relative discount on repurchases which is arguably opposing the more value destroying nature of other finance decisions taken by men compared to women. The dominant effect appears to be the influence from information provision discrepancies between more and less gender diverse boards. Thus, reduced (increased) timing opportunity induced by richer (poorer) information provision by more (less) diverse boards, results in payment of on average a higher (lower) relative repurchase price.

4.3 Share repurchases and gender diversity during Covid-19

H3. *Boards with more gender diversity are significantly less likely to repurchase shares during the first phase of the Covid-19 crisis compared to boards with less gender diversity.*

H4. *Boards with more gender diversity realise a significantly different relative repurchase price during the first phase of the Covid-19 crisis compared to boards with less gender diversity.*

In this subsection I discuss share repurchases during Covid-19 in relation to the gender composition of boards. Essentially, *H3* and *H4* are similar to respectively *H1* and *H2*, however they specifically investigate the period during which the Covid-19 pandemic unfolded to document possible gender driven discrepancies in corporate action taking (i.e., share repurchases).

Table 4 showed that for 2020, there is a statistically significant difference between firms with and without female directors on the board in terms of repurchasing frequency both for repurchases as part of a publicly announced program and total repurchases. Notably, the overall repurchasing activity as shown in Table 11 takes a substantial hit as repurchases drop from occurring in 25.91% of all firm-months in 2019, to 7.76% in 2020. With that, the (in)direct impact of Covid-19 on the volume of share repurchases is already immense.

On 11 March 2020, the World Health Organisation declared Covid-19 an official pandemic (World Health Organization, 2020). It is debatable whether to include March 2020 in the sample for *H3* and *H4*, as March is the month during which Covid-19 began to be viewed as a pandemic threat by

TABLE 8

The decision to repurchase (under a publicly announced program) during Covid-19 in relation to gender diversity

	Repurchase period			
	April – September 2020		April – December 2020	
	(1)	(2)	(3)	(4)
Gender ratio	1.0578*		0.5158*	
	(1.86)		(1.82)	
Female dummy		-0.5343***		-0.2489**
		(-3.17)		(-2.53)
Ln Assets	0.0604	0.0728	0.0363	0.0379*
	(1.28)	(1.61)	(1.61)	(1.72)
Market-to-book	-0.0243	-0.0278	-0.0188	-0.0200
	(-0.93)	(-1.04)	(-1.08)	(-1.15)
Return on assets	2.1420***	2.1989***	2.2902***	2.3318***
	(3.85)	(3.90)	(5.80)	(5.89)
Leverage	0.1404	0.1414	0.2025	0.2040
	(0.57)	(0.58)	(1.38)	(1.41)
Cash-to-assets	0.9138**	0.8170*	-0.2239	-0.2659
	(2.13)	(1.88)	(-0.70)	(-0.84)
Prior six-month return	0.5418	0.5524	1.8863***	1.9025***
	(1.47)	(1.50)	(6.81)	(6.92)
Volatility	-10.3939*	-11.0624*	-26.0400***	-26.1515***
	(-1.79)	(-1.92)	(-5.56)	(-5.56)
Constant	-3.5393***	-2.3011***	-1.8977***	-1.3480**
	(-4.14)	(-3.82)	(-3.22)	(-2.55)
Pseudo R^2	0.1316	0.1421	0.2024	0.2033
Observations	9,234	9,234	16,405	16,405

Table 8 reports the results of the probit regressions on firm monthly observations covering different sample periods between April and December 2020, where the dependent variable is a binary variable indicating whether a given firm repurchased shares under a publicly announced program in a given month. The binary variable equals 1 for repurchase firm-months, whereas the dependent variable equals 0 for no repurchase firm-months. Columns (1) and (3) include Gender ratio as a measure for gender diversity and Columns (2) and (4) include Female dummy as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. z-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for industry (i.e., based on 2-digit SIC codes) fixed effects.
*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

the World Health Organisation. During the first part of March, many firms likely repurchased shares without considering any Covid-19 related implications. Therefore, as my sample concerns firm monthly observations, using a sample that ranges from April onward is most suitable to test for corporate actions consciously taken by board members. Pettenuzzo, Sabbatucci, and Timmermann (2021) show in their analysis that firms did not suspend or stop share repurchases any sooner than during March 2020. The authors show in their overview of weekly corporate actions that suspensions of buybacks primarily started during the same week the Fed established a Commercial Paper Funding Facility (CPFF) on 17 March 2020. While the primary goal of *H3* is to test for differences in reactions towards the unfolding pandemic, this provides further arguments in favour of exclusion of data on repurchases spanning the first half of March 2020. During this period, there were little concrete concerns within firms that lead to suspension of buybacks based on the corporate actions taken (Pettenuzzo, Sabbatucci, and Timmermann, 2021). I hypothesised that more and less gender diverse boards would respond differently to Covid-19 induced uncertainty, reasoning from the inherently differing risk attitudes between women and men. To test this hypothesis, I again employ a probit model and the findings are presented in Table 8.

Table 8 shows a reversal of the established influence of gender diversity on repurchasing likelihood for the full period between 2004 and 2020. Now, I find that gender diversity reduces the likelihood of a repurchase during Covid-19, whereas I showed earlier that in general gender diversity increases the likelihood of a share repurchase. As both coefficients of the measures for gender diversity are statically significant, I present robust evidence consistent with *H3*. In addition to the results in Table 8, I again observe a statistically significant difference between more and less gender diverse boards as proxied by the female director dummy if I do include observations from March 2020. For comparison purposes, the results are displayed in Table 14, at the end of this manuscript considering conciseness. The coefficients of interests have less statistical significance and lose a substantial part of the economic effect. This difference in terms of both statistical and economic significance indicates that the March 2020 observations have a different effect of gender diversity on repurchasing likelihood than the average effect for the observations from April onward. I reason that this difference originates from share repurchases performed during the first half of March when the pandemic was not recognised to have a profound impact. As such, the board likely did not consider Covid-19 related implications up to the extent they would from April onward explaining the discrepancy.

Overall, Table 8 provides concrete evidence confirming *H3* which reasoned that the discrepancies in gender-based risk attitudes drive a significant difference in repurchasing behaviour in response to the Covid-19 pandemic. I find robust evidence that more (less) gender diversity results in a decreased (increased) likelihood of deciding to repurchase shares during Covid-19. With that, the initially established positive effect of gender diversity on repurchasing likelihood for the full sample period is reversed for a period characterised by a higher degree of uncertainty.

The final hypothesis, *H4*, aims to test for differences between more and less gender diverse boards in terms of timing ability when repurchasing shares during Covid-19. To test the hypothesis, I use a similar methodology used to investigate *H2*. The results are displayed in Table 9 and Table 10.

I find no evidence that gender diversity results in a statistically significant difference in terms of timing ability when repurchasing shares, compared to less gender diverse boards, for any of the measures for market timing. Table 9 and Table 10 use gender ratio as a measure for diversity, however in further undocumented testing with the dummy variable for female director presence, I do not find a significant association between diversity and timing ability either. Neither does varying the end of the sample period between September and December and/or the start between January and March, result in a statistically significant difference between more and less diverse boards.

In undocumented univariate analysis, I do find a statistically significant difference between more and less gender diverse boards, more specifically that boards without any female directors are associated with on average a 1.35 percentage point lower relative repurchase price, significant at the 10 percent level. However, I observe this finding only when I restrict the observations to the entire year of 2020, whereas I previously argued that inclusion of January up until March is not justifiable

TABLE 9

Market timing in relation to gender diversity during Covid-19

	Relative repurchase price under a publicly announced program			
	Repurchase month	+1 month	+3 months	+6 months
	(1)	(2)	(3)	(4)
Gender ratio	-0.0078	-0.0104	-0.0454	-0.0356
	(-0.31)	(-0.37)	(-0.97)	(-0.53)
Ln Assets	0.0038***	0.0029	0.0013	-0.0018
	(2.91)	(1.62)	(0.32)	(-0.27)
Market-to-book	-0.0000	0.0007	0.0056	0.0127***
	(-0.02)	(0.44)	(1.95)	(3.03)
Return on assets	-0.0159	-0.0496	-0.1865	-0.3135**
	(-0.27)	(-0.82)	(-1.80)	(-2.16)
Leverage	-0.0259**	-0.0320***	0.0383	-0.0293
	(-2.37)	(-2.70)	(-1.67)	(-0.82)
Cash-to-assets	0.0342	0.0051	-0.0735	-0.2178**
	(1.27)	(0.14)	(-1.13)	(-2.36)
Prior six-month return	-0.0279	-0.0075	0.1106	0.3336***
	(-1.36)	(-0.30)	(2.28)	(5.12)
Volatility	-0.0692	0.0572	-0.0359	0.4862
	(-0.28)	(0.23)	(-0.08)	(0.59)
Constant	-0.0196	0.0008	0.0007	-0.0021
	(-0.80)	(0.03)	(0.01)	(-0.02)
R^2	0.2862	0.3339	0.2566	0.2916
Observations	795	795	795	795

Table 9 reports the results of the multivariate regressions on firm monthly observations covering the period between April and December 2020, where the dependent variable is the relative repurchase price, which is the average price paid per share repurchased under a publicly announced program in a given month compared to the average price paid in the market during one, three, and six months before the given repurchase firm-month. Columns (1-4) include Gender ratio as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. t-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for year and industry (i.e., based on 2-digit SIC codes) fixed effects.

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

when investigating corporate actions in response to Covid-19. Also, the statistically significant difference does not persist into the multivariate regressions, and therefore it is likely driven by the firm characteristics controlled for. Interestingly, the notion that there is no significant difference in timing ability during 2020 implies that the observed results for the full sample period in the previous subsections are likely more significant, if I were to omit observations from the year 2020. Undocumented further testing confirms this reasoning as I find that, without exception, both the statistical significance and economic magnitude of the diversity coefficients increase (e.g., the coefficient of gender ratio in Column (1) of Table 6 and Table 7 would decrease from -0.0139 to -0.0143, with t-stats of respectively -3.10 and -3.34). Besides, the lack of a significant difference is not caused by the complete absence of market timing, as the average relative repurchase price amounts to -1.80% from April 2020 onward. This last statistic is interesting as it provides evidence for the persistent ability to time the market even during the Covid-19 pandemic.

One note that is important to make is that the conclusions I draw in relation to *H4* are based on a substantially smaller sample than my conclusions from the other hypotheses. As the relative repurchase price requires a repurchase to begin with and many firms completely cancelled their share repurchase program as of March/April 2020, the available sample to base my results on shrunk

TABLE 10

Market timing in relation to gender diversity during Covid-19

	Relative repurchase price under a publicly announced program			
	Repurchase month	±1 month	±3 months	±6 months
	(1)	(2)	(3)	(4)
Gender ratio	-0.0078	0.0097	-0.0124	0.0118
	(-0.31)	(0.32)	(-0.32)	(0.23)
Ln Assets	0.0038***	0.0045**	0.0031	-0.0001
	(2.91)	(2.57)	(1.39)	(-0.02)
Market-to-book	-0.0000	0.0026	0.0029	0.0032
	(-0.02)	(0.76)	(0.96)	(0.58)
Return on assets	-0.0159	-0.0632	-0.0264	-0.0070
	(-0.27)	(-0.65)	(-0.49)	(-0.08)
Leverage	-0.0259**	-0.0316**	-0.0372**	-0.0367
	(-2.37)	(-2.22)	(-2.21)	(-1.51)
Cash-to-assets	0.0342	-0.0147	-0.0325	-0.0952
	(1.27)	(-0.60)	(-0.78)	(-1.45)
Prior six-month return	-0.0279	-0.0402*	-0.0402	0.0142
	(-1.36)	(-1.70)	(-1.01)	(0.31)
Volatility	-0.0692	0.0115	-1.2041**	-2.6661***
	(-0.28)	(0.04)	(-2.46)	(-3.94)
Constant	-0.0196	-0.0085	0.0086	0.0333
	(-0.80)	(-0.27)	(0.19)	(0.54)
R^2	0.2862	0.2047	0.1243	0.2971
Observations	795	726	604	584

Table 10 reports the results of the multivariate regressions on firm monthly observations covering the period between April and December 2020, where the dependent variable is the relative repurchase price under a publicly announced program, which is the average price paid per share repurchased in a given month compared to the average price paid in the market during one, three, and six months before and after the given repurchase firm-month. Columns (1-4) include Gender ratio as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. t-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for year and industry (i.e., based on 2-digit SIC codes) fixed effects.

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

substantially. Nevertheless, I conclude that there is no significant difference between more and less gender diverse boards in market timing ability when repurchasing shares during Covid-19. With that I do not find evidence that provides reason to accept *H4* and therefore my final hypothesis is rejected.

5 Conclusion

This paper researches repurchasing frequency and the ability to time the market in the context of board gender diversity and Covid-19 using actual repurchases. To formulate the results, I use a unique sample of US (open market) share repurchases performed in the period between 2004 and 2020. I find that boards characterised by more (less) gender diversity are significantly more (less) likely to conduct a share repurchase, also when restricting repurchases to those under a publicly announced program. Moreover, firms that have more gender diverse boards realise a significantly higher relative repurchase price than their less gender diverse counterparts, implying reduced ability to time the market in firms with more gender diverse boards. Both these results remain significant after controlling for firm characteristics and fixed effects. My conclusions hold for both definitions of gender diversity. When restricting the observed period to the period surrounding the Covid-19 pandemic, I observe a reversal of the initially established increased likelihood to repurchase associated with more gender diverse boards. I reason that this pivot can arguably be explained by gender driven differences in risk attitudes (Faccio, Marchica, and Mura, 2016; Halton, 2020) in response to a crisis inducing great uncertainty. In addition, the results related to market timing ability observed for the full sample period do not hold during the Covid-19 pandemic. I find no evidence for a significant gender driven discrepancy in timing ability for the period, despite the observed persistence of market timing ability during this period.

I reason that my findings in terms of repurchasing frequency can be explained by the fact that female directors increase the quality of corporate governance. Corporate pay-outs are a way to discipline management by reducing possible agency costs associated with free cash flows (Jensen, 1986), and therefore pay-outs are a practice of good corporate governance. The presence of female directors bolsters the frequency of pay-outs in the form of share repurchases and therefore, female director presence results in an increased level of governance quality. Second, the increased level of corporate governance quality from gender diversity also results in richer information disclosure to the public, increasing the stock price informativeness (Gul, Srinidhi, and Ng, 2011). Subsequently, the increased stock price efficiency results in reduced opportunities to time the market for firms with more gender diverse boards, explaining the observed reduction in market timing ability.

The implications of gender diversity for corporate governance quality are relevant for policy makers. As discussed, several papers show that the presence and efforts of female directors result in a higher quality of corporate governance and therefore these papers provide convincing evidence favouring a higher degree of gender diversity on boards. Concerning the implications of my specific topic of research, share repurchases, I provide clear evidence of the possible consequences originating from gender-based policy. However, share repurchases are not undisputedly recognised as a value creating or destroying event. Allocating scarce resources to repurchasing shares may be perceived as

value destroying, as investments in business development and continuity will be lower as a result. Regardless of the view taken whether repurchases are value creating or destroying, my implications are relevant as I provide empirical evidence on the consequences of policies targeted at gender equality. Moreover, the implications of gender diversity may be valuable for investors looking to create an investment strategy targeted at achieving stock returns through share repurchases. Such practitioners can start to weigh the information on a board's gender composition in their decision to invest or not.

Alternatively, I acknowledge that my findings can be subject to endogeneity concerns around the measures used to proxy gender diversity. Despite the controls added for firm characteristics, firms with female directors on the board may exhibit certain characteristics not controlled for compared to firms with little gender diversity on the board. Moreover, throughout this research I reason that a higher actual relative repurchase price originates from a lower ability to time the market, but perhaps more gender diverse boards are less inclined to attempt market timing in general. Female directors put more effort into monitoring (Adams and Ferreira, 2009) and taking such different priorities may consequently result in less time for and interest in market timing. This would contradict research by Brav et al. (2005), which shows that undervaluation is the prevailing reason for executives to conduct share repurchases. However, in 2004 only 7.2% of board members were female based on my dataset, thus the findings by Brav et al. (2005) may be driven by a predominantly male sample. If undervaluation is no longer the primary reason to repurchase for more gender diverse boards, it may not necessarily be the reduced ability to time the market, but the reduced inclination to time the market I observe for more gender diverse boards. As such, my findings might not be related to a gender driven discrepancy in timing ability but merely in the interest taken in market timing.

There are some limitations to the results obtained in this research. First, throughout this paper I employ annual data to construct monthly observations of the measures for gender diversity and for most control variables. I opted for this method to conform to the frequency of available data, however the monthly observations based on annual data contain less variation as a result. It would be interesting to see how the economic significance of especially gender diversity would change if there is monthly data on board composition. As such, this is also a recommendation for future extensions of my research. Second, another limitation is the geographical character of my sample as it solely comprises firms listed on US stock exchanges. A mitigating argument is that US stock exchanges have many firms listed that are headquartered in other countries. Nevertheless, the limited geographical spread is a concern due to discrepancies between countries and continents, as for example US firms tend to have an Anglo-Saxon business culture whereas most European firms do not. Consequently, generalising the results of this research should be done with care whilst accounting for geographical discrepancies.

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Tables Supplement

TABLE 11

Repurchasing frequency in relation to female director presence

Year	Number of repurchase months / Total months (%)	Female director		Difference
		No	Yes	
	(1)	(2)	(3)	(4)
2004	6,318 / 39,418 (16.03%)	2,028 / 20,827 (9.74%)	4,290 / 18,591 (23.08%)	0.1334***
2005	8,375 / 45,428 (18.44%)	2,662 / 23,780 (11.19%)	5,813 / 21,648 (26.39%)	0.1520***
2006	8,915 / 47,657 (18.71%)	2,806 / 24,845 (11.29%)	6,109 / 22,812 (26.78%)	0.1549***
2007	10,138 / 47,587 (21.30%)	3,248 / 24,215 (13.41%)	6,890 / 23,372 (29.48%)	0.1607***
2008	10,252 / 47,232 (21.71%)	3,843 / 24,037 (15.99%)	6,409 / 23,195 (27.63%)	0.1164***
2009	7,472 / 45,675 (16.36%)	2,615 / 23,178 (11.28%)	4,857 / 22,497 (21.59%)	0.1031***
2010	7,679 / 43,125 (17.81%)	2,402 / 21,025 (11.42%)	5,277 / 22,100 (23.88%)	0.1245***
2011	9,005 / 41,502 (21.70%)	2,709/ 19,729 (13.73%)	6,296 / 21,773 (28.92%)	0.1519***
2012	9,283 / 40,424 (22.96%)	2,646 / 18,286 (14.47%)	6,637 / 22,138 (29.98%)	0.1551***
2013	7,300 / 39,375 (18.54%)	1,845 / 16,951 (10.88%)	5,455 / 22,424 (24.33%)	0.1344***
2014	9,619 / 38,591 (24.93%)	2,342 / 15,893 (14.74%)	7,277 / 22,698 (32.06%)	0.1732***
2015	9,314 / 38,084 (24.46%)	2,069 / 14,907 (13.88%)	7,245 / 23,177 (31.26%)	0.1738***
2016	8,968 / 37,097 (24.17%)	1,835 / 13,807 (13.29%)	7,133 / 23,290 (30.63%)	0.1734***
2017	8,387 / 35,251 (23.79%)	1,390 / 12,487 (11.13%)	6,997 / 22,765 (30.74%)	0.1961***
2018	8,871 / 33,816 (26.23%)	1,352 / 11,071 (12.21%)	7,519 / 22,745 (33.06%)	0.2085***
2019	8,425 / 32,518 (25.91%)	949 / 9,190 (10.33%)	7,476 / 23,328 (32.05%)	0.2172***
2020	1,903 / 24,544 (7.76%)	153 / 4,472 (3.42%)	1,750 / 20,072 (8.72%)	0.0530***
Full sample	140,224 / 677,324 (20.70%)	36,894 / 298,700 (12.35%)	103,330 / 378,624 (27.29%)	0.1494***

Table 11 reports the difference in repurchasing frequency, by female director presence, based on firm-monthly observations between January 2004 and December 2020. If there is a single female director present the observation qualifies for Column (3) 'Yes', otherwise the observation is included in Column (2) 'No'. The table displays the number of months in which a repurchase occurred, compared to the total number of months included in the sample. The percentage of months during which a repurchase occurred is shown between the brackets. *, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively, using Welch's t-test.

TABLE 12

Market timing in relation to gender diversity

	Relative repurchase price			
	Repurchase month	+1 month	+3 months	+6 months
	(1)	(2)	(3)	(4)
Gender ratio	-0.0010***	-0.0123***	-0.0135**	-0.0146*
	(-2.70)	(-2.90)	(-2.32)	(-1.80)
Ln Assets	0.0005***	0.0009***	0.0022***	0.0036***
	(2.85)	(4.34)	(6.79)	(7.44)
Market-to-book	-0.0011***	-0.0008***	0.0030***	0.0092***
	(-4.15)	(-2.73)	(7.25)	(13.00)
Return on assets	-0.0190***	-0.0094***	-0.0076	0.0086
	(-6.11)	(-2.71)	(-1.29)	(0.94)
Leverage	0.0039**	0.0042*	0.0004	-0.0083*
	(2.50)	(1.93)	(0.12)	(-1.70)
Cash-to-assets	0.0014	-0.0009	-0.0144**	-0.0326***
	(0.39)	(-0.22)	(-2.37)	(-3.93)
Prior six-month return	-0.0126***	0.0971***	0.2893***	0.6070***
	(-3.99)	(25.12)	(42.26)	(52.44)
Volatility	0.0414**	0.0373*	0.1052***	0.2344***
	(2.21)	(1.73)	(2.71)	(3.83)
Constant	0.002	0.0008	-0.0177**	-0.0350***
	(1.09)	(0.14)	(-2.28)	(-3.24)
R^2	0.0099	0.0290	0.0973	0.1814
Observations	127,580	127,474	126,595	125,113

Table 12 reports the results of the multivariate regressions on firm monthly observations covering the period between January 2004 and December 2020, where the dependent variable is the relative repurchase price, which is the average price paid per share repurchased in a given month compared to the average price paid in the market during one, three, and six months before the given repurchase firm-month. Columns (1-4) include Gender ratio as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. t-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for year and industry (i.e., based on 2-digit SIC codes) fixed effects. *, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

TABLE 13

Market timing in relation to gender diversity

	Relative repurchase price			
	Repurchase month	±1 month	±3 months	±6 months
	(1)	(2)	(3)	(4)
Gender ratio	-0.0010***	-0.0141***	-0.0183***	-0.0210***
	(-2.70)	(-2.70)	(-3.02)	(-2.95)
Ln Assets	0.0005***	0.0010***	0.0019***	0.0027***
	(2.85)	(3.99)	(6.22)	(7.24)
Market-to-book	-0.0011***	-0.0005*	0.0021***	0.0054***
	(-4.15)	(-1.79)	(5.86)	(9.71)
Return on assets	-0.0190***	-0.0207***	-0.0272***	-0.0155**
	(-6.11)	(-5.31)	(-5.65)	(-2.32)
Leverage	0.0039**	0.0057***	0.0030	-0.0031
	(2.50)	(2.76)	(1.17)	(-0.82)
Cash-to-assets	0.0014	0.0014	-0.0063	-0.0165**
	(0.39)	(0.27)	(-1.00)	(-2.20)
Prior six-month return	-0.0126***	0.0517***	0.2122***	0.4438***
	(-3.99)	(13.38)	(37.02)	(47.33)
Volatility	0.0414**	0.1129***	0.1884***	0.2167***
	(2.21)	(3.62)	(4.15)	(3.71)
Constant	0.002	0.0044	-0.0074	-0.0180
	(1.09)	(0.58)	(-0.83)	(-1.48)
R^2	0.0099	0.0128	0.0457	0.1100
Observations	127,580	126,881	125,097	122,648

Table 13 reports the results of the multivariate regressions on firm monthly observations covering the period between January 2004 and December 2020, where the dependent variable is the relative repurchase price, which is the average price paid per share repurchased in a given month compared to the average price paid in the market during one, three, and six months before and after the given repurchase firm-month. Columns (1-4) include Gender ratio as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. t-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for year and industry (i.e., based on 2-digit SIC codes) fixed effects.

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

TABLE 14

The decision to repurchase (under a publicly announced program) during Covid-19 in relation to gender diversity

	Repurchase period			
	March – September 2020		March – December 2020	
	(1)	(2)	(3)	(4)
Gender ratio	0.5873		0.3839	
	(1.36)		(1.45)	
Female dummy		-0.3435**		-0.1843**
		(-2.28)		(-1.96)
Ln Assets	0.0555	0.0640*	0.0375*	0.0385*
	(1.49)	(1.77)	(1.79)	(1.88)
Market-to-book	-0.0318	-0.0337	-0.0218	-0.0227
	(-1.28)	(-1.36)	(-1.26)	(-1.32)
Return on assets	2.3989***	2.4446***	2.3722***	2.4022***
	(5.03)	(5.07)	(6.38)	(6.45)
Leverage	0.0332	0.0263	0.1570	0.1567
	(0.18)	(0.14)	(1.16)	(1.17)
Cash-to-assets	0.8411**	0.7640**	-0.0912	-0.1237
	(2.38)	(2.15)	(-0.32)	(-0.44)
Prior six-month return	-0.7728***	-0.7810***	1.1836***	1.1916***
	(-2.74)	(-2.76)	(5.33)	(5.38)
Volatility	-14.0735***	-14.4048***	-25.8532***	-25.9274***
	(-3.06)	(-3.16)	(-6.22)	(-6.23)
Constant	-2.9002***	-2.1801***	-1.7612***	-1.3493***
	(-4.26)	(-4.22)	(-3.21)	(-2.80)
Pseudo R^2	0.1426	0.1466	0.1853	0.1858
Observations	12,478	12,478	18,756	18,756

Table 14 reports the results of the probit regressions on firm monthly observations covering different sample periods between March and December 2020, where the dependent variable is a binary variable indicating whether a given firm repurchased shares under a publicly announced program in a given month. The binary variable equals 1 for repurchase firm-months, whereas the dependent variable equals 0 for no repurchase firm-months. Columns (1) and (3) include Gender ratio as a measure for gender diversity and Columns (2) and (4) include Female dummy as a measure for gender diversity. Accounting variables, including those that serve as input for any ratios in the table, are measured at the most recently available fiscal year-end prior to the repurchase month. All variables other than the binary variables are winsorised at the 0.1 and 99.9 percent level to reduce the influence of outliers. z-statistics are reported in parentheses based on clustered standard errors at firm level. All regressions include controls for industry (i.e., based on 2-digit SIC codes) fixed effects.
*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent confidence levels, respectively.

Appendix A – Variable Definitions

Variable	Definition
Female dummy	Binary variable that is equal to one at least one female director is on the board and zero otherwise, measured prior to repurchase (*from BoardEx*)
Total assets	Reported total assets in millions of US Dollars, measured prior to repurchase (*from Compustat*)
Ln Assets	Natural logarithm of reported total assets, measured prior to repurchase
Market-to-book	Market capitalisation plus long-term debt and the current portion of long-term debt divided by the book value of equity, measured prior to repurchase (*from Compustat and CRSP*)
Return on assets	Income before extraordinary items on from the previous four quarters divided by total assets, measured prior to repurchase (*from Compustat*)
Leverage	Long-term debt and the current portion of long-term debt divided by total assets, measured prior to repurchase (*from Compustat*)
Cash-to-assets	Cash and cash equivalents divided by total assets, measured prior to repurchase (*from Compustat*)
Prior six-month return	Prior six-month return on the S&P1500 Composite Index including dividend returns. Estimated as the closing price adjusted for dividends in a given month divided by the closing price adjusted for dividends 6 months prior to the given month minus one, measured prior to repurchase (*from Compustat*)
Volatility	Standard deviation of six-month daily stock return. Estimated based on the daily closing stock prices, measured prior to repurchase (*from CRSP*)