Essays on Empirical Corporate Finance

Mian Wei

Thesis submitted to the University of Ottawa
in partial fulfillment of the requirements for the
PhD degree in Finance of Management

Telfer School of Management
University of Ottawa

Abstract

In this dissertation, I investigate important questions in the realm of empirical corporate finance. The research topics include with-in firm pay inequality and dividend policy (first chapter), the determinants and predictive power of SPAC shares redemption (second chapter), and the firm-level political risk and stock repurchases (third chapter). The first and third chapters are co-authored with Dr. Ali Akyol, and the second chapter is single authored.

The first chapter examines CEO behavior in response to within-firm pay inequality. Using CEO-median employee pay ratio data mandated by the SEC, the study reveals that following the release of pay ratio disclosures, CEOs with higher pay ratios tend to issue higher dividend payments as a strategy to mitigate adverse reactions from the investors and market than those with lower pay ratios. The positive correlation between CEO pay ratio and dividend payouts is consistently observed on both yearly and quarterly basis. The relationship between CEO pay ratio and dividend payouts remains robust when taking into account various firm characteristics and external shocks such as the COVID-19 pandemic and overall market condition. Furthermore, we employ instrumental variable regression analysis, subsample analysis, alternative measures analysis, and omitted variables analysis to validate the findings. On the other hand, the results indicate that CEO pay ratio does not significantly impact stock repurchases, as the decision of stock repurchases is sensitive to exogenous shocks, and stock repurchases lead to potential shareholder base loss.

In the second chapter, I address potential factors affecting investors' share redemption decisions in Special Purpose Acquisition Companies (SPACs). I show that investors demand information on SPACs from different sources, and several relevant factors are identified from the SPAC side, the target company side, and the merger deal and financial market side. I also find that the SPAC share redemption rate shows predictive power for post-merger operational performance. Furthermore, the redemption rate significantly predicts the post-merger stock performance for original SPAC shareholders but not for the new shareholders who purchase stock shares in the newly merged firm after the merger.

In the third chapter, we use a novel measure of firm-level political risk developed by Hassan, Hollander, Van Lent, and Tahoun (2019) to explain stock repurchase activities in publicly listed U.S. firms. With our monthly open-market repurchase data, we find a positive and significant effect of firm-level political risk on open-market repurchases. The positive association also exists in the subcategories of political risk related to economics, environment, institutions, security, tax, and technology. We find that firms' ROA volatility and growth potential act as intermediary effects on the relationship between political risk and repurchases. Further, we conduct robustness checks including omitted variables, instrumental variable analysis, subsample tests, and propensity score

matching. The results of robustness checks support our main hypothesis and are consistent with our primary findings.

Keywords: Pay inequality, CEO-median employee pay ratio, Dividends, Stock repurchases, Payout policy, SPAC, Share redemption, Political risk

Acknowledgements

First and foremost, I wish to express profound appreciation to all those who contributed in various capacities throughout my journey in the PhD program. I am grateful for receiving great help and advice from families, mentors, colleagues, and friends.

A special acknowledgement is reserved for my thesis supervisor, Dr. Ali Akyol. I would like to send my sincerest gratitude to Dr. Ali Akyol as he has been offering me tremendous help and support along my PhD program. It is my great honour to have the opportunity to learn and have learned many invaluable lessons in and out of the realm of research and teaching. His passion on research and his kindness to students have enhanced my determination of pursuing my career in academia as well. Thank you, Professor, for so much you have done for me.

My heartfelt appreciation goes out to my parents, Xinnian and Linru. It is their unconditional love and support that allow and encourage me to dive into the PhD program and get through this challenging journey. I send my gratitude to my partner, co-author, great friend, Chen Zhang for her help, concern, and many brilliant ideas. I want to express my profound thanks to my brother from another mother, Zhaowenbo, who has always concerned about me like a family.

I thank my fellow PhD colleagues, Renato Lazo Paz, Andrew Scarffe, Chen Li, Xiaoyu Sun, and Shaista Jaffer. Their encouraging words and companionship have rendered this journey truly memorable. I am grateful for the help and advice from faculty members and my committee members, namely Shantanu Dutta, Samir Saadi, Allan Riding, Imed Chkir, Walid Ben Amar, Harshit Rajaiya, Yuri Khoroshilov, Kaouthar Lajili, Fabio Moneta, and François-Éric Racicot. Special thanks to Laura Steadman. Her help and words of encouragement were essential during crucial times, thanks for being so kind and helpful!

Recognition is extended to my previous professors in Tulane University, namely Karen Foust and Shyam Venkatesan. Their encouragement has propelled me to embrace academic life and continually challenge myself to achieve higher goals.

Lastly, I want to express my gratitude to the numerous individuals I had the pleasure of meeting during conferences and presentations, with a special mention to Lingfei Kong and Janet Gao.

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Chapter 1

With-in Firm Pay Inequality and Payout Policies

1. INTRODUCTION

The Dodd-Frank Wall Street Reform and Consumer Protection Act mandated that firms disclose the ratio of their CEO's compensation to the median compensation of their employees. Subsequently, the Securities and Exchange Commission (SEC) adopted the CEO-median employee pay ratio disclosure rule, which took effect in 2017. This disclosure requirement applies to all companies that must provide executive compensation information under Item 402(c)(2)(x) of Regulation S-K. Companies are required to disclose their pay ratio information within 120 days after the end of their fiscal year. With the implementation of the pay ratio rule, CEOs, investors, analysts, and other stakeholders gained better insights into pay inequality within firms across different industries. As a result, one could expect to see changes in investor reactions, firm policies, and analyst forecasts.

In a recent study, Pan et al. (2022) find that the equity market is concerned about within-firm pay inequality, as indicated by pay ratio disclosures. They report that the market reacts negatively to the disclosure of high pay ratios and that institutional investors who are more inequality-averse reduce their allocations to stocks with higher CEO pay ratios compared to other institutional investors. In this paper, we build upon the work of Pan et al. (2022) to examine whether and how firms respond to the negative impact of CEO pay ratio disclosures. Specifically, we investigate whether firms adjust their payout policies to mitigate the adverse effects of high pay ratios by increasing distributions to shareholders.

Some studies on pay inequality suggest that high pay inequality does not harm firms (e.g., Cheng et al., 2017; Mueller et al., 2017). In these cases, CEOs and firms may not pay much attention to pay inequality and may avoid making significant policy changes. However, the results of Pan et al. (2022) indicate that high pay ratios can have serious consequences for firms. Their findings suggest that negative market reactions and the exodus of inequality-averse investors may prompt firms to reconsider their policies and engage in activities to mitigate the impact of high pay ratio disclosures, ultimately aiming to retain current shareholders and attract new ones. One potential strategy for firms to lessen the negative effects of high pay ratios is through dividend payments and share repurchases. These actions can help maintain the shareholder base while also conveying confidence in future performance to prospective investors (Miller and Modigliani, 1961; Bhattacharya, 1979; Bartov, 1991).

While pay ratio disclosures may affect both dividends and stock repurchases, the effect is likely to be more pronounced for dividends. Although repurchases are considered an alternative to dividend payouts (Skinner, 2008), their inherent flexibility means they do not necessarily signal permanent payments and are often associated with the business cycle and transient cash flows (Guay and Harford, 2000; Jagannathan, Stephens, and Weisbach, 2000). Additionally, the literature indicates that shareholders tend to prefer repurchases when there are larger cash distributions (Brennan and Thakor, 1990). Although stock repurchases have gained popularity due to their tax benefits and flexibility (e.g.,

Jagannathan et al., 2000; Desai and Jin, 2011; Bonaime et al., 2014), they lack the commitment aspect inherent in dividends, which are typically viewed as "sticky" and associated with permanent cash flows (Jagannathan et al., 2000). From this perspective, firms may prefer to issue dividends as a stronger signal to their shareholder base.

To understand if and how firms use their payout policies strategically in response to pay ratio disclosures, we start by analyzing pay ratio data from SEC filings between 2017 and 2021. Specifically, we examine how the CEO pay ratio affects a firm's dividend payouts and share repurchases in the year following the disclosure. Our results for dividends indicate that the CEO pay ratio is positively associated with subsequent dividend payouts, suggesting that firms with higher pay ratios tend to increase their dividends in the following year compared to those with lower pay ratios. With respect to repurchases, we do not find a strong relationship between pay ratio and subsequent stock repurchases in the year following the disclosures.

In the second part of our analysis, we examine firms' payout policies more closely by investigating the relationship between CEO pay ratios and firm payouts on a quarterly basis. This approach allows us to better understand when firms react to pay ratios and adjust their payouts. Most firms disclose their pay ratios at the end of the first quarter or the beginning of the second quarter. Our results show that the positive relationship between CEO pay ratios and dividend payouts persists from the second to the fourth quarter of the following year. Meanwhile, a weak positive relationship between the pay ratio and stock repurchases is observed in the third quarter, while no significant relationship is found in the second and fourth quarters of the following year.

We also investigate internal factors that may influence the relationship between CEO pay ratios and dividend payouts. Building on prior research examining the determinants of dividend payouts, we use interaction terms between the pay ratio and firm- and CEO-level factors in our annual baseline model (e.g., Holder et al., 1998; Mitton, 2004; Jiraporn et al., 2011). Our findings suggest that return on assets (ROA) significantly impacts the pay ratio–dividend payout relationship at the firm level, while CEO age and option awards affect this relationship at the CEO level.

We next focus on institutional investor ownership. First, we test how the horizon of institutional ownership affects the relationship between CEO pay ratios and dividend payouts through interaction terms. Our results show that a higher proportion of quasi-indexer investors (mid-term horizon) in high pay ratio firms is associated with higher levels of dividend payouts. In contrast, a higher proportion of dedicated ownership (long-term horizon) in high pay ratio firms is associated with lower dividends. We do not observe any statistically significant relationship for transient investors (short-term horizon). These results indicate that a firm's response to pay ratio disclosure could depend on the type of institutional investors it has.

Second, as Pan et al. (2022) report, inequality-averse investors tend to switch their portfolios away from high-pay ratio firms following the disclosure of pay ratios in 2017. Therefore, we investigate whether higher dividend payouts could prevent the exodus of investors concerned about CEO pay levels. Specifically, we examine whether independent investment advisors—who are more likely to be inequality-averse—reduce their ownership in high pay ratio firms if those firms increase their dividend payouts. Our results indicate that, while keeping the pay ratio constant, higher dividend levels positively affect the proportion of shares owned by independent investment advisors. Thus, our findings suggest that firms may be aware of losing investors and could be using dividends as a strategy to retain existing investors or attract new ones.

We also examine the impact of the COVID-19 pandemic on the relationship between CEO pay ratios and payout policies, as a significant number of our observations fall within the pandemic period. Reports have identified that firms were likely to adjust their payout policies and cash reserves during this time. We conduct a subsample test for the periods before and during the pandemic. Despite the cash shortages and financial constraints firms may face during the pandemic, we find that the pay ratio remains positively associated with dividend payouts at a significant level in both periods. In contrast, the relationship between the pay ratio and stock repurchases is significantly positive before the pandemic but disappears during the pandemic. To further investigate the effects of the pandemic, we introduce a dummy variable and its interaction with the pay ratio in our analysis. Although the results indicate that the pay ratio continues to affect both dividend payouts and stock repurchases during the pandemic, the interaction term is significantly negative. These findings are consistent with prior research suggesting that firms focused on cash reserves during this period (Cejnek et al., 2021; Krieger et al., 2021). Overall, our analysis shows that dividend payouts are more resilient than stock repurchases in their relationship with the pay ratio.

We also conduct several robustness tests to assess the sensitivity of our results to alternative variables and explanations. First, we address potential reverse causality and endogeneity issues. Although we use a lagged value of the pay ratio in our tests—showing how the disclosure of the pay ratio in year *t* affects payout policies in year *t+1*—we also conduct a two-stage least squares (2SLS) regression using the mean value of peer CEO compensation as the instrumental variable. Similar instruments have been employed in previous literature (e.g., Burns et al., 2015; Ding et al., 2021). Our findings indicate that the mean CEO compensation of peer companies is positively and significantly associated with the CEO pay ratio, and we continue to observe a statistically significant impact of the CEO pay ratio on dividend payouts in year *t+1*.

Our next analysis involves subsample tests on different perspectives. Specifically, we check the subsamples regarding internationalization of the firm, different levels of CEO compensation, and

different levels of firms' market-to-book ratios. The pay ratio disclosure rule allows for a certain level of discretion regarding the inclusion of overseas employees, and evidence suggests that this discretion can significantly impact median employee pay and the pay ratio (Lifshey, 2018). Therefore, we test whether domestic and multinational firms exhibit the same pattern in the relationship between pay ratio and dividend payouts. The results of this subsample test indicate that the significant positive relationship between dividend payouts and pay ratio continues to hold for both domestic and multinational firms. Meanwhile, we find out that the significant and positive relationship between CEO pay ratio and dividend payouts are more pronounced in the firms with lower CEO compensation and higher market-to-book ratios. These results are also consistent with past literature (e.g., Bhattacharyya, 2007; Bhattacharyya et al., 2008).

Next, we use alternative measures of pay ratios. We begin by creating an indicator variable that equals one if the pay ratio is higher than the annual industry mean or median, and zero otherwise. Additionally, we assess extreme values of pay ratios within the industry by creating another indicator variable based on each industry's 75th percentile. The results show that CEOs with pay ratios higher than the industry mean, median, and 75th percentile are associated with higher dividend payouts in the following year, confirming the robustness of our main findings. Furthermore, these results suggest that CEOs may compare their pay ratios with those of their peers and make decisions regarding dividend payouts based on their perceptions of pay dispersion levels within the industry.

In our main analysis, following the literature, such as Hwang and Kahle (2022), we use non-negative cash dividend payouts scaled by total assets as our primary dependent variable. We also test the sensitivity of our main results to alternative specifications of the dependent variable. Our findings indicate that the positive relationship between the CEO pay ratio and dividends holds when we restrict the sample to firms with above-zero dividend payouts and when we use different measures of dividend payouts, such as dividends per share. Next, we investigate whether our baseline results hold when we use dividend growth as our dependent variable. The results show that the relationship between a high pay ratio and dividend growth remains significantly positive, confirming our baseline findings. To further validate our results and mitigate potential selection bias, we also employ propensity score matching (PSM). The relationship between the CEO pay ratio and dividends remains consistent and robust.

Next, we test the robustness of our results to market conditions by including the relative dividend premium (RDP) measure in our analysis. The RDP and the catering theory of dividends were originally developed by Baker and Wurgler (2004) and further employed by Caliskan and Doukas (2015). According to the catering theory, a high RDP indicates a strong market preference for dividends. We incorporate the RDP into our annual baseline model and find that the positive association between the pay ratio and dividend payouts persists regardless of the market's preference for dividends. This finding

confirms the robustness of our primary results.

Finally, we examine whether managerial entrenchment affects our results. Jiraporn and Chintrakarn (2009) find that managerial entrenchment and corporate governance quality are significantly associated with dividend payouts, as dividends help alleviate agency conflicts. We use the E-index developed by Bebchuk et al. (2009) in our regression analysis. The results indicate that including the E-index does not affect the relationship between the CEO pay ratio and dividend payouts, further reinforcing the robustness of our original findings.

Our study makes several contributions to the literature on payout policy. While related studies report that absolute CEO compensation is negatively associated with payout policy—suggesting that highly compensated CEOs are perceived as effective and more likely to use retained earnings for investments—our study offers an alternative perspective by evaluating payout policy through the lens of pay inequality rather than solely focusing on absolute CEO compensation (e.g., Bhattacharyya, 2007; Bhattacharyya et al., 2008). Additionally, our findings align with Bodnaruk and Östberg (2013), indicating that CEOs are more inclined to adopt dividend payouts instead of share repurchases to prevent shareholder base loss. Secondly, this study contributes to the pay inequality literature. Pan et al. (2022) report that high pay inequality within firms leads to negative market reactions and potential investor loss. Building on their study, we examine how firms and CEOs might try to retain their investors. While Knust and Oesch (2020) argue that CEO compensation is not affected by pay ratio disclosures, our results suggest that CEOs are indeed concerned about investors' negative reactions to high pay ratios and implement payout policies to mitigate shareholder loss.

Furthermore, this study can assist policymakers by shedding light on the potential impact of pay ratio disclosure regulations on firm behavior, suggesting that such regulations may lead to changes in corporate payout policies. Policymakers can consider this insight when designing or evaluating pay ratio disclosure policies. Finally, from an investor's perspective, our study provides an understanding of potential payout policy changes following the disclosure of pay ratio information, possibly allowing them to take this into account in their portfolios. Overall, our study has both theoretical and practical implications that can benefit various stakeholders.

2. LITERATURE REVIEW

Numerous studies have been conducted on CEO compensation and its impact on firms and investors. A key research focus in this field is the interplay among CEO compensation, CEO abilities, and firm policies. Lambert et al. (1989) and Myers and Bacon (2004) posit that executives who receive high stock option compensation are less inclined to issue dividends, as doing so may conflict with their personal interests. Bhattacharyya (2007) and Bhattacharyya et al. (2008) find a positive (negative)

relationship between executive compensation and earnings retention (dividend payout ratio), suggesting that highly compensated executives are typically considered more skilled and productive. In this context, they are better equipped to identify and pursue profitable investment opportunities rather than allocate funds toward dividend payouts.

With the growing popularity of topics related to environmental, social, and governance (ESG) issues, recent studies have focused on within-firm pay inequality between CEOs and employees, rather than simply examining absolute CEO compensation. Faleye et al. (2013) gather CEO compensation data from S&P 1500 firms using Execucomp and manually collect ordinary employee pay data from SEC filings to calculate the CEO-employee pay ratio. Their results indicate that employees do not perceive higher pay ratios as inequitable outcomes that need to be addressed through costly behaviors that lower productivity. They further find that higher relative pay is associated with increases in firm value and operating performance. Cheng et al. (2017) use a proprietary dataset of firm-level average worker pay to investigate the relationship between CEO pay ratios and firm performance. They find that firms with higher CEO pay ratios have greater one-year-ahead market values and return on assets (ROA). In Mueller et al. (2017), the authors also find that higher pay inequality indicates greater levels of managerial talent. Firms with higher pay inequality exhibit larger equity returns and greater earnings surprises.

After the implementation of the CEO-median employee pay ratio rule by the SEC in 2017, firms must disclose their pay ratios within 120 days after the fiscal year-end, allowing investors and other parties to directly compare pay ratios among firms. Several recent studies investigate different stakeholders' reactions to this pay ratio disclosure. Knust and Oesch (2020) conclude that the pay ratio disclosure does not lead to a reduction in CEO compensation. Furthermore, there is no evidence that say-on-pay voting outcomes are influenced by the disclosure. Alam et al. (2021) find that firms tend to use more complex methods for calculating the pay ratio when CEOs have higher pay, greater reputation concerns, or when their headquarters are in states that exhibit stronger aversion to income inequality. However, the authors find no evidence to suggest that firms make actual changes to reduce the pay differential between CEOs and employees. In a recent study, Pan et al. (2022) find that investors, especially inequality-averse and independent investors, are more likely to shift their portfolios away from high-pay ratio firms to low-pay ratio firms. Meanwhile, high-pay ratio firms experience more significant adverse equity market reactions than low-pay ratio firms.

Overall, while earlier studies relied on CEO compensation data and hand-collected information on pay inequality with small sample sizes, recent studies—enabled by the pay ratio disclosure—continue to examine pay inequality and the interplay between CEO compensation and various firm policies using larger samples.

3. DATA AND METHODOLOGY

We describe the pay ratio data that we use in the study and our research methodology in this section.

3.1 Data and variable construction

The SEC's rule requiring companies to disclose the CEO-to-median-employee pay ratio took effect in January 2017, with disclosures required for the first fiscal year starting on or after January 1, 2017. This rule, as previously noted, is part of the Dodd-Frank Wall Street Reform and Consumer Protection Act and aims to provide shareholders with greater transparency regarding executive compensation compared to the compensation of a company's average worker. Disclosure of this information is mandatory for all companies required to provide executive compensation disclosure under Item 402(c)(2)(x) of Regulation S-K. However, smaller reporting companies, foreign private issuers, MJDS filers, emerging growth companies, and registered investment companies are exempt from this requirement. We have collected pay ratio data for the period from 2017 to 2021, compiled by The University of Alabama Libraries.[1] Our initial sample includes 11,214 firm-year observations.

We use data from Compustat, CRSP, and 13F filings to construct our dependent and independent variables. In line with other studies, such as Hwang and Kahle (2022), we use two payout measures as our dependent variables: non-negative cash dividend payouts and the dollar value of common stock repurchases, both scaled by total assets. For ease of interpretation, we multiply each measure by 100 and winsorize them at the 1st and 99th percentiles.

Following studies on payout policy, such as John et al. (2011), Caliskan and Doukas (2015), and Hwang and Kahle (2022), we control for both firm- and CEO-level characteristics in our analysis to more accurately assess the relationship between CEO pay ratio and firm payout policies. We control for firm size, return on assets (ROA), tangible assets, market-to-book ratio, leverage, R&D intensity, institutional ownership, firm age, and firm risk. Definitions for all variables are provided in the Appendix. We collect the data for CEO-level controls from Execucomp, including CEO age, gender, stock ownership, and option grants. To avoid extreme values, we winsorize our continuous variables at the 1st and 99th percentiles.

Additionally, we require that firms have non-negative dividends and repurchases, and that both our dependent and control variables are available for all firm-year observations. This requirement reduces the sample size to 5,768 firm-year observations for dividend payouts and 5,119 firm-year observations for stock repurchases.

Panel A of Table 1 shows the annual breakdown of our sample, as well as the mean and median pay ratios from 2017 to 2021. The table indicates that the number of firms in the sample ranges from 758

[1] The data was downloaded from https://guides.lib.ua.edu/c.php?g=879087&p=6314340.

to 1,359 per year. The mean (median) pay ratio in the sample is 195.76 (106.7). Additionally, we observe that the mean pay ratio initially starts high and then declines before increasing again in the last two years of the sample. As both the mean and median pay ratios rose during the COVID-19 pandemic period from 2020 to 2021, we investigate the effects of the pandemic on the relationship between pay ratios and payout policies in Section 4.

Panel B of Table 1 shows how pay ratios differ by industry, based on the Global Industry Classification (GIC). Mean pay ratios range from 75 to 409, while medians range from 65 to 220. Among the 11 industry sectors, the Consumer Discretionary sector has the highest pay ratio (408.73), while the Utilities sector has the lowest (75.00). Given the large variation in pay ratios across industries and the high standard deviations, we will use the natural logarithm of the pay ratio as the main variable throughout the analysis.

[Insert Table 1 here]

Most firms disclose their pay ratios between 90 and 120 days after the end of their fiscal year (t), which typically coincides with the end of the first quarter or the beginning of the second quarter of the following fiscal year (t+1). As we examine the relationship between pay ratios and payout policies, we need to measure how the disclosure of pay ratios in the first quarter of year (t+1) affects dividends and repurchases in year (t+1). Therefore, our dependent variables are measured for year (t+1), while most of our financial control variables, including the pay ratio, come from year (t). We measure institutional holdings as of year (t+1) as it reflects institutional shareholders' demand in year (t+1). CEO-level control variables, on the other hand, are measured as year (t+1), the year of pay ratio disclosure.

Table 2 presents the descriptive statistics for the dependent and control variables in both the dividend and repurchase samples. In Panel A, which focuses on the dividend sample, we observe that the average firm has a dividend payout of 1.551% and a pay ratio of 108.74 9 (with a natural log of 4.689). The mean market-to-book ratio is 2.205, while mean institutional ownership is 82.3%. However, the table also shows that the mean and median values of dividends are much lower than those for repurchases (1.551% vs. 3.167% of total assets). Repurchases are also more volatile than dividends, as indicated by their standard deviations (5.246% vs. 2.431%). These findings align with the literature, which suggests repurchases are now higher than dividends (for example, Grullon and Michaely, 2002) and that firms primarily use repurchases to distribute cash, while dividends, being more stable, serve as a commitment tool rather than a flexible one (Jagannathan et al., 2000; Brav, Graham, Harbey, and Michaely, 2005).

[Insert Table 2 here]

In Table 3, we present the correlation matrix for the explanatory variables included in the baseline models. Overall, we observe that the correlations among the variables are low.

[Insert Table 3 here]

3.2 Methodology

We use panel data regression to examine the relationship between CEO pay ratio and payout policies. In our regression analysis, we include year-fixed effects and firm-fixed effects to address concerns about omitted variables, and we use robust standard errors clustered at the firm level to account for potential non-independence and non-identical distribution of errors. Our baseline model is as follows:

$$\begin{aligned} Payout\ Policies_{i,t+1} &= \alpha + \beta Pay\ Ratio_{i,t} + \gamma_1 Control(Firm)_{i,t+1} + \\ &\gamma_2 Control(Firm\ Risk\ and\ Institutional\ Holdings)_{i,t} + \\ &\delta Control(CEO)_{i,t} + Year\ FE + Firm\ FE + \epsilon \end{aligned} \quad (1)$$

where *i* and *t* denote firm and year, respectively. The main independent variable is the natural logarithm of the pay ratio. The error term, ϵ ,is the robust standard error clustered at the firm level. The baseline model examines the individual impact of the pay ratio on dividend payouts and stock repurchases separately.

In addition to the annual model, we conduct a quarterly regression analysis to examine the relationship between the pay ratio and payout policies over shorter intervals. The overall format of the quarterly model is consistent with the annual model. The pay ratio, CEO-level control variables, firm risk, and institutional holdings are extracted from the same year *t* to ensure consistency. Meanwhile, other firm-level control variables are extracted from the fiscal quarter corresponding to corporate payouts in year *t+1*. Since firms typically report their previous year's pay ratios between the end of the first quarter and the beginning of the second quarter of the following year, we examine firms' payout policies in the second, third, and fourth quarters of the subsequent year to see how firms adjust their dividends and repurchases in response to the pay ratio disclosure.

4. MAIN RESULTS

In this section, we present our main results on the relationship between pay ratio and corporate payout policies.

4.1 Pay ratio and annual payout policies

Evidence suggests that a high CEO pay ratio may lead inequality-averse shareholders to switch their portfolios away from firms with high pay ratios, resulting in a loss of the shareholder base (Pan et al., 2022). In this section, we investigate how firms with high pay ratios could manage such situations within the framework of payout policies and whether these firms adjust their subsequent dividend payments or share repurchases.

In Table 4, we regress dividends and repurchases on pay ratio and other control variables using

our baseline model.

[Insert Table 4 here]

Column (1) of the table presents the relationship between the pay ratio and one-year-ahead dividend payouts. It indicates a significant positive association between the pay ratio and one-year-ahead dividend payouts, with a significance level of 1%. This result suggests that firms with high pay ratios are more likely to increase their dividend payouts in the following year.[2] This increase may indicate that firms are aware of the potential loss of investors and might raise dividends to send a positive signal to the market, aiming to prevent portfolio shifts among inequality-averse investors or to attract new investors. From this perspective, the results align with agency theory and dividend signaling theory, which propose that dividends are used to mitigate agency conflicts between managers and shareholders and to convey information about a firm's financial health and future prospects (e.g., Miller and Modigliani, 1961; Bhattacharya, 1979; La Porta et al., 2000; John and Knyazeva, 2006).

Column (2) presents the relationship between the pay ratio and stock repurchases. While previous studies (such as Bartov, 1991) have suggested that stock repurchases can signal underpricing, among other factors, our analysis reveals no significant relationship between the pay ratio and one-year-ahead stock repurchases. Our results support the shareholder base loss model proposed by Bodnaruk and Östberg (2013), which shows that firms with small shareholder bases are less likely to engage in stock repurchases due to the significant reduction in the shareholder base that such repurchases would cause. Consistent with this model, our findings indicate that firms with high pay ratios—aware of the potential portfolio shifts by inequality-averse investors—tend to avoid repurchases and instead opt for dividends to maintain their shareholder base.

Additionally, we observe that several control variables show significant and expected signs. The return on assets (ROA), R&D intensity, and institutional holding proportions show significantly positive relationships with both dividends and repurchases. Meanwhile, firm risk shows significantly negative relationships with both dividends and repurchases. These results are consistent with other studies (e.g., John et al., 2011; Caliskan and Doukas, 2015; Hwang and Kahle, 2022). Finally, the positive relationship between the market-to-book ratio and dividend payouts aligns with the findings of Hwang and Kahle (2022) and supports the dividend catering theory developed by Baker and Wurgler (2004).

4.2 Pay ratio and quarterly payout policies

In this section, we examine the relationship between pay ratios and quarterly payout policies, focusing on the short-term behaviors of firms and providing evidence of how quickly they react to pay

[2] In an unreported table, we also run separate annual regressions and find that the coefficient on the pay ratio is around 0.30 in 2018 and statistically significant at the 1% level. The coefficients in other years are around 0.15. This suggests that firms possibly reacted to the pay ratio disclosure more in 2018 than in later years.

ratio disclosures once available. Since pay ratio disclosures must be reported in a proxy statement within 120 days after the end of the fiscal year, most firms report their pay ratios between the end of the first quarter and the beginning of the second quarter of the following fiscal year, typically 90 to 120 days after the fiscal year-end. For instance, firms with a fiscal year-end of December 31 typically disclose their pay ratios at the end of March or in April. To analyze how firms might be adjusting their dividends and share repurchases, we separately examine these payouts in the second, third, and fourth quarters of year *t+1*, which correspond to the first, second, and third quarters after the pay ratio information becomes available.

Table 5 reports the relationship between pay ratios and quarterly dividend payouts. Columns (1), (2), and (3) correspond to the dividend payouts in the second, third, and fourth quarters of year *t+1*, respectively. In all models, we find that the pay ratio is positively and significantly associated with quarterly dividend payouts. Notably, the coefficient for the pay ratio in the second quarter of year t+1, as shown in Column (1), is the smallest (0.014) and only significant at the 10% level. A possible explanation is that, since most firms' pay ratios are available during the first month of the second fiscal quarter in year t+1, some firms may still need time to compare their pay ratios with those of their peers and determine appropriate payout policies. We observe that the coefficient for the third quarter model in Column (2) is the largest (0.026) and significant at the 1% level, suggesting that firms may begin adjusting their dividends in the third quarter. Overall, these findings indicate that firms adjust their dividend payouts in response to their pay ratio levels throughout the three quarters following the pay ratio disclosure.

[Insert Table 5 here]

In Table 6, we report the relationship between pay ratios and quarterly stock repurchases. While previous results indicate that the pay ratio is not significantly related to annual stock repurchases, we take a closer look at quarterly data to examine whether a relationship exists over shorter intervals. We do not observe a significant relationship between the pay ratio and stock repurchases in the second and fourth quarters of year t+1 in Table 6. Although a weak positive relationship between the pay ratio and repurchases exists in the third quarter (at the 10% level), overall, there is no strong relationship between pay ratios and subsequent stock repurchases.

One possible explanation for the lack of a general relationship between the pay ratio and repurchases is that repurchases are perceived as less of a commitment device compared to dividends and may also be more sensitive to external shocks, such as the COVID-19 pandemic (which we examine in Section 4.5). If the objective of payout policy adjustments in response to pay ratio disclosure is to retain current investors, stock repurchases could work in the opposite direction, potentially leading to a loss of shareholder base (Bodnaruk and Östberg, 2013). Thus, investors may view a stock repurchase opportunity provided by the firm as a chance to sell their stakes and exit the company, exacerbating the loss of shareholders. In this context, firms with high pay ratios might prefer dividends over repurchases.

[Insert Table 6 here]

4.3 Firm- and CEO-level effects

The previous section shows a significant relationship between the pay ratio and dividend payout. We will now examine how different firm- and CEO-level factors influence this relationship. Specifically, we explore several interaction terms between the pay ratio and other variables. The results indicate that particular firm and CEO characteristics notably affect the relationship between the pay ratio and dividends. Table 7 presents the results of annual dividend regressions that include firm- and CEO-level interaction terms. In Table 7, we focus only on dividends, as the previous results do not suggest a strong relationship between the pay ratio and share repurchases.

[Insert Table 7 here]

We would expect that firms with sufficient financial capacity are more likely to increase their dividends. We explore this possibility in Column (1). Here, we interact the pay ratio with ROA and find that the interaction term is significantly positive at the 1% level. This result suggests that firms with higher ROAs are more inclined to increase their dividend payments relative to those with lower ROAs when their CEOs face pay ratio pressure. This result aligns with previous research indicating that a firm's profitability and cash flows are positively associated with dividend payouts (e.g., Charitou and Vafeas, 1998; DeAngelo et al., 2006; Denis and Osobov, 2008).

In the second and third columns, we use CEO characteristics and interact them with the pay ratio. In Column (2), we examine whether CEO age affects the relationship between the pay ratio and dividend payments, as previous literature indicates that age can be a factor influencing corporate policies. For example, it has been shown that older CEOs tend to adopt lower-risk corporate strategies than their younger counterparts (e.g., Coles et al., 2006; Serfling, 2014). Column (2) shows that the interaction between the pay ratio and CEO age is significantly positive at the 5% level. This finding is consistent with the idea that older CEOs are often more risk-averse and may prioritize steady income for shareholders. Therefore, when confronted with high pay ratios, older CEOs may view increasing dividends as a means to manage shareholder expectations and mitigate potential concerns about excessive compensation.

Column (3) examines the impact of stock option awards on the relationship between pay ratio and dividend payouts. Although John et al. (2011) report that option awards are negatively associated with dividend payouts, we find that the interaction term between the pay ratio and option awards has a significant positive coefficient at the 5% level. Since these option awards represent newly granted stock options that cannot be exercised in the short term, CEOs may not be overly concerned about the potential short-term negative effects of paying higher dividends on stock prices. Instead, they may be more focused

on mitigating adverse market effects and selling pressure generated by certain institutional investors concerned about high pay ratios, as indicated by Pan et al. (2022). Thus, they may opt for increased dividend payouts as a strategic move to enhance shareholder satisfaction and stabilize stock prices, ultimately balancing their immediate compensation incentives with long-term shareholder interests.

Overall, this section shows that certain firm and CEO characteristics are associated with a firm's propensity to pay higher dividends in response to increased pay ratios.

4.4 Institutional holdings

Past studies show mixed results regarding the relationship between payout policies and a firm's institutional ownership (e.g., Grinstein and Michaely, 2005; Rubin and Smith, 2009; Huang and Paul, 2017). However, Pan et al. (2022) show that certain types of institutional investors adjust their portfolios away from firms with high pay ratios, suggesting that investor type could be an important factor in the relationship between pay ratios and dividends, especially when firms experience negative reactions due to high pay ratios. In this section, we examine the interplay between institutional investor types and pay ratios and present our results in Table 8.

[Insert Table 8 here]

In Panel A, we focus on institutional investors with different investment horizons—transient investors (TRA), quasi-indexer investors (QIX), and dedicated investors (DED) (Bushee and Noe, 2000; Bushee, 2001)—and create interaction variables with the pay ratio. TRA represents transient investor ownership, reflecting the ownership by institutions with short investment horizons. QIX denotes quasi-indexer investor ownership, indicating the ownership by institutions with medium investment horizons. DED stands for dedicated investor ownership, which represents the ownership by institutions with long investment horizons and passive investment strategies. The institutional ownership data is sourced from the end of the first calendar quarter following the fiscal year-end of the CEO pay ratio reporting year.

In Column (1) of Panel A, we interact TRA with the pay ratio and find no significant relationship between the two. As transient investors adjust their portfolios more often than other investor types, this finding suggests that either transient investors do not view high pay ratios as problematic compared to other investors, or firms may not consider them a significant factor in long-term investor satisfaction strategy relative to other investor types.

In Column (2), we focus on quasi-indexers, who are classified as medium-term investors and are expected to hold their shares longer than transient investors. Additionally, some of them may be dividend-income-oriented investors. We observe a significant and positive coefficient on the interaction term between QIX and the pay ratio in Column (2), suggesting that dividends in firms with higher pay ratios increase with the percentage of shares held by quasi-indexers. Thus, firms may view quasi-indexers as a

more integral part of their long-term strategy for maintaining investor satisfaction compared to other investor types, such as transient investors. When these investors move away from firms with high pay ratios (Pan et al., 2022), increasing dividends could help firms retain these institutions as shareholders and maintain or expand their shareholder base.

Column (3) shows the ownership of long-term institutional investors (DED) and its interaction with the pay ratio. Here, we observe a significantly negative coefficient on the interaction term at the 1% level. The negative coefficient of -0.618 on the interaction term implies that when firms face the same level of high CEO pay ratio pressure, those with larger dedicated institutional ownership have lower dividend payouts compared to their peers. One explanation for this could be that in firms with higher DED ownership, QIX ownership tends to be relatively low, and firms may not feel the need to increase their dividend payouts. Therefore, when DED ownership is high, indicating low QIX ownership, firms are less inclined to raise their dividend payouts. However, when DED ownership is low, suggesting relatively higher QIX ownership, firms may choose to increase dividends to retain their shareholder base, as discussed previously. Additionally, it is possible that because DED investors are long-term holders, firms with higher pay ratios may believe they do not need to increase their dividends, as they may not expect that DEDs will adjust their portfolios away from them.

In Panel B, we focus on independent investment advisors (IIAs), who, according to Pan et al. (2022), are more likely to have local investors and may be more sensitive to high pay ratios. These investors may be more inclined to reduce their holdings in firms with high pay ratios. We examine whether IIAs decrease their holdings in these firms within one year after the pay ratio disclosure date. Panel B has three models. In the first model, we classify all institutional investors as either IIAs or other investors and use the change in IIA ownership as the dependent variable, following the classifications of Noe (2000), Bushee (2001), and Pan et al. (2022). The second model focuses on large IIAs, specifically those who hold portfolios worth more than $1 billion. In the final model, we examine all other institutional investors and use the change in their ownership percentage as the dependent variable. Our key independent variable is the interaction dividends with the pay ratio.

Both Columns (1) and (2) show that the coefficient on the pay ratio is insignificantly negative, while the coefficient on dividends is significantly negative. The interaction term in both models is significantly positive. Thus, for firms with the same pay ratio, IIAs are more likely to increase their ownership in firms with higher dividends. In the final model, we examine non-IIAs (other institutions) and find no significant impact of the interaction between dividends and pay ratio on the change in their ownership levels. Overall, the results in Panel B align with the findings of Pan et al. (2022) and further demonstrate that firms that increase their dividends can mitigate the negative impact of high pay ratios

on their investor base by retaining existing IIAs or attracting new ones.[3]

4.5 The COVID-19 pandemic shock

In this section, we explore how the COVID-19 pandemic affected the relationship between pay ratios and payout policies. Although the mandatory pay ratio disclosure requirement began on January 1, 2017, a significant portion of our data comes from the pandemic period. As this was an exogenous shock, we aim to address two questions: (1) how the shock affected the pay ratio, and (2) whether the pay ratio-payout relationship observed in the previous sections was resilient to the shock. We report our results in Table 9.

In Table 9, we examine both dividends and repurchases using a subsample approach, and we also interact the pay ratio with an indicator variable for the pandemic. The World Health Organization (WHO) declared COVID-19 a global pandemic in March 2020. Given that pay ratio disclosures are generally made in March or April for most firms, we consider any firm-year observation with a fiscal year-end before the end of April 2020 as unaffected by the pandemic, while others are deemed affected. We create our pandemic indicator variable based on this cutoff. Using our classification, we note that the dividend dataset contains 1,960 observations in the pre-pandemic group and 3,808 observations in the during-pandemic group. The stock repurchase dataset includes 1,791 observations in the pre-pandemic group and 3,328 observations in the during-pandemic group.

Columns (1) and (2) show the results of the pre-pandemic and during-pandemic dividend subsample regressions. Both regressions indicate a significantly positive relationship between the pay ratio and dividend payouts, suggesting that this relationship is robust to the exogenous shock. It is also important to note that the coefficient of the pay ratio on dividends before the pandemic is much higher than during the pandemic, implying that the sensitivity of the pay ratio's effects on dividend payouts decreased during the pandemic period. This can be interpreted as firms having to forgo some of the adverse effects associated with high pay ratios in order to address other pressing issues crucial for their short-term survival when the pandemic hit.

[Insert Table 9 here]

In Columns (4) and (5), we focus on stock repurchases and present the subsample regression analysis for the pre-pandemic and during-pandemic periods. The results indicate a positive association between the pay ratio and stock repurchases before the pandemic, suggesting that firms with higher pay ratios conducted more stock repurchases than those with lower pay ratios. However, this relationship does not persist in the face of the pandemic shock, as no significant relationship is observed once the pandemic

[3] In an unreported table, we also test small independent investment advisors, and find no significant results. One reason for this may be that small independent advisors typically represent a small fraction of a firm's total ownership.

began. This finding is consistent with Cejnek et al. (2021) and Krieger et al. (2021), who suggest that firms chose to increase cash reserves during the pandemic to prepare for emergencies and avoid cash shortages. Compared to dividend payouts, stock repurchases represent a less stable payout policy for corporations and carry fewer negative implications if firms reduce their stock repurchases. Therefore, firms are more likely to increase cash reserves by reducing stock repurchases rather than dividends. It is evident that the relationship between the pay ratio and stock repurchases does not exist once the pandemic started.

In Columns (3) and (6), we regress dividends and repurchases on the pay ratio, including the pandemic indicator and the interaction term between the pay ratio and the pandemic indicator. The significant results in both regressions show that, compared to the pre-pandemic period, firms had lower corporate payouts during the pandemic when facing high pay ratio pressure. However, the difference is that the pay ratio-dividend relationship can withstand the pandemic shock, as indicated in Column (2), while the pay ratio-repurchase relationship cannot, as shown in Column (5). The results from this section further support and validate the findings from our baseline model in Table 4.

5. ROBUSTNESS CHECKS

In this section, we present the robustness checks on the main results, along with additional related tests. We focus on dividends only, as our earlier results showed no strong relationship between the pay ratio and repurchases.

5.1 Reverse causality and endogeneity issue

We use the lagged value of the CEO pay ratio and regress dividends and repurchases from year *t+1* on our key explanatory variable—the CEO pay ratio from year *t*. This approach should alleviate concerns about reverse causality. However, since the pay ratio is disclosed approximately 90 to 120 days after the previous fiscal year-end, this timeline allows firms sufficient time to adjust their payouts for the following year, which raises concerns about a causal relationship between the CEO pay ratio and payout policies.

To address potential endogeneity concern, we conduct a 2SLS regression analysis. Following the approach of Burns et al. (2015) and Ding et al. (2021), we select the mean value of CEO total compensation from peer companies within the same GICS industry as our instrumental variable. According to John and Knyazeva (2006), industry structure is unique to each sector and is therefore expected to be exogenous. The rationale is that the average CEO compensation of peer firms in the same industry is positively associated with the CEO pay ratio of a single firm, but is unlikely to have a direct impact on individual dividend payouts. From this perspective, this instrument can influence the CEO pay

ratio without directly affecting dividend payouts. Table 10 presents the results of the first and second stage regressions. A value of 15.04 on the Kleibergen-Paap Wald rk F statistic further validates the results by demonstrating that the instrumental variable is not weakly correlated with the CEO pay ratio in the first-stage regression.

[Insert Table 10 here]

Column (1) shows the first-stage regression. The dependent variable is the key explanatory variable in the main regression analysis—the pay ratio. The instrumental variable in Column (1) is the mean CEO compensation of peer companies within the same GICS sector. We observe a significant positive coefficient for the instrumental variable, indicating that the mean CEO compensation of peer companies is positively associated with the firm's CEO pay ratio. Column (2) presents the second-stage regression on dividend payouts using the instrumented value of the CEO pay ratio. It shows a positive relationship at the 5% significance level, confirming our baseline regressions. Importantly, we can now interpret the result in Column (2) as evidence of causality, suggesting that firms with high pay ratios increase their subsequent dividend payouts.

5.2 Subsample tests

In this section, we conduct several subsample tests to check the robustness of our primary results as well as to provide further insights on the relationship between CEO pay ratio and dividend payouts. Specifically, we conduct subsample analysis from three different perspectives: internationalization, CEO compensation, and firm investment opportunity.

The first analysis in this section is regarding the operating scope. The pay ratio disclosure rule allows companies to exclude up to 5% of non-U.S. employees when identifying the median employee. In this context, the discretion regarding whether and how to include overseas employees may influence the CEO pay ratio to some extent. Previous research has shown that including a significant overseas workforce can substantially affect both the median employee pay and the pay ratio (Lifshey, 2018). Therefore, firm internationalization may also impact the relationship between the pay ratio and dividend payouts, and we will examine whether our results are robust to the firm's internationalization.

Table 11 presents the summary statistics for two groups of firms in the sample: 1,303 multinational firm-year observations and 4,465 domestic firm-year observations. [4] Within the multinational subgroup, all firms have operational branches in the U.S. and are listed on the U.S. stock market, although none operates exclusively abroad. Consistent with previous studies, the table reveals that multinational firms tend to have larger sizes, higher profitability, and lower firm risk compared to

[4] We use the "idbflag" in Compustat to classify firms as either domestic or multinational. If the "idbflag" is set to "international" or "both," the firm is classified as multinational; otherwise, it is classified as domestic.

fully domestic firms (e.g., Shaked, 1986; Calof, 1993). Additionally, we find that multinational firms issue more dividends and have higher mean and median pay ratios than domestic firms.

[Insert Table 11 here]

Panel A of Table 12 presents the subsample regression results for multinational and domestic firms. Column (1) reports the results for multinational firms, while Column (2) reports the results for domestic firms. The results suggest that the positive and significant relationship between pay ratio and dividend payouts holds for both groups, indicating that this relationship is robust to the internationalization of the firm. Notably, the coefficient of the pay ratio for multinational firms in Column (1) is higher than that for domestic firms in Column (2). This difference suggests that multinational firms may be more sensitive to the adverse effects of high pay ratios and may be more cautious about potential shareholder loss. These findings are consistent with previous studies and highlight the importance of considering international factors when analyzing the relationship between pay ratio and dividend payouts (Shaked, 1986).

[Insert Table 12 here]

In the second part of the analysis, we look into the subsample test regarding CEO total compensation. Panel B of Table 12 shows the regression results of high-compensation subgroup and low-compensation subgroup when we split them using the year-industry median. We observe that the positive significant association between CEO pay ratio and dividends remains robust for the low-compensation subgroup but not for the high-compensation subgroup. As CEOs with higher compensations are referred as high-talents CEOs and are more likely to retain the earnings, it is not surprising to find out that low-compensation CEOs are more likely to issue higher dividends when they face the high pay ratio pressure comparing to high-compensation CEOs. This finding is also consistent with Bhattacharyya (2007) and Bhattacharyya et al. (2008).

The last subsample test we conduct is regarding firm's market-to-book ratio. The market-to-book ratio can be interpreted in many different ways such as growth potential, investment opportunity, and possible overvaluation. After dividing the full sample into two subsamples using the year-industry median market-to-book ratio in Panel C of Table 12, we find out that the significant relationship between CEO pay ratio and dividends remains in high-market-to-book ratio group but not in the low one. Our interpretation is that firms with high market-to-book ratios have more to lose from investor dissatisfaction due to the governance concerns. Therefore, this positive relationship is more pronounced comparing to low market-to-book ratio firms.

5.3 Alternative measures of CEO pay ratio

The preceding sections have established that firms with high pay ratios tend to have higher

dividend payouts. In this section, we aim to test the robustness of our main findings using alternative measures of pay ratios. First, we use two indicator variables for pay ratios instead of a continuous variable. We categorize all firm-year observations according to the Global Industry Classification (GIC) sectors, which divide firms into eleven different industries. Next, we compare each of our pay ratio observations to its annual industry mean and median. We then create two indicator variables that equal one if an observation's pay ratio is higher than the industry's annual mean or median, and zero if it is lower than or equal to those values. Additionally, we use the 75th percentile of the industry each year to assess whether the pay ratio-dividend relationship holds for extreme values. Finally, we include the regression analysis with the industry-adjusted pay ratio, which is calculated as the individual firm's CEO pay ratio minus the industry median pay ratio (in the natural log form). The results are presented in Table 13.

[Insert Table 13 here]

Columns (1) and (2) display the regression results of dividend payouts based on the indicator variables created from annual industry means and medians. Both variables have a significantly positive coefficient. Additionally, Column (3) shows that the dummy variable based on the 75th percentile of the annual industry pay ratio also indicates a significant positive relationship with dividend payouts. In Column (4), we use the industry-adjusted pay ratio as our independent variable. The significant positive relationship remains. The analysis of these alternative measures of pay ratios demonstrates the robustness of our primary findings and highlights how firms perceive their pay ratios in relation to industry averages and medians. The results suggest that firms may compare their pay ratios with the industry mean or median and adjust their dividend payouts accordingly.

5.4 Alternative measures of dividend payouts

In this section, we use several alternative measures of dividend payouts to provide a more comprehensive understanding of the relationship between the CEO pay ratio and dividend payouts. In the baseline model from Table 4, our sample includes all observations with non-negative dividends. To further investigate the robustness of the results, the first test we conduct checks whether the significant relationship still holds when only including observations with above-zero dividends. This is important because firms that do not pay dividends may not initiate payouts even if they have high pay ratios. The findings are reported in Column (1) of Table 14, where we observe that the positive and significant relationship between the CEO pay ratio and dividend payouts persists when considering only observations with dividends above zero.

[Insert Table 14 here]

Next, we use dividends per share as the second alternative measure, and again using the same above-zero dividends observations. To maintain consistency with the rest of the study, dividends per

share is defined as total cash dividends divided by the total number of shares outstanding. The regression results are shown in Column (2) of Table 14, where we find a significant positive relationship between the pay ratio and dividends per share, consistent with our main results.

Building on this, the third measure examines the change in dividends per share between the following year and the current year. The purpose of this test is to determine whether firms with high pay ratios tend to increase their dividends in the following year. Dividend growth is defined as the following year's dividends per share minus the current year's dividends per share, divided by the current year's dividends per share. As shown in Column (3), there is a moderately significant positive relationship between CEO pay ratio and dividend increases, indicating that firms with high CEO pay ratios not only have higher dividend payouts than those with low CEO pay ratios but also tend to increase their dividend per share in the subsequent year.

To further ensure the robustness of our primary findings and avoid possible selection bias, we conduct a propensity score matching (PSM) test and regression analysis on all alternative measures of dividends using a matched sample. Specifically, we define the top quartile of observations with above-zero dividends as the treatment group, while the remaining above-zero dividend observations serve as the control group. We include all firm-level control variables in the matching process. Additionally, we match for CEO age and option pay, as these two CEO-level factors demonstrated moderating effects in our previous analysis of the relationship between CEO pay ratio and dividend payouts. Panel A of Table 15 presents the comparisons between the two subgroups (i.e., treatment and control groups) before and after the one-to-one, non-replacement propensity matching.

[Insert Table 15 here]

After confirming that there is no significant difference between the treatment and control groups, we conduct the regression analysis with the matched sample. Panel B of Table 15 presents the results. To remain consistent with the alternative measures in Table 15, Column (1) displays the regression of the pay ratio on dividends to total assets, Column (2) shows the regression on dividends per share, and Column (3) presents the regression on dividend growth. The results indicate that even after applying the propensity score matching approach, the coefficients on the pay ratio remain positive and statistically significant, alleviating concerns about selection bias.

5.5 Relative dividend premium (RDP) effect

In this section, we include the relative dividend premium (RDP)—the market preference for dividends—developed by Baker and Wurgler (2004) and used by Caliskan and Doukas (2015) as an additional control variable. According to Baker and Wurgler's (2004) catering theory on dividends, firms are more likely to pay dividends when dividend-paying firms trade at a premium in the market. Therefore,

we investigate whether our results remain robust after controlling for market preferences regarding dividends. To do this, we adopt the method used by Caliskan and Doukas (2015) to incorporate the RDP variable into our annual baseline model. The RDP is defined as the yearly value-weighted average of the market-to-book ratios of dividend-paying firms, minus the market-to-book ratio of each firm-year observation. A high RDP value indicates a strong market preference for a firm to issue dividends, suggesting that RDP should be positively associated with dividend payouts. In our model, we calculate the RDP as the total assets-weighted average of the market-to-book ratios of dividend-paying firms, minus the market-to-book ratio of each firm. The regression results are presented in Table 16.

[Insert Table 16 here]

Column (1) uses the full sample while Column (2) uses the subsample of observations with above-zero dividends. In Column (1), while RDP is positively associated with dividends, it is not statistically significant. The results from Column (2) show that the coefficient of RDP is positive at 0.328 and statistically significant at the 1% level. Overall, our results are consistent with Caliskan and Doukas (2015), indicating that the inclusion of RDP is valid in our model. Meanwhile, the payout ratio remains significantly related to dividend payouts in both Column (1) and Column (2). Therefore, these results suggest that the relationship between the payout ratio and dividend payouts is not sensitive to specific market conditions.

5.6 Omitted variable - managerial entrenchment

Jiraporn and Chintrakarn (2009) find that firms with staggered boards pay significantly larger dividends, suggesting that higher dividends are necessary to compensate for the managerial entrenchment associated with staggered boards. Whether managerial entrenchment correlates with the CEO pay ratio, and whether this correlation affects the relationship between the CEO pay ratio and dividend payouts, is a question worth investigating. In this section, we test the robustness of our results by including the E-index. We follow Bebchuk et al. (2009) to generate the E-index for our sample. The E-index is composed of six governance provision dummies: staggered board, limits on amending bylaws, limits on amending the charter, supermajority, golden parachutes, and poison pill.[5] We report the results in Table 17.

[Insert Table 17 here]

Column (1) of Table 17 shows the full sample with the inclusion of the E-index, while Column (2) presents the subsample of observations with above-zero dividends. Although Jiraporn and Chintrakarn (2009) state that the GIM index is positively correlated with dividend payouts, we do not find any significant relationship between the E-index and dividend payouts in our sample. Importantly, the

[5] In an unreported table, we conduct the additional analysis by including only the staggered board dummy in our yearly baseline model. The positive relationship between CEO pay ratio and dividend payouts is significant at 5%, further validating the robustness of our main results.

inclusion of the E-index does not affect the relationship between the CEO pay ratio and dividend payouts. To further validate our findings, Column (3) reports results using dividends per share instead of dividends to total assets. We find no significant difference between the results in Column (3) and the previous findings in Table 14.

6. CONCLUSIONS

Following Pan et al. (2022), which concludes that firms with high CEO pay ratios experience adverse market reactions and loss of shareholder base, we investigate the differences in payout policies between high- and low-pay ratio firms. Focusing on the changes in corporate payout policies after the disclosure of pay ratios, we find that the CEO pay ratio is significantly associated with subsequent dividend payouts, but not necessarily with stock repurchases. The positive relationship between the CEO pay ratio and dividend payouts suggests that firms are concerned about the negative effects of high pay ratios; high-pay ratio firms attempt to increase their dividend payouts to mitigate adverse market reactions and retain shareholders. Furthermore, the significantly positive relationship between pay ratio and dividend payouts emerges immediately after firms disclose their pay ratios and remains significant throughout the second, third, and fourth quarters of that year. Using alternative measures of CEO pay ratio, our findings also indicate that CEOs may compare their pay ratios with those of peers in the same industry to better understand their pay inequality levels before making decisions about dividend payouts.

Equally important, we find that certain types of institutional investor ownership affect the relationship between the pay ratio and dividend payouts. Firms with higher dividend payouts are better able to retain existing institutional investors and maintain their shareholder base. Furthermore, by conducting several additional tests and robustness checks, we confirm that the relationship between the CEO pay ratio and dividend payouts is robust and not influenced by additional variables or alternative explanations.

Overall, our results suggest that firms recognize the adverse effects of high pay ratios on their shareholder base, among other factors, and take measures to retain existing shareholders or attract new ones by increasing their dividend payouts. In this context, our findings suggest that payout policy is sometimes used by firms not merely to distribute value back to shareholders, but rather as a means to placate them in the face of high pay ratios. This raises important questions about whether such an approach undermines the original purpose of payout policy. When firms use dividends primarily to maintain shareholder loyalty rather than to enhance shareholder value, it calls into question the effectiveness and integrity of payout policies in serving the best interests of all shareholders.

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Appendix A: Variable Definitions

Variable	Definition (Compustat variable name in parentheses)
Dependent variables	
Dividends	Cash dividends (DV) to total assets (AT).
Repurchases	Purchase of common and preferred stock (PRSTKC) minus the reduction in the book value of preferred stock (PSTKRV), scaled by total assets (AT).
Dividends per share	Cash dividends (DV) to total number of shares outstanding (CSHO).
Dividends growth	Dividends per share in year *t* minus dividends per share in year *t-1*, divided by dividends per share in year *t-1*.
Independent variables	
CEO pay ratio	Natural logarithm of original CEO pay ratio.
CEO pay ratio dummy - mean	Indicator equals to one if the original CEO pay ratio is higher than the industry average and equals to zero otherwise.
CEO pay ratio dummy - median	Indicator equals to one if the original CEO pay ratio is higher than the industry median and equals to zero otherwise.
CEO pay ratio dummy - p75	Indicator equals to one if the original CEO pay ratio is higher than the industry 75th percentile and equals to zero otherwise.
CEO pay ratio - industry adjusted	Individual firm's CEO pay ratio minus the year-industry median CEO pay ratio (both in the natural log form).
Control variables	
ROA	Earnings before interest, taxes, depreciation and amortization (EBITDA) to total assets (AT).
R&D intensity	R&D expenses (XRD) to total assets (AT).
Tangible assets	Property, plant and equipment (PPENT) to total assets (AT).
Market-to-book	The market value of assets (book assets (AT) plus market value of equity (PRCC_F*CSHO) minus book value of equity (CEQ)) scaled by book assets (AT).
Leverage	Long-term debt (DLTT) plus debt in current liabilities (DLC), scaled by total assets (AT).
Firm size	Natural logarithm of total assets (AT).
Firm age	Natural logarithm of one plus the number of years since the firm's first appearance in CRSP.
Firm risk	Natural logarithm form of the standard deviation of ROA over the past ten years.
Institutional holdings	Total number of shares held by institutional shareholders to total number of shares outstanding (CSHO).
CEO age	CEO age (AGE).
CEO gender	CEO gender (GENDER), indicator equals to one if CEO is female and equals to zero if CEO is male.
CEO ownership	Number of shares held by the CEO to total common sharesoutstanding (SHROWN_EXCL_OPTS_PCT).
Option pay	value of CEO option grants (OPTION_AWARDS) to total CEO pay (TDC2).

Conditioning variables	
TRA ownership	Total number of shares held by transient institutional investors to total number of shares outstanding (CSHO).
QIX ownership	Total number of shares held by quasi-indexer institutional investors to total number of shares outstanding (CSHO).
DED ownership	Total number of shares held by dedicated institutional investors to total number of shares outstanding (CSHO).
IIA change	Independent investment advisor ownership percentage change over three quarters.
Big IIA change	Big-size independent investment advisor ownership percentage change over three quarters. The big-size is defined as the net worth of portfolio holdings exceeds $1 billion.
Other change	All other institutional shareholders ownership percentage change over three quarters.
Pandemic	Indicator equals to one if the fiscal year end (DATADATE) is after April 30th, 2020 and equals to zero otherwise.
Peer CEO compensation - mean	Mean value of CEO compensation (TOTAL_ALT2) of peer companies in the same industry categorized by GICS with the exclusion of the company itself.
Relative dividend premium	Yearly value-weighted average of dividend paying firms' market-to-book ratio minus the market-to-book ratio of firm *i* at time *t*.
E-index	six-factor index collected from ISS database, originally developed by Bebchuk et al. (2009).

Table 1: Summary statistics of CEO pay ratio

The table presents the descriptive statistics of the CEO pay ratio across various industries. Panel A provides the summary statistics of CEO pay ratio in our final sample, whereas Panel B provides the summary statistics of CEO pay ratio in separate sectors according to the Global Industry Classification Standard (GICS). The choice of GIC sector division over more detailed divisions is based on the adequate differentiation it provides among industries and the sufficient number of observations in each division. In this way the GIC division ensures that the descriptive statistics of each industry are representative and valid. The final sample contains 5,768 firm-year observations.

Panel A: Summary statistics of CEO pay ratio - full sample

Full Sample	N	Mean	Median
CEO pay ratio (2017)	758	194.391	95.000
CEO pay ratio (2018)	1,216	127.015	102.500
CEO pay ratio (2019)	1,330	157.175	100.950
CEO pay ratio (2020)	1,359	219.777	105.200
CEO pay ratio (2021)	1,105	257.845	130.200
CEO pay ratio (2017-2021)	5,768	195.761	106.700

Panel B: Summary statistics of CEO pay ratio by industry

GIC Sector	N	Mean	Median	STD	P25	P75
Energy	313	93.58	76.70	85.21	49.10	105.30
Material	404	131.39	101.80	116.22	57.35	165.40
Industrial	1,002	154.19	110.15	182.49	68.70	178.60
Consumer discretionary	849	408.73	220.20	607.97	103.00	472.40
Consumer staples	282	388.37	178.45	1404.47	97.60	334.70
Health care	686	148.77	108.50	160.12	47.60	200.20
Financial	901	104.67	71.20	98.51	42.00	135.80
Information technology	832	208.12	119.50	314.56	58.45	240.90
Communication service	178	212.45	98.65	322.32	41.90	233.40
Utilities	246	75.00	65.45	48.94	39.20	97.60
Real Estate	75	132.87	107.40	100.38	54.50	174.70
Total	5,768	195.76	106.70	437.87	56.10	203.60

Table 2: Summary statistics of variables in baseline models

The table presents the descriptive statistics of all the variables in the baseline models. Panel A shows the statistics of dividend payout dataset and Panel B shows the statistics of stock repurchase dataset. Two separate tables are presented here because the observations for dividend payout and stock repurchase are not fully overlapped. There are different number of missing values in two datasets. The final samples contain 5,768 dividends firm-year observations and 5,119 repurchases firm-year observations. Dividends is the ratio of cash dividends to the total assets, times 100. The main variables are collected from Compustat, Execucomp, CRSP, and 13F fillings. Appendix A presents the variable definitions.

Panel A: Descriptive statistics of dividend dataset

Variables	N	Mean	Median	STD	P25	P75
Dividends	5,768	1.551	0.577	2.431	0.000	2.121
CEO pay ratio	5,768	4.689	4.670	1.038	4.027	5.316
ROA	5,768	0.111	0.105	0.092	0.061	0.152
R&D intensity	5,768	0.022	0.000	0.049	0.000	0.021
Tangible assets	5,768	0.247	0.154	0.245	0.060	0.369
Market-to-book	5,768	2.205	1.567	1.813	1.136	2.488
Leverage	5,768	0.301	0.289	0.213	0.122	0.427
Firm size	5,768	8.675	8.569	1.672	7.442	9.774
Firm age	5,768	3.331	3.367	0.717	2.944	3.892
Firm risk	5,768	-3.620	-3.539	1.089	-4.222	-2.958
Institutional holdings	5,768	0.823	0.857	0.155	0.744	0.937
CEO age	5,768	57.912	58.000	6.713	54.000	62.000
CEO gender	5,768	0.055	0.000	0.229	0.000	0.000
CEO ownership	5,768	1.301	0.277	3.384	0.088	0.806
Option pay	5,768	0.122	0.000	0.285	0.000	0.149

Panel B: Descriptive statistics of repurchase dataset

Variables	N	Mean	Median	STD	P25	P75
Repurchases	5,119	3.167	0.944	5.246	0.124	3.826
CEO pay ratio	5,119	4.693	4.672	1.047	4.013	5.326
ROA	5,119	0.116	0.111	0.091	0.067	0.157
R&D intensity	5,119	0.023	0.000	0.049	0.000	0.023
Tangible assets	5,119	0.245	0.158	0.237	0.065	0.358
Market-to-book	5,119	2.285	1.638	1.866	1.166	2.598
Leverage	5,119	0.300	0.287	0.214	0.124	0.426
Firm size	5,119	8.556	8.478	1.576	7.397	9.611
Firm age	5,119	3.315	3.367	0.714	2.944	3.871
Firm risk	5,119	-3.554	-3.496	1.032	-4.119	-2.937
Institutional holdings	5,119	0.826	0.861	0.154	0.747	0.940
CEO age	5,119	57.845	58.000	6.732	53.000	62.000
CEO gender	5,119	0.050	0.000	0.219	0.000	0.000
CEO ownership	5,119	1.350	0.291	3.464	0.092	0.841
Option pay	5,119	0.126	0.000	0.290	0.000	0.156

Table 3: Pairwise correlations of explanatory variables.

The table presents the pairwise correlations among CEO pay ratio and other control variables. The highest absolute value of the correlation coefficient is (-0.462) between firm risk and firm size, still considered as weakly correlated. we do not observe any significant high correlation between any variables in the table. Appendix A presents the variable definitions.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. CEO pay ratio	1.000													
2. ROA	0.193	1.000												
3. R&D intensity	-0.160	-0.088	1.000											
4. Tangible assets	0.025	0.116	-0.212	1.000										
5. Market-to-book	0.025	0.420	0.370	-0.113	1.000									
6. Leverage	0.253	0.136	-0.148	0.330	0.027	1.000								
7. Firm size	0.381	-0.080	-0.249	-0.019	-0.192	0.042	1.000							
8. Firm age	0.165	0.045	-0.114	0.135	-0.086	-0.021	0.296	1.000						
9. Firm risk	-0.059	0.243	0.323	0.166	0.265	0.187	-0.462	-0.187	1.000					
10. Institutional holdings	0.107	0.035	0.045	-0.067	0.022	0.053	-0.147	-0.124	0.084	1.000				
11. CEO age	0.026	-0.022	-0.061	0.014	-0.027	-0.076	0.068	0.083	-0.087	-0.119	1.000			
12. CEO gender	0.016	0.008	-0.008	0.052	0.006	0.010	0.003	0.016	-0.003	0.017	-0.042	1.000		
13. CEO ownership	-0.179	0.005	0.025	-0.006	0.056	-0.055	-0.222	-0.107	0.070	-0.253	0.216	-0.021	1.000	
14. Option pay	0.031	-0.000	0.225	-0.063	0.122	0.016	-0.081	-0.047	0.161	0.012	-0.029	-0.004	0.046	1.000

Table 4: CEO pay ratio and yearly payout policies

The table presents the yearly relationship between CEO pay ratio and next year's payout policies with full samples. Both dividend payouts and stock repurchases are scaled by total assets, times 100. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level.Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. Theconstant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)
VARIABLES	Dividends	Repurchases
CEO pay ratio	0.103***	0.183
	(3.263)	(1.350)
ROA	3.800***	14.791***
	(5.431)	(7.455)
R&D intensity	2.373**	14.356**
	(1.987)	(2.125)
Tangible assets	0.788	3.289
	(1.052)	(1.253)
Market-to-book	0.106***	0.164
	(2.604)	(1.179)
Leverage	-0.534	1.052
	(-1.128)	(0.766)
Firm size	-0.422***	-2.276***
	(-2.847)	(-4.659)
Firm age	0.025	3.903***
	(0.055)	(3.472)
Firm risk	-0.233***	-0.419**
	(-4.510)	(-2.055)
Institutional holdings	0.834***	2.623***
	(2.969)	(2.826)
CEO age	-0.001	-0.000
	(-0.173)	(-0.019)
CEO gender	0.101	-0.503
	(0.616)	(-0.859)
CEO ownership	0.024	-0.078*
	(0.484)	(-1.708)
Option pay	-0.084	-0.556*
	(-1.489)	(-1.939)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	5,768	5,119
R-squared	0.073	0.129

Table 5: CEO pay ratio and quarterly dividend payouts

The table presents the relationship between CEO pay ratio and the quarterly dividend payouts. Dividends is the ratio of cash dividends to the total assets, times 100. Column (1), (2), and (3) correspondto the second, third and fourth quarter of the next year, which can also be understand as around one quarter, two quarters, and three quarters after previous fiscal year's CEO pay ratio being disclosed. Thedifferent numbers of observations are caused by missing values in each quarter. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEOownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constantis not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)
VARIABLES	Dividends	Dividends	Dividends
CEO pay ratio	0.014*	0.026***	0.020**
	(1.667)	(3.053)	(2.148)
ROA	0.976***	0.874***	0.341
	(3.053)	(3.005)	(1.120)
R&D intensity	0.886	0.725	1.087*
	(1.296)	(1.001)	(1.939)
Tangible assets	0.045	0.009	-0.145
	(0.311)	(0.061)	(-0.777)
Market-to-book	0.026**	0.033**	0.042***
	(2.320)	(2.321)	(4.472)
Leverage	-0.342***	-0.350***	-0.394***
	(-4.543)	(-4.569)	(-3.879)
Firm size	-0.047	-0.046	-0.069**
	(-1.643)	(-1.644)	(-1.993)
Firm age	0.079	0.123	0.009
	(0.911)	(1.640)	(0.143)
Firm risk	-0.062***	-0.030**	-0.040***
	(-4.731)	(-2.478)	(-2.959)
Institutional holdings	-0.017	0.133**	0.156*
	(-0.293)	(2.175)	(1.719)
CEO age	-0.001	0.000	0.001
	(-0.353)	(0.083)	(0.432)
CEO gender	0.009	-0.056*	-0.004
	(0.341)	(-1.828)	(-0.161)
CEO ownership	0.009	0.013	-0.000
	(0.698)	(1.394)	(-0.013)
Option pay	-0.009	-0.005	-0.021
	(-0.847)	(-0.465)	(-1.557)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	5,458	5,474	5,598
R-squared	0.051	0.062	0.043

Table 6: CEO pay ratio and quarterly stock repurchases

The table presents the relationship between CEO pay ratio and the quarterly stock repurchases. Repurchases is the ratio of common stock repurchases to the total assets, times 100. Column (1), (2), and (3) correspond to the second, third and fourth quarter of the next year, which can also be regarded as around one quarter, two quarters, and three quarters after previous fiscal year's CEO pay ratio being disclosed. The different numbers of observations are caused by missing values in each quarter. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)
VARIABLES	Repurchases	Repurchases	Repurchases
CEO pay ratio	0.064	0.093*	0.029
	(1.172)	(1.925)	(0.573)
ROA	4.542***	5.991***	3.937***
	(4.121)	(5.443)	(4.467)
R&D intensity	7.308	10.703*	14.063**
	(1.322)	(1.830)	(2.146)
Tangible assets	0.837	0.551	-0.988
	(1.060)	(0.689)	(-1.154)
Market-to-book	0.093**	0.068	0.056
	(2.115)	(1.198)	(1.166)
Leverage	-0.318	-0.407	-0.572
	(-0.852)	(-1.133)	(-1.308)
Firm size	-0.096	-0.104	-0.424**
	(-0.762)	(-0.807)	(-2.553)
Firm age	0.858***	0.405*	0.786***
	(2.679)	(1.675)	(2.888)
Firm risk	0.019	-0.056	0.005
	(0.266)	(-0.944)	(0.078)
Institutional holdings	0.062	0.461*	0.368
	(0.173)	(1.884)	(0.930)
CEO age	0.003	-0.001	-0.007
	(0.450)	(-0.201)	(-1.236)
CEO gender	-0.319	-0.292	-0.332
	(-1.457)	(-1.581)	(-1.575)
CEO ownership	-0.005	0.002	-0.003
	(-0.240)	(0.114)	(-0.163)
Option pay	0.046	-0.132	-0.161
	(0.373)	(-1.291)	(-1.392)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	5,132	5,174	5,236
R-squared	0.069	0.063	0.057

Table 7: Firm- and CEO-level effects

The table presents the pay ratio regressions on yearly dividend payouts with different firm- and CEO-level interactions. Dividends is the ratio of cash dividends to the total assets, times 100. Column (1) reports the dividends baseline regression with the interaction on pay ratio and ROA; Column (2) reports the dividends baseline regression with the interaction on CEO age; And Column (3) reports the dividends baseline regression with the interaction on option awards. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The other controls and the constant are not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)
VARIABLES	Dividends	Dividends	Dividends
CEO pay ratio	-0.039	-0.313	0.091***
	(-0.878)	(-1.529)	(2.871)
CEO pay ratio*ROA	1.243***		
	(3.288)		
CEO pay ratio*CEO age		0.007**	
		(2.017)	
CEO pay ratio*Option pay			0.088**
			(2.315)
ROA	-1.400	3.792***	3.803***
	(-0.871)	(5.429)	(5.439)
CEO age	-0.002	-0.035*	-0.001
	(-0.284)	(-1.946)	(-0.176)
Option pay	-0.085	-0.083	-0.503**
	(-1.514)	(-1.462)	(-2.463)
R&D intensity	2.098*	2.323*	2.471**
	(1.916)	(1.948)	(2.087)
Tangible assets	0.944	0.783	0.821
	(1.280)	(1.045)	(1.097)
Market-to-book	0.095**	0.106***	0.109***
	(2.360)	(2.614)	(2.640)
Leverage	-0.488	-0.549	-0.530
	(-1.040)	(-1.159)	(-1.123)
Firm size	-0.380**	-0.418***	-0.419***
	(-2.573)	(-2.810)	(-2.827)
Firm age	0.039	0.042	0.019
	(0.085)	(0.094)	(0.042)
Firm risk	-0.236***	-0.233***	-0.232***
	(-4.663)	(-4.501)	(-4.498)
Institutional holdings	0.826***	0.821***	0.825***
	(2.978)	(2.930)	(2.948)
CEO gender	0.109	0.114	0.103
	(0.677)	(0.702)	(0.632)
CEO ownership	0.025	0.024	0.024
	(0.515)	(0.485)	(0.487)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	5,768	5,768	5,768
R-squared	0.080	0.074	0.074

Table 8: Institutional shareholder ownership

Panel A of the table presents the regressions on different types of institutional ownership and their interactions with CEO pay ratio. Column (1) includes the transient (short-term) institutional investor ownership and its interactions with CEO pay ratio. Column (2) includes the quasi-indexer (medium-term) institutional investor ownership and its interactions with CEO pay ratio. And Column (3) includes the dedicated (long-term) institutional investor ownership and its interactions with CEO pay ratio. Panel B presents the regressions regarding ownership changes on different types of institutional investors including all the independent investment advisors (IIA), big IIAs, and all other investors. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

Panel A: Institutional Investors of different investment time horizons			
	(1)	(2)	(3)
VARIABLES	Dividends	Dividends	Dividends
CEO pay ratio	0.126***	-0.091	0.251***
	(2.669)	(-1.088)	(4.340)
CEO pay ratio*TRA	-0.246		
	(-0.700)		
CEO pay ratio*QIX		0.461**	
		(2.335)	
CEO pay ratio*DED			-0.618***
			(-3.693)
TRA ownership	0.914		
	(0.547)		
QIX ownership		-1.557	
		(-1.646)	
DED ownership			2.347***
			(2.840)
Control Variables	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	5,752	5,756	5,750
R-squared	0.073	0.076	0.078
Panel B: Dividend policy and institutional ownership changes			
	(1)	(2)	(3)
VARIABLES	IIA change	Big IIA change	Others change
CEO pay ratio	-0.000	-0.000	0.000
	(-0.020)	(-0.050)	(0.078)
Dividends	-0.008***	-0.009***	0.003
	(-3.183)	(-3.216)	(1.197)
CEO pay ratio*Dividends	0.002***	0.002***	-0.001
	(2.944)	(2.862)	(-1.485)
Control Variables	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	5,727	5,725	5,726
R-squared	0.117	0.078	0.456

Table 9: COVID-19 pandemic shock

The table presents the pay ratio regressions on yearly payout policies with COVID-19 pandemic effects. Both dividend payouts and stock repurchases are scaled by total assets, times 100. Column (1) and (2) report the analysis of dividend payouts before and during the pandemic; Column (4) and (5) report the analysis of stock repurchases before and during the pandemic; Column (3) and (6) report the analysis of dividend payouts and stock repurchases with the pandemic dummy variable and interaction term between the pay ratio and pandemic dummy. The pandemic dummy equals to zero for all observations before April 30th, 2020 and equals to one otherwise. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Dividends	Dividends	Dividends	Repurchases	Repurchases	Repurchases
CEO pay ratio	0.151*	0.057*	0.171***	1.045**	0.126	0.321*
	(1.869)	(1.677)	(3.406)	(2.204)	(0.717)	(1.921)
CEO pay ratio*Pandemic			-0.096**			-0.200*
			(-2.058)			(-1.723)
Pandemic			0.325			0.071
			(1.231)			(0.081)
ROA	3.158**	3.311***	3.785***	8.860*	16.993***	14.752***
	(2.356)	(4.536)	(5.437)	(1.780)	(6.383)	(7.464)
R&D intensity	3.263	1.634	2.456**	-16.809	26.201***	14.478**
	(1.003)	(1.215)	(2.084)	(-1.127)	(2.690)	(2.143)
Tangible assets	-3.222**	2.189	0.837	0.230	9.283**	3.375
	(-2.029)	(1.551)	(1.122)	(0.044)	(2.499)	(1.281)
Market-to-book	0.248***	0.027	0.104**	-0.552*	-0.284	0.160
	(2.943)	(0.696)	(2.556)	(-1.712)	(-1.602)	(1.150)
Leverage	1.210	-0.012	-0.495	2.153	6.249***	1.179
	(0.729)	(-0.025)	(-1.051)	(0.619)	(2.945)	(0.860)
Firm size	-1.186**	-0.519**	-0.434***	-5.718***	-3.404***	-2.296***
	(-1.966)	(-2.429)	(-2.929)	(-4.603)	(-4.419)	(-4.695)
Firm age	1.237	0.442	-0.077	9.374*	2.330	3.693***
	(1.393)	(1.317)	(-0.174)	(1.934)	(1.474)	(3.315)
Firm risk	-0.104	-0.157**	-0.215***	-1.166*	-0.506	-0.382*
	(-1.009)	(-2.317)	(-4.307)	(-1.944)	(-1.569)	(-1.864)
Institutional holdings	0.147	0.729**	0.832***	-0.803	4.324**	2.651***
	(0.623)	(2.170)	(2.949)	(-0.719)	(2.506)	(2.830)
CEO age	0.009	-0.014*	-0.001	0.075**	0.004	-0.001
	(1.617)	(-1.871)	(-0.209)	(2.008)	(0.137)	(-0.035)
CEO gender	-0.676	0.275	0.107	-0.104	-1.033	-0.499
	(-0.953)	(0.931)	(0.656)	(-0.065)	(-0.935)	(-0.852)
CEO ownership	-0.022**	0.081**	0.025	-0.174	-0.119**	-0.074
	(-1.996)	(2.148)	(0.504)	(-1.495)	(-2.351)	(-1.637)
Option pay	-0.093	0.002	-0.084	-1.132	-0.600	-0.545*
	(-1.586)	(0.036)	(-1.493)	(-1.350)	(-1.202)	(-1.893)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,960	3,808	5,768	1,791	3,328	5,119
R-squared	0.152	0.064	0.075	0.174	0.175	0.130

Table 10: Instrumental variable (IV) regressions

The table presents the 2SLS regression using the mean CEO compensation of peer companies as the instrumental variable. The instrument is in the same industry (GIC) and in the same fiscal year as those of a firm's own pay ratio. Column (1) presents the first stage regression, and Column (2) presents the second stage regression with the fitted value of CEO pay ratio. The Kleibergen-Paap Wald rk F statistic is reported in the table as well. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)
VARIABLES	First stage - CEO pay ratio	Second stage - Dividends
Peer CEO compensation - mean	0.215***	
	(3.878)	
CEO pay ratio (fitted)		0.991**
		(2.253)
ROA	0.170	3.694***
	(1.196)	(5.204)
R&D intensity	1.410**	1.188
	(2.149)	(0.823)
Tangible assets	0.187	0.609
	(0.943)	(0.826)
Market-to-book	-0.003	0.106***
	(-0.238)	(2.612)
Leverage	-0.040	-0.506
	(-0.306)	(-1.075)
Firm size	0.191***	-0.598***
	(4.042)	(-3.365)
Firm age	0.244	-0.223
	(1.609)	(-0.480)
Firm risk	-0.012	-0.225***
	(-0.444)	(-4.368)
Institutional holdings	0.262*	0.588*
	(1.718)	(1.930)
CEO age	0.004	-0.004
	(1.357)	(-0.662)
CEO gender	0.009	0.095
	(0.093)	(0.582)
CEO ownership	0.001	0.024
	(0.164)	(0.470)
Option pay	0.260***	-0.316**
	(4.328)	(-2.485)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Kleibergen-Paap Wald rk F statistic	15.040	
Observations	5,768	5,768
R-squared	0.062	0.072

Table 11: Summary statistics of variables by different operating regions

The table presents the descriptive statistics of CEO pay ratio and other key variables by different operating regions. Firms are divided into multinational firms and domestic firms. All multinational firms have United States branches and are listed on the US stock exchanges. The multinational sector contains 1,303 observations and the domestic sector contains 4,465 observations. Dividends is the ratio of cash dividends to the total assets, times 100. Compared to domestic firms, the multinational firms in the sample have higher dividends, higher CEO pay ratio, higher ROA, larger firm size, and lower firm risk. Consistent with previous analysis, ROA and firm risk are winsorized at 1st and 99th percentile to avoid extreme values. Appendix A presents the variable definitions.

	N	Mean	Median	STD	P25	P75
Multinational						
Dividends	1,303	2.231	1.292	2.897	0.000	3.090
CEO pay ratio	1,303	5.118	5.133	0.957	4.515	5.685
ROA	1,303	0.125	0.113	0.092	0.070	0.171
Firm size	1,303	9.855	9.823	1.738	8.633	11.030
Firm risk	1,303	-3.620	-3.585	1.039	-4.256	-2.993
Domestic						
Dividends	4,465	1.353	0.463	2.239	0.000	1.831
CEO pay ratio	4,465	4.563	4.543	1.027	3.904	5.174
ROA	4,465	0.107	0.102	0.091	0.057	0.147
Firm size	4,465	8.331	8.219	1.485	7.235	9.364
Firm risk	4,465	-3.620	-3.531	1.103	-4.214	-2.947

Table 12: Subsample tests

The table presents the subsample tests from three different perspectives. Dividends is the ratio of cash dividends to the total assets, times 100. Panel A shows the subsample test regarding the internationalization of firms. Panel B shows the subsample test regarding different levels of CEO compensations. And Panel C shows the subsample test regarding different levels of firms' market-to-book ratio. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. I compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

Panel A: Multinational and domestic firms		
	(1)	(2)
VARIABLES	Dividends (multinational)	Dividends (domestic)
CEO pay ratio	0.158**	0.090**
	(2.363)	(2.571)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	1,303	4,465
R-squared	0.183	0.066
Panel B: High-compensation CEOs and low-compensation CEOs		
	(1)	(2)
VARIABLES	Dividends (high CEO compensation)	Dividends (low CEO compensation)
CEO pay ratio	0.065	0.114**
	(1.240)	(2.370)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	2,883	2,885
R-squared	0.118	0.060
Panel C: High-market-to-book firms and low-market-to-book firms		
	(1)	(2)
VARIABLES	Dividends (high market-to-book)	Dividends (low market-to-book)
CEO pay ratio	0.174***	0.011
	(3.220)	(0.378)
Control Variables	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	2,870	2,898
R-squared	0.104	0.071

Table 13: Alternative measures of CEO pay ratio

The table presents the robustness test on the relationship between CEO pay ratio and yearly dividend payouts by using alternative CEO pay ratio measures. Dividends is the ratio of cash dividends to the total assets, times 100. Column (1) uses the CEO mean pay ratio dummy variable; Column (2) uses the CEO median pay ratio dummy variable; Column (3) uses the CEO 75th percentile pay ratio dummy variable; and Column (4) use the year-industry adjusted CEO pay ratio, as the main explanatory variables to dividend payouts. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

VARIABLES	(1) Dividends	(2) Dividends	(3) Dividends	(4) Dividends
CEO pay ratio dummy - mean	0.110**			
	(2.174)			
CEO pay ratio dummy - median		0.111*		
		(1.959)		
CEO pay ratio dummy - p75			0.101*	
			(1.676)	
CEO pay ratio - industry adjusted				0.091***
				(2.945)
Control Variables	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	5,768	5,768	5,768	5,768
R-squared	0.072	0.072	0.072	0.073

Table 14: Alternative measures of dividend payouts

The table presents the robustness test using different measures on dividend payouts. Column (1) reports the subsample analysis on above-zero dividends observations. Dividends is the ratio of cash dividends to the total assets, times 100. Column (2) uses the same subsample as Column (1). Dividends per share is defined as total cash dividends to common shares outstanding. Column (3) uses the full sample. Dividends growth is defined as current year's dividends per share minus previous year's dividends per share, scaled by previous year's dividends per share. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)
VARIABLES	Dividends	Dividends per share	Dividends growth
CEO pay ratio	0.147***	0.055*	0.127*
	(2.708)	(1.956)	(1.701)
ROA	7.374***	3.689***	5.155***
	(5.386)	(5.275)	(3.579)
R&D intensity	7.586*	-0.474	-2.190
	(1.948)	(-0.211)	(-0.525)
Tangible assets	-0.047	0.712	0.410
	(-0.042)	(1.275)	(0.361)
Market-to-book	0.190**	0.003	-0.067
	(2.291)	(0.092)	(-0.968)
Leverage	-0.138	-0.088	0.371
	(-0.165)	(-0.191)	(0.307)
Firm size	-0.946***	0.328**	-0.108
	(-3.505)	(2.405)	(-0.366)
Firm age	-0.148	-0.081	0.297
	(-0.180)	(-0.236)	(0.646)
Firm risk	-0.215***	-0.029	0.155
	(-3.063)	(-0.646)	(1.420)
Institutional holdings	1.136**	0.188	-0.198
	(1.966)	(0.536)	(-0.399)
CEO age	-0.003	0.003	-0.004
	(-0.334)	(0.590)	(-0.514)
CEO gender	0.094	0.082	0.135
	(0.451)	(0.980)	(1.256)
CEO ownership	-0.007	-0.004	-0.008
	(-0.161)	(-0.195)	(-0.204)
Option pay	-0.026	0.022	0.134
	(-0.235)	(0.491)	(0.574)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	3,790	3,790	3,787
R-squared	0.124	0.137	0.011

Table 15: Propensity score matching (PSM) test

The table presents the PSM test. Panel A presents the matching results. After matching, there is no significant difference between the treatment group and control group on the matched variables. Panel B presents the regression analysis on alternative measures of dividend payouts using the matched sample. Column (1) shows the regression on dividends to total assets, Column (2) shows the regression on dividends per share, and Column (3) shows the regression on dividends growth. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

Panel A

	Before PSM				After PSM			
	Treated	Control	diff	t-statistic	Treated	Control	diff	t-statistic
ROA	0.132	0.110	0.022	7.354	0.126	0.129	-0.003	0.844
R&D intensity	0.013	0.011	0.002	2.076	0.013	0.014	-0.001	0.789
Tangible assets	0.251	0.259	-0.007	0.871	0.252	0.263	-0.011	0.950
Market-to-book	2.309	1.931	0.378	6.251	2.156	2.183	-0.027	0.348
Leverage	0.378	0.270	0.108	13.517	0.354	0.366	-0.013	1.272
Firm size	9.778	8.920	0.859	13.922	9.662	9.581	0.081	1.051
Firm age	3.647	3.460	0.187	7.318	3.615	3.616	-0.001	0.025
Firm risk	-3.719	-3.964	0.244	7.291	-3.748	-3.684	-0.063	1.477
Institutional holdings	0.818	0.804	0.014	2.734	0.821	0.817	0.004	0.580
CEO age	58.555	58.042	0.513	2.121	58.431	58.454	-0.023	0.077
Option pay	0.137	0.086	0.051	5.724	0.127	0.123	0.004	0.283

Panel B

	(1)	(2)	(3)
VARIABLES	Dividends	Dividends per share	Dividends growth
CEO pay ratio	0.231***	0.120**	0.148*
	(2.624)	(2.360)	(1.729)
Control Variables	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	1,644	1,644	1,607
R-squared	0.186	0.190	0.037

Table 16: Relative dividend premium (RDP) effect

The table presents the robustness test on the relationship between CEO pay ratio and yearly dividend payouts by introducing the market preference for dividends: the relative dividend premium (RDP). Dividends is the ratio of cash dividends to the total assets, times 100. The RDP is measured as the yearly weighted average book-to-market ratio of dividend paying firms minus the book-to-market ratio of firm i in year t. Column (1) reports the results of full sample regression with the inclusion of the RDP; Column (2) presents the above-zero dividends subsample analysis with the inclusion of the RDP. After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)
VARIABLES	Dividends	Dividends
CEO pay ratio	0.104***	0.152***
	(3.287)	(2.805)
Relative dividend premium	0.111	0.328***
	(1.240)	(2.735)
ROA	3.787***	7.386***
	(5.414)	(5.394)
R&D intensity	2.314*	7.167*
	(1.936)	(1.837)
Tangible assets	0.803	-0.015
	(1.075)	(-0.013)
Market-to-book	0.222**	0.533***
	(2.109)	(3.327)
Leverage	-0.552	-0.110
	(-1.165)	(-0.132)
Firm size	-0.420***	-0.953***
	(-2.835)	(-3.570)
Firm age	0.016	-0.188
	(0.035)	(-0.231)
Firm risk	-0.229***	-0.211***
	(-4.434)	(-3.016)
Institutional holdings	0.831***	1.149**
	(2.961)	(1.987)
CEO age	-0.001	-0.003
	(-0.195)	(-0.347)
CEO gender	0.100	0.095
	(0.610)	(0.455)
CEO ownership	0.024	-0.007
	(0.484)	(-0.159)
Option pay	-0.083	-0.028
	(-1.472)	(-0.257)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	5,768	3,790
R-squared	0.074	0.127

Table 17: Omitted variable - managerial entrenchment

The table presents the robustness test on the inclusion of possible omitted variable - managerial entrenchment. Column (1) reports the full sample analysis. Dividends is the ratio of cash dividends to the total assets, times 100. Column (2) uses the above-zero dividends subsample. Column (3) changes the dependent variable to dividends per share, which is defined as total cash dividends to common shares outstanding. Column (3) also uses the same above-zero subsample as Column (2). After checking the original data, ROA, R&D intensity, market-to-book, leverage, firm risk, institutional holdings, CEO ownership, and option pay are winsorized at 1st and 99th percentile to avoid extreme values. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)
VARIABLES	Dividends	Dividends	Dividends per share
CEO pay ratio	0.094***	0.128**	0.051*
	(2.960)	(2.425)	(1.796)
E-index	-0.034	-0.101	-0.077
	(-0.321)	(-0.484)	(-0.654)
ROA	3.561***	6.295***	3.505***
	(5.112)	(4.911)	(4.761)
R&D intensity	1.869	6.813*	-0.608
	(1.613)	(1.738)	(-0.267)
Tangible assets	0.922	0.181	0.712
	(1.219)	(0.159)	(1.220)
Market-to-book	0.107**	0.203**	0.002
	(2.563)	(2.398)	(0.073)
Leverage	-0.649	-0.465	-0.092
	(-1.330)	(-0.552)	(-0.186)
Firm size	-0.423***	-0.948***	0.318**
	(-2.795)	(-3.485)	(2.234)
Firm age	0.196	-0.045	-0.042
	(0.419)	(-0.052)	(-0.115)
Firm risk	-0.220***	-0.199***	-0.028
	(-4.153)	(-2.784)	(-0.596)
Institutional holdings	0.866***	1.335**	0.230
	(2.851)	(2.256)	(0.623)
CEO age	-0.001	-0.001	0.003
	(-0.089)	(-0.126)	(0.496)
CEO gender	-0.066	-0.116	0.073
	(-0.839)	(-1.078)	(0.845)
CEO ownership	0.023	-0.012	-0.004
	(0.439)	(-0.281)	(-0.211)
Option pay	-0.102*	-0.095	0.025
	(-1.821)	(-0.895)	(0.521)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	5,469	3,628	3,628
R-squared	0.073	0.118	0.129

Chapter 2

Determinants and Predictive Power of SPAC Share Redemption

1. INTRODUCTION

Special Purpose Acquisition Companies (SPACs) represent a distinctive category of public companies in the financial market. These entities are commonly perceived as an appealing alternative for private firms seeking to enter the public market. In 2021, there was an unprecedented surge with 613 new SPAC Initial Public Offerings (IPOs). The popularity of this novel asset class has attracted significant attention from investors, analysts, and researchers, prompting a keen interest in understanding the distinctive features of SPACs. All SPACs go public without a specific product or service, and their shares are structured as trust units with a par value of $10 per share. The primary objective of SPACs is to merge with a private company, providing an alternative for private firms to go public. Researchers have been debating the efficacy of SPACs in delivering favorable merger deals and whether they can serve as a suitable alternative to traditional IPOs for private firms (e.g., Gahng et al., 2021; Klausner et al., 2022; Kiesel et al., 2023). In this paper, I study one of the important procedures in the life of SPACs – share redemption. Specifically, I address the crucial determinants affecting the shareholders' decision on SPAC share redemption. Subsequently, I investigate the predictive power of the share redemption rate on the operational performance and stock market performance of the newly merged company during the post-merger period.

When a SPAC acquisition is announced, original shareholders of the SPAC face a crucial decision: they can either redeem their shares and exit the SPAC or they can opt to remain invested and become shareholders of the newly merged firm. However, if the merger deal fails to reach completion within a specified time frame, the SPAC faces liquidation. The availability of funds is another pivotal factor that significantly impacts the success of a SPAC merger. If a substantial number of SPAC shareholders redeem their shares following the acquisition announcement, the founders may need to seek alternative financing sources to finalize the merger or pursue a different target company within a limited period. In this case, inadequate funding could also eventually lead to the liquidation of the SPAC. Between 2010 and April 21st, 2023, 1,458 SPACs have gone public. Of these, 499 SPACs successfully completed their mergers, while 263 SPACs were liquidated. The rest of the SPACs are still operating and looking for potential targets.

The decision regarding share redemption holds significant implications for both SPAC shareholders and sponsors. For SPAC sponsors, if the SPAC undergoes liquidation, they will lose all their initial investments and face a complete failure. Conversely, if they successfully finalize the merger with a private firm, SPAC sponsors can reap exceptionally high returns (Klausner et al., 2022). For SPAC shareholders, the share redemption decision is crucial as well. Redeeming shares and walking away with a low but stable return or becoming the shareholders of the newly merged

company. This choice can directly affect their own wealth and future investment strategies.

I separate the paper into two main segments: determinants of SPAC share redemption and the predicting power of share redemption rate on SPAC's post-merger performance. The first part of this paper focuses on investigating the demand for investor information within the context of SPACs. The primary objective is to understand how different factors influence investors' decisions regarding the redemption of their SPAC shares, which can serve as a proxy for merger quality and reflect investors' confidence in the newly merged firms. The analysis incorporates information from three distinct sources: the SPAC firm, the target firm, and the broader market conditions and merger transactions. Analyzing a dataset of 499 successfully merged SPACs from 2010 to April 21st, 2023, I find significant associations between the share redemption rate and specific factors from each of the three sides mentioned earlier. Notable influences include the investment weight of SPAC sponsors, the time frame-related characteristics of the SPAC, the degree of SPAC share dilution, the extent of media coverage on the target firm, the geographical location of the target, and the prevailing market conditions. These findings shed light on the factors driving investors' share redemption decisions in the SPAC context and offer valuable insights into the dynamics of SPAC merger quality and investor's confidence in the newly merged companies.

To provide a more comprehensive and generalized picture of share redemption determinants, I conduct additional analysis by including different contemporary market conditions, SPAC operating time frames, and geographic characteristics of target firms. I first examine the impact of short-term and long-term stock market conditions on investors' decisions regarding share redemption. I employ various time frames of market return and volatility in the regression analysis. The findings reveal that while the financial market return does not consistently influence shareholders' redemption decisions, the redemption rate is consistently affected by market volatility. Specifically, market volatility has a negative association with the share redemption rate. These results provide valuable insights into the role of market conditions in shaping investors' choices within the SPAC context.

Next, I focus on the different SPAC operating time frames because the deSPAC process is time-sensitive. I believe that investors will make distinct redemption decisions as they perceive these time frames differently. The baseline regression outcomes exhibit a positive association between the target search duration (from the SPAC's IPO date to the merger announcement date) and the share redemption rate. After integrating several other time frame variables, I find that the redemption rate reacts quite differently regarding different time lengths of SPAC operations. There is an observed lower redemption rate when the SPAC's original planned lifespan (measured from the IPO date to the merger closing date) is more prolonged. Conversely, there is a higher redemption rate when the

merger negotiation period (the time from the merger announcement to the merger closing date) is elongated. Furthermore, an examination of SPACs that underwent actual extensions versus those that did not reveal that the former group experienced higher redemption rates. The insights gathered from this portion of the study underscore the differences in shareholder perceptions regarding the time frames of various SPAC operations.

Since the baseline regression results demonstrate that SPACs merging with foreign target firms witness higher redemption rates than those merging with domestic target firms, I also conduct the redemption analysis based on different geographic characteristics of target firms. The subsample test reveals that the shareholders' decision on redemption – when the target is a foreign entity – is influenced exclusively by information from the SPAC side. In contrast, when the target firm is domestic, the redemption rate is influenced by various factors from the SPAC side, the target side, and the merger deal and the financial market side. A contributing factor to this observed discrepancy could be the information barrier between investors and foreign target companies.

The second part of this study focuses on the relationship between the redemption rate and SPAC's post-merger performance. Specifically, I investigate the potential of the share redemption rate as a predictive instrument for the future performance of a newly merged entity. The exploration commences with an evaluation of post-merger operational performance. To provide a comprehensive view of post-merger performance, the analysis encompasses a proxy for firm profitability - return on assets (ROA), and a proxy for firm liquidity - the cash ratio. The analysis, derived from quarterly and annual data, reveals that the redemption rate is negatively associated with post-merger operational performance in terms of firm profitability and liquidity.

In addition to operational performance, I examine the potential of the redemption rate as a predictor of a company's post-merger stock market performance. Previous studies have investigated the post-merger performance of SPACs over both short-term and long-term horizons (e.g., Kolb and Tykvova, 2016; Vulanovic, 2017; Kiesel et al., 2023). This paper narrows the focus on the implication of the share redemption rate, discussing the extent to which investors' redemption decisions might forecast the subsequent stock performance of the deSPAC entity. Using the same estimation method as Feng et al. (2023) on SPAC's stock return, I find that the share redemption rate possesses predictive power concerning post-merger stock performance. SPACs that undergo a higher rate of share redemption tend to display lower stock returns in the three- to six-month window following the merger. However, this significant negative relationship is limited to the original SPAC shareholders who acquired the SPAC share units before the merger announcement. The predictive capacity of the redemption rate does not extend to investors acquiring shares after the merger.

My study significantly contributes to the existing body of SPAC literature in multiple

dimensions. Prior SPAC research predominantly investigates the distinctions between SPAC mergers and traditional IPOs and the performance dynamics before and after the merger (e.g., Jenkinson and Sousa, 2011; Shachmurove and Vulanovic, 2017). This study of investors' behavior offers various perspectives for analyzing the success of SPACs and shareholder confidence in SPAC mergers. It highlights key factors influencing investors' financial decisions within the SPAC context, especially when facing limited information from conventional sources such as the SEC. Furthermore, the post-merger performance analysis provides insights into the intrinsic value of the share redemption rate and sheds light on the relationship between redemption rate and SPAC post-merger performance. From a practical standpoint, a more profound comprehension of investor behavior serves a dual purpose; it furnishes current and prospective shareholders with informed strategies about their SPAC investments and equips SPAC founders and management with insights to optimize decision-making, thus heightening the likelihood of successful acquisitions.

The remainder of the paper is organized as follows. Section 2 introduces the institutional and academic backgrounds relevant to this study. Section 3 elaborates on the SPAC data and outlines the research methodology. Section 4 discusses the primary findings pertaining to the SPAC share redemption rate and the associated tests. Section 5 presents the results concerning the predictive capability of the SPAC share redemption rate on post-merger performance. Section 6 concludes.

2. INSTITUTIONAL AND LITERATURE BACKGROUNDS

2.1 Institutional background of SPACs

A SPAC's single purpose is to raise equity from investors from the time of its initial public offering (IPO) and, later, to locate an investment opportunity in a private company and acquire it. While the IPO process for SPACs resembles that of traditional companies, a distinctive feature is the uniform IPO-day setting price of $10 for all SPACs. During the life cycle of a SPAC, the potential for SPAC liquidation arises primarily from two risk factors: time constraints and funding shortfalls. Therefore, investor perceptions regarding the merger deal and their confidence in the post-merger entity are paramount. Their perceptions and attitudes directly influence their decisions about the proposed merger votes and share redemption choices.

Although some SPACs target their mergers on specified industries, offering investors additional insight, they are still technically blank-check companies after IPO. Typically, SPAC share prices hover around the $10 range until merger announcements are made. In this case, it is difficult for investors to evaluate the SPACs' performance compared to other specific industrial companies before the SPAC merger. After IPO, most SPACs present offerings in the form of warrants and common shares. Notably, nearly all invested funds are channeled into a third-party trust, which can

earn a relatively low but stable return for SPAC shareholders. Even if the SPAC gets liquidated, the trust will still return investors their initial investments plus some risk-free profit. Given these dynamics, certain individual investors equate SPACs with private equity. Concurrently, some institutional investors are drawn to SPACs, leveraging them as hedging instruments (Dimitrova, 2017).

For most SPACs, management can identify target companies and present proposals to investors approximately twelve months after the SPAC's IPO. Upon receipt of such a proposal, public shareholders have two alternatives. The first is to retain their position in the SPAC and transition into shareholders of the newly merged entity upon the merger's completion. Alternatively, they can redeem their shares and leave the company with their initial pro-rata investments, including a modest and stable profit.

In the early years, SPACs required 80% of shareholder votes for acquisition approval. Should opposition from shareholders exceed 20%, the proposed acquisition would be deemed unsuccessful. This means that SPACs required a minimum shareholder approval rate and adequate financing to close the merger. In the cases of first merger proposal failure, SPAC founders usually do not have sufficient time to identify an alternative target, leaving liquidation as their only option. Subsequently, to enhance the probability of successful merger completions, the disapproval threshold was incrementally raised from 20% to 30%, 40%, or even higher beginning in 2006. After 2010, a series of pivotal reforms were instituted in the realm of SPACs, drawing from the principles of the "tender offer regulation" (e.g., Kolb and Tykvova, 2016; Rodrigues and Stegemoller, 2012; Gahng et al., 2021). The changes make post-2010 SPACs more investor-friendly. One important shift entailed decoupling share redemption rights from the shareholder approval voting mechanism, which means even shareholders choose to redeem their shares, they can still vote "yes" to the proposed merger. Meanwhile, in recent years, most SPACs no longer formally maintain the disapproval threshold feature, meaning they only need to get enough funding to finish the merger within certain time limits (Klausner et al., 2022).

After SPACs' merger announcements, shareholders are generally given several months to consider whether to redeem their shares. High redemption rates can precipitate a "cash shortfall" dilemma for the SPAC. To address this deficit, SPACs often secure additional capital through Private Investment in Public Equity (PIPE). PIPE investors help SPACs alleviate the cash shortage caused by redemption and provide enough liquidity to target companies. Upon the merger's closing, SPACs start trading under a new ticker symbol, representing the newly merged entity.

2.2 Literature background of SPAC research

Existing literature predominantly focuses on the SPAC IPO, the SPAC merger deal and subsequent stock market performance, and the managerial traits characterizing SPACs (e.g., Abrahamson et al., 2011; Vulanovic, 2017; Howe and O'Brien, 2012; Lin et al., 2021). In this section, I review prior studies from these two perspectives, highlighting the importance of comprehending investor behavior in the context of SPAC mergers.

2.2.1 SPAC performance

Early SPAC studies primarily focus on this new entity's legal and financial aspects. Hale (2007) studies the fundamental structure of SPACs, shedding light on the incentives driving various stakeholders. She posits that SPACs represent a propitious evolution within the financial market landscape with the potential to confer benefits across all shareholder classes. Heyman (2007) offers a comprehensive overview of blank-check companies, emphasizing that SPACs operated between 2003 and 2006 exhibited superior performance relative to their predecessors from the 1990s. He argues that the SPAC's structure enables sufficient investor protection, compliance with all SEC rules, and representation of an example of legal creativity. Such characteristics bolster the SPAC's standing as a mainstream corporate entity in financial markets.

As the proliferation of SPACs in the market continues, investors and scholars have amplified their focus on this emergent asset class. Several studies on SPAC compare SPAC mergers with traditional IPOs. Sjostrom Jr (2007) claims that SPACs emerge as a plausible alternative to conventional IPOs when viewed through the lens of private companies. He asserts that SPACs have the same components and structure as traditional IPOs in specific dimensions, such as vested-in underwriters and fund injection to new firms. Berger (2008) examines three complete SPAC merger cases and claims that during 2003-2007, SPACs worked well in more complicated circumstances by having enough cash to improve the capital structure to an optimal level, offering valuation benchmarks and providing exit opportunities for companies without prominent strategic buyers.

Through an empirical analysis of a dataset encompassing 87 SPACs from 2003 to 2006, Boyer and Baigent (2008) assert that SPACs pave a less expensive and more expeditious avenue for private firms to access public financing, particularly in a depressing IPO market. Consistent with their findings, concurrent research also claims that a SPAC merger can accelerate the transition of private entities into publicly traded ones in a more condensed time frame than a conventional IPO. The main reason is that most SPACs only have 18-24 months to complete the acquisition if there is no permitted extension. Otherwise, liquidation is the only option. SPAC sponsors and SPACs' underwriters do not want to end the deal with liquidation. Given the time constraints of SPAC life, a private firm can go public within a shorter period via a SPAC merger than a traditional IPO.

In a more recent comprehensive study spanning from 2003 to 2019 and encompassing 370 SPACs, Dimic et al. (2020) investigate the determinants that may influence SPACs' IPO withdrawal decisions. The authors conclude that SPACs exhibit a reduced propensity to withdraw their IPOs if they possess a well-defined focus on acquisitions (i.e. specific industry of target firms), have many underwriters, and if their legal counsel obtains specialization within the SPAC market domain.

Conversely, a segment of the literature highlights discernible underperformance issues associated with SPACs. One study in this domain by Abrahamson et al. (2011) embarks on a detailed examination of 58 SPACs that successfully closed their mergers between 2003 and 2009. Their findings illuminate a scenario where numerous acquisitions gain approval despite harboring the potential for negative post-merger returns. Their ex-post test results show that more than half of the SPAC acquisitions are value-destroying deals. After six months of the merger, SPAC investors experienced an average cumulative return of -24%, and this trend continued to exacerbate over time. As they report, the one-year average cumulative return is -55%. Although the gap between "good" and "bad" SPACs' return is large ("good" SPACs experience close to zero six-month return and -6.2% annual return, whereas "bad" SPACs experience -39% six-month return and -79% annual return), the overall post-merger performance of SPACs is not ideal.

Dimitrova (2017) examines long-term post-merger returns and the effects of the contractual features of the SPAC structure on their performance. Drawing from an analytical sample of 105 SPACs from 2003 to 2013, she finds out that most SPACs exhibit poor post-merger performance. Notably, the mean return observed a year after the SPAC merger is around -40.00%. In the meantime, the study takes the performance of other IPOs that went public in the same period as a benchmark and reports a positive annual return of 8.5%. These results further indicate that SPACs commonly exhibit poor post-merger stock performance compared to their traditional IPO counterparts.

In recent literature, Hung et al. (2021) investigate determinants of SPAC merger outcomes and returns. They highlight that a larger SPAC management team while prolonging decision-making, enhances the likelihood of merger success. However, the heterogeneity of experience significantly negatively correlates with merger success. In the context of stock returns, they emphasize that team size, average age, experience, and educational attainment exhibit varying influences across industries. Meanwhile, Lin et al. (2021) demonstrate that the centrality of sponsors' networks accounts for substantial variations in returns. Their data reveals that a standard deviation increase in this centrality corresponds to a 3.7% rise in merger success rates and a 2.1% uptick in post-merger monthly abnormal returns. According to the results, the authors claim that despite the typical post-merger underperformance, SPAC management team networks can bolster

the value of SPAC transactions.

As gleaned from the literature review, the prevailing consensus – particularly from recent studies – is that SPAC mergers are value-destroying deals. Given this insight, understanding the motivations and drivers of successfully closing these deals becomes essential. This has led researchers to pay attention to the roles of SPAC sponsors and management teams. After all, they are the driving force behind identifying target companies and spearheading the approval of acquisitions.

2.2.2 SPAC management characteristics and incentives

Drawing from previous research, it is evident that a predominant consensus points out that many value-destroying acquisitions receive approval. Central to this phenomenon is the incentive structure that heavily favors SPAC management (e.g., Jog and Sun, 2007; Howe and O'Brien, 2012; Lakicevic and Vulanovic, 2013; Kolb and Tykvova, 2016). In the early stages of a SPAC's life cycle, management teams typically invest an average of $25,000 to acquire all the pre-IPO shares. After the IPO, these management teams often distribute approximately 80% of their holdings to investors (Jog and Sun, 2007; Lakicevic and Vulanovic, 2013).

From the perspective of shareholders, their investment in SPACs is relatively risk-free before the merger closing. After the merger announcement, some shareholders opt to redeem their shares. This choice often stems from the steady income that SPACs have already provided, prompting them to explore other investment avenues. Continuously holding onto their SPAC shares introduces additional risks for the newly merged firm and potential opportunity costs. However, this dynamic is strikingly different for SPAC management. Jog and Sun (2007) posit that SPAC management can realize substantial returns (with a median annualized return of 1,900%) if they successfully close the acquisition. Conversely, they risk losing their entire at-risk investment and the opportunity cost of their time if the SPAC faces liquidation. This disparate outlook on merger completion potentially sows the seeds of agency conflicts between investors and management. Such differences in the perspective of the SPAC merger might also explain why numerous SPACs have recently opted to eliminate the approval threshold. Furthermore, other studies corroborate the assertion that SPAC sponsors often yield exceptionally high returns regardless of post-merger performance (e.g., Gahng et al., 2021; Klausner et al., 2022).

According to Lakicevic and Vulanovic (2013), any post-acquisition price exceeding $1 guarantees a positive return for SPAC management. Consequently, management tends to support most acquisitions and exerts efforts to ensure their approvals. To avoid a large shareholder being able to reject the acquisition single-handedly, certain SPACs have implemented stipulations that

restrict shareholders who own more than 10% to redeem only up to 10% of their shares (Simmat and Siebert, 2010). In other instances, SPAC management teams sometimes buy shares from investors to solidify approval or to ensure they meet the minimum cash holding threshold as the acquisition proposal nears its decision point.

2.2.3 Understanding investors' behaviors

As mentioned above, most studies have focused on the management determinants of SPAC performance and compared SPAC mergers with traditional IPOs. However, limited attention has been directed towards understanding SPAC mergers from the standpoint of shareholders. Works by Riemer (2007), Boyer and Baigent (2008), and Lewellen (2009) posit that SPACs can be perceived as analogues to private equity firms, especially for small independent shareholders. The reason is that after the IPO, SPACs will provide shareholders who purchase their public shares with relatively stable investments by depositing their funds into a trust that operates independently. On the other hand, some research investigates the interplay between investor characteristics and post-merger performance. For example, Vulanovic (2017) suggests that enhanced investor engagement invariably correlates with a heightened likelihood of post-merger survival. Overall, the investors' choice to either stay in the pool and become the shareholders of the newly merged company or redeem their shares at pro-rata price is essential to their wealth as they choose between a new risky asset and stable low profits.

Recognizing the pivotal role that investor decisions play for both SPAC founders and the investors themselves, it becomes evident that discerning the factors influencing their redemption choices could offer valuable insights to various stakeholders of SPACs. Beyond the often-discussed management characteristics in the extant literature, other determinants such as the characteristics of the target private firm, differences among the SPAC merger deals, and contemporary market conditions can sway investor decisions. For investors contemplating retention in the pool, their future outcomes as shareholders of the newly merged firm are crucial. Consequently, these investors have a pronounced incentive to seek comprehensive information about the target firm.

Past related studies have investigated how different kinds of information can affect stock performance, corporate governance, and other financial-related features of the firm before and after the merger (e.g., Vlastakis and Markellos, 2012; Drake et al., 2012; Schroff et al., 2016). However, one should not neglect the importance of the SPAC share redemption decision, as different characteristics of the SPAC firm, target firm, and the contemporary market may cause various effects on investors' share redemption decisions, which are closely linked to the merger's success. Therefore, a more comprehensive understanding of the redemption decision could benefit SPAC

sponsors and shareholders.

3. DATA AND RESEARCH DESIGN

3.1 Data and variable construction

To analyze determinants and predictive power of share redemption. I collect data from various sources. The data on SPAC firms is collected from the SPACInsider database. From 2010 to April 21st, 2023, a total of 1,456 SPACs is recorded. The total sample includes SPACs that have liquidated, those that have successfully completed mergers, and those either in the process of identifying suitable targets or in the acquisition-pending phase. Figure 1 shows the relationship between the mean redemption rate, the ratio of liquidated SPACs to SPAC IPOs, and the ratio of PIPE investments to IPO proceeds from 2010 to 2022. From 2010 to 2015. It is obvious that higher redemption rates are leading to higher liquidation rates. Since 2016, more SPACs started to use PIPE investments to avoid liquidations. For almost all the years, I find that a higher redemption rate either is indicative of a higher liquidation rate or implies overall higher PIPE investments in the same year. This finding illustrates the importance of understanding investors' redemption decisions as the redemption rate can be the determinants of SPAC's future outcomes and needs.

[Insert Figure 1 here]

In the following analysis, I focus on the SPACs that have successfully closed mergers with target companies, as the share redemption rate is exclusively available for this group of SPACs. The redemption rates of liquidated SPACs are all 100%. During the stipulated sample period, 499 SPACs successfully closed merger transactions. The SPAC share redemption rate is the dependent variable of interest extracted from the SPACInsider database.

Potential explanatory variables that can influence SPAC share redemption are collected from three domains: the SPAC, the target company, and broader market conditions, along with the merger deal specifics. From the SPAC side, I first include the total SPAC IPO proceeds in the form of natural logarithm. The second factor I add is the SPAC sponsor experience. A reasonable assumption is that more experienced sponsors can find better deals and be more efficient, thus leading to lower redemption rates from initial SPAC investors. I count the number of different SPACs raised by the same sponsors. For the first SPAC they raised, I put zero as "sponsor previous experience." The number increases with new SPACs with the same sponsors throughout the sample period. The third factor is the at-risk capital ratio to SPAC total IPO proceeds. This variable commonly has a value between 2% and 6%. If the SPAC successfully finishes the merger, sponsors will profit significantly from this investment. However, unlike investors, sponsors will lose all their investments if the merger fails. This variable indicates how much initial funds sponsors have invested in the SPAC

compared to the IPO proceeds. Then, I include the SPAC IPO underwriter prestige. I create a dummy variable that equals one if the underwriter of the SPAC is one of the top seven underwriters from 2010-2022 and equals zero otherwise.[1] The fifth factor from SPAC is the search time - the time between the SPAC IPO date and the merger announcement. The logic behind the inclusion of this variable is the different perceptions of investors on SPAC managers' ability to locate proper merger targets within a limited time. Finally, the last variable from the SPAC side is the share unit dilution. When investors initially buy shares from SPACs, some SPACs offer warrants with stocks. One share of warrant allows investors to purchase a fraction of one stock share at a specific price.[2] The different warrant-stock exchange rates may affect the redemption rate because the dilution may affect the redemption value. Therefore, I include the warrant-stock exercise ratio as the last SPAC-side factor. All the SPAC-side variables above are collected from the SPACInsider database.

Target firm is another essential role that SPAC shareholders consider when making share redemption decisions. Before the merger with SPACs, the target firms were all private. Therefore, I collect data from various databases. Past literature has proved that media coverage influences firm and stock performance (e.g., Fang and Peress, 2009; Fang et al., 2014; Dang et al., 2020). Although the target firms are private, they still show different levels of media coverage before the merger is finished. Therefore, I define the first variable - media coverage as the number of relevant news between the merger announcement date and the SPAC shareholders' last vote date for the merger approval, scaled by the number of days described above.[3] The second variable from the target side is the geographic information of the target firms. Before the merger, the target companies are from different countries and regions. The accessibility of target information due to the target's location can be important because of language barriers and regional business regulations. Therefore, I believe this factor also affects investors' choice of share redemption. The target companies' geographic information is extracted from the SPACInsider database. I set the variable as a dummy that equals one if the target is located in the US and equals zero otherwise. The third factor is the target lifespan. I collect the target founding year from various sources including Glassdoor, Thomson Reuters, and Google. The target lifespan is defined as the natural logarithm of one plus the number of years between the target founding year and the merger announcement year. The last target-side variable I include is the existence of the target firm's voluntary disclosure before the merger announcement. Doran et al. (2012) find that earning conference content significantly influences a firm's stock price.

[1] The top seven underwriters are namely Goldman Sachs, Morgan Stanley, JP Morgan, Citigroup, Barclays, Credit Suisse, and Deutsche Bank.
[2] Normally the warrant exercise price is a bit higher than the SPAC IPO price - $10. For example, many SPACs have set the exercise price of warrants at $11.50, which is 15% higher than the SPAC IPO price.
[3] The number of relevant news is collected from Factiva database. To reduce the data noise, I count the news that containthe target company's name in the news title.

In another paper, Borochin et al. (2018)'s empirical tests show that conference tones from managers and analysts are both related to the market uncertainty regarding firm valuation. Based on their studies, I believe that investors should also pay attention to the conference call transcripts. In this study, I set a dummy that equals one if the target firm has issued any conference call transcripts or related corporate disclosure on or before the merger announcement date and equals zero otherwise. The corporate disclosure data is collected from Refinitiv Eikon.

In addition to the characteristics of the SPAC and the target firm, external determinants such as market conditions and specifics of the merger deal may influence investors' redemption decisions. Therefore, the regression model incorporates contemporary market indicators: the value-weighted market return and market standard deviation, both sourced from the Center for Research in Security Prices (CRSP). I have included the total merger transaction value from SDC Platinum. Table 1 provides descriptive statistics for all variables included in the share redemption regression analysis.

[Insert Table 1 here]

Table 1 shows that the mean redemption rate is 56.8%, and the median is 68%, which are not small values for SPACs. However, because the second-generation SPACs have separated the redemption choice with merger voting, some investors would vote to agree to the proposed merger but still redeem their shares. It frequently happens to the SPACs that sell warrants with stock shares because the warrant holders can exercise their right to buy the stock shares at a fixed price (normally around $11.5) if the newly merged firm performs well in the future. Meanwhile, IPO proceeds, search time, target lifespan, and merger transaction value are presented in the natural logarithm form to avoid large dispersion. After the merger, the original SPAC changes its ticker and appears as the newly merged target company on the public market. In this case, all the post-merger performance variables are extracted from CRSP and Compustat, which will be discussed in Section 5. For the post-merger performance, I focus on both operational and stock market performances to investigate whether the redemption rate can indicate the new firm's future performance.

3.2 Research design

In every SPAC, there is a single merger transaction during its existence. The full sample contains 499 SPACs with successful merger transactions from 2010 to April 21st, 2023. I employ a pooled regression analysis, incorporating all pertinent explanatory variables into the model. I have included year-fixed and industry-fixed effects to control exogenous variables and alleviate omitted variable bias concerns. The standard errors are clustered at the firm level. The model can be presented as:

$$Redemption\ Rate = \alpha + \beta_1(SPAC - Side\ Factors) + \beta_2(Target - Side\ Factors) + \beta_3(Market\ and\ M\&A\ Factors) + Year\ FE + Industry\ FE + \epsilon \quad (1)$$

After identifying the potential factors that can affect shareholders' redemption decisions, I further explore the possibility of viewing the share redemption rate as an indicative tool to forecast the future performance of the post-merger company. I divide my redemption rate – performance examination into two parts: the operational performance and the stock market performance in the post-merger phase. The model can be presented as:

$$Post - Merger\ Performance = \alpha + \beta_1(Redemption\ Rate) + \beta_2(Control\ Variables) + Year\ FE + Industry\ FE + \epsilon \quad (2)$$

Equation (1) and Equation (2) serve as baseline models concerning the SPAC share redemption rate and post-merger performance. In Sections 4 and 5, I further undertake variations on these baseline models to provide deeper insights into the results.

4. DETERMINANTS ON SPAC SHARE REDEMPTION RATE

In this section, I employ pooled regressions with various specifications to discern the information demand of SPAC shareholders. A recent working paper by Fu et al. (2023) posits that several factors related to the SPAC firm influence the share redemption rate. However, the authors perceive the redemption rate more as a proxy of SPAC success than an indication of shareholders' information demand. While Fu et al. (2023) focus on SPAC-side factors, I probe the SPAC redemption rate from three distinct perspectives to provide deeper insights for investors and SPAC sponsors.

4.1 Redemption rate on the full sample

Table 2 presents the pooled regression analysis on 499 successfully merged SPACs. Column (1) to Column (3) present the model with different fixed effects specifications. There are some minor differences, but the significance of most share redemption determinants is consistent among the three regressions. Column (2) uses the merger announcement year-fixed effect and industry-fixed effect, whereas Column (3) uses the SPAC IPO year-fixed effect and industry-fixed effect, which aligns with the methodology outlined by Fu et al. (2023). However, I believe that employing the

announcement year as the year-fixed effect in the model offers higher estimation accuracy. The reason is that investors are predominantly inclined to finalize their redemption decisions at the period of the merger announcement rather than the moment when the SPAC enters the public domain. It is around the merger announcement date when contemporary factors may affect shareholders' redemption decisions.

[Insert Table 2 here]

After identifying the regression in Column (2) as the baseline redemption rate model, I take a closer look starting from the SPAC-side factors. The first noteworthy observation of the six SPAC-side variables is the positive correlation between the At-risk capital and the redemption rate. This significant correlation implies that SPACs with a larger initial investment weight by the sponsor tend to witness a higher redemption rate. As previously highlighted, the initial at-risk investment by the sponsor typically ranges between 2% and 6% of the total IPO proceeds and is predetermined before the SPAC IPO. Meanwhile, the IPO proceeds are observable right after the IPO date. It is common knowledge that better recognition and higher IPO purchases by the investors will lead to a lower percentage of at-risk capital to total IPO proceeds. Conversely, an elevated at-risk capital proportion suggests a lower IPO sale, which indicates a lower investor expectation and a smaller shareholder base. In this sense, it is intuitive that a higher At-risk capital is a proxy for lower shareholder confidence in the SPAC and leads to a higher redemption rate from shareholders.

The second significant variable is the Search time, representing the duration between the SPAC IPO and the merger announcement. I find a positive correlation between this search duration and the redemption rate, a finding that aligns with Fu et al. (2023). The underlying rationale for this relationship suggests that investors expect a reputable SPAC not to spend an extended period to pinpoint a suitable target. Thus, a shorter search duration can be considered a symbol of superior SAPC management ability, which leads to a lower redemption rate.

The last SPAC-related factor displaying a significant association with the redemption rate is the Share dilution, defined as the exercise ratio of a warrant to a stock share. Within the context of SPACs, an elevated exercise ratio leads to increased dilution, subsequently causing a more pronounced decline in stock price. Given this circumstance, it is intuitive that the dilution is positively related to the redemption ratio because investors would try to avoid the possible post-merger stock price drop due to the warrant exercise by the warrant holders.

From the target company's perspective, two factors influence the redemption rate. The first one is media coverage, quantified as the ratio of the number of relevant news articles to the number of days spanning from the merger announcement date to the final vote date. Elevated media coverage could indicate enhanced corporate information exposure and augmented transparency, which is

important to investors when they evaluate private firms. As observed in Column (2), a more pronounced target firm media coverage correlates significantly with a lower redemption rate, suggesting that the substantial media presence of the target firm is advantageous to SPACs. Similar to the influences of media coverage on IPO firms, the influences of media coverage also play an important role on investor behavior regarding SPAC share redemption (Guldiken et al., 2017).

Another salient factor from the target firm's perspective is geographic location. The data presented in Table 2 reveals that target firms in the US show lower share redemption rates than those headquartered in other nations and regions. Such an observation is intuitively plausible. Since all target firms operate as private entities before the merger, they aren't mandated to submit corporate disclosures to the SEC. The information about foreign companies can be more challenging to extract and analyze due to linguistic differences, divergent regional regulations, and other potential barriers. For investors, there's an inherent inclination to confer greater trust upon domestic entities. Consequently, SPACs that merge with domestic targets show lower share redemption rates compared to SPACs that merge with foreign target companies.

The merger deal characteristics and prevailing market conditions constitute the third dimension of my investigation. In the baseline model, I incorporate three variables: the market return, the market volatility from the preceding six months of the merger announcement date, and the merger transaction value. Both the market return and volatility demonstrate a statistically significant negative correlation with the redemption rate, while the merger transaction value does not exhibit a discernible relationship. The negative relationship between market return and redemption rate can be explained by various studies' short-to-mid-term persistence of the momentum effect (e.g., Chan et al., 1996; Rouwenhorst, 1998; Cooper et al., 2004). If the market performed well for the last few months, investors may perceive that this upward trend will persist longer. Consequently, investors have an increased propensity to retain their shares in the newly merged firm, capitalizing on anticipated market growth. This logic results in a negative correlation between market return and share redemption rate. With regard to market volatility, the findings in Table 2 suggest that SPAC shareholders tend to remain in the pool during periods of heightened market fluctuations. This finding, from an alternative perspective, illustrates the high-risk preference profile of SPAC investors.

In the baseline model from Column (2) of Table 2, SPAC IPO proceeds, SPAC sponsor experience, the presence of a top underwriter (as denoted by the dummy variable), the lifespan of the target company, and the target corporate disclosure (again represented as a dummy variable) do not exhibit statistically significant relationships with the share redemption rate. However, this lack of significance should not be misconstrued as an absence of influence on investors' redemption

decisions. The impact of these factors could be contingent on specific conditions or time frames. Subsequent sections present analyses with varied specifications to furnish a more comprehensive understanding of the interplay between information demand and the share redemption tendencies of SPAC investors.

4.2 Contemporary market condition alternatives

The baseline regression in Table 2 shows that both the contemporary market return and market volatility are negatively associated with SAPC's share redemption rate. In some scenarios, investors may less likely to adjust their portfolios when the market shows high volatility and their portfolio is overall at a loss (An, Engelberg, Henriksson, Wang, & Williams, 2023). However, when the market is performing well and the market return is high, investors may be more active on portfolio adjustment. To better understand the relationship between share redemption rate and contemporary market performance, in this section, I examine how detailed market condition factors across various time periods affect the SPAC share redemption rate. Table 3 presents the regression analysis with distinct market condition specifications. Columns (1) and (2) display the results when the market return and volatility from the three months preceding the merger announcement date are included. Column (1) incorporates only the year-fixed effects, whereas Column (2) includes both industry- and year-fixed effects. Upon including the industry-fixed effects, the three-month market return is not significantly correlated with the redemption rate. The absolute t-value for the market return in Column (2) is 1.61, nearing a moderate significance level. Beyond this observation, the outcomes from Columns (1) and (2) do not exhibit notable disparities.

[Insert Table 3 here]

Column (3) and Column (4) of Table 3 delineate regressions that include the market conditions from the twelve months preceding the merger announcement date. While Column (3) only considers the year-fixed effects, Column (4) integrates both industry- and year-fixed effects. The table shows that the long-term market return does not correlate significantly with the redemption rate. Other variables show patterns similar to the baseline regression presented in Column (2) of Table 2. The conclusions drawn from this section resonate with the momentum effects, suggesting that short-term to mid-term market performances tend to sustain (e.g., Chan et al., 1996; Rouwenhorst, 1998; Cooper et al., 2004). When the overarching market demonstrates commendable performance in the preceding three to six months, shareholders tend to align with this trend, retaining their shares and consequently becoming stakeholders in the newly merged company instead of opting for share redemption. Meanwhile, past market volatility is negatively associated with the redemption rate, which is highly significant regardless of the different regression specifications.

Such outcomes illustrate the prior assertion that SPAC shareholders possess a pronounced risk preference, exhibiting reluctance to redeem their shares in scenarios characterized by heightened market volatility.

4.3 The effects of different time frames on redemption rate

SPACs are characterized by a relatively strict temporal framework during every phase leading up to the merger's closing. The specific duration dedicated to each phase can influence investors' share redemption decisions. In the baseline model presented in Column (2) of Table 2, I include the target search time by SPACs. The results show that the longer the SPAC searches for a target, the higher the redemption rate is. This can be interpreted as SPACs with superior management quality tend to identify suitable targets relatively quickly and can consequently announce their mergers faster than their counterparts that lack management quality. In this section, I investigate additional time frame structure variables to understand investors' perceptions of varied SPAC timelines and how time frame factors influence their redemption choices.

Table 4 presents essential statistics among various time frame variables associated with SPACs. In Panel A of Table 4, descriptive statistics are laid out. The SPAC search time mirrors that from the baseline model. Another variable of interest is the *Total merger time (plan)*, which indicates the projected duration, in months, from the SPAC's IPO date to the merger closing date. Insights from Panel A suggest that the majority of SPACs anticipate completing their merger within two years. Notably, there isn't a pronounced correlation between the search time and the projected total merger time. A further temporal variable is the *Pre-closing period*, which represents the time between the SPAC's merger announcement date and the merger closing date. This phase encompasses detailed negotiations concerning the merger, due diligence, legal documentation preparation, and other ancillary yet crucial activities toward finalizing the merger. On average, this period spans roughly six months within the sampled SPACs. No significant correlation is observed between the *Pre-closing period* and other time-associated variables. The last temporal variable is the *Extension*, which quantifies the additional months layered onto the *Total merger time (plan)*. The extension indicates the SPAC's inability to wrap up the merger within the pre-specified time limit and a request for added time. More than half of the SPACs did not require merger extension in the sample. Meanwhile, the extension shows a high positive correlation with SPAC search time, and a high negative correlation with projected total merger time.[4]

[4] If a SPAC spends longer to search for a proper target, it is more likely that the SPAC cannot finish the merger on scheduled time, leading to a high positive correlation between *Extensio*n and *Search time*. If the projected total merger time for the SPAC is too short, then it is more likely that the SPAC cannot finish the merger on scheduled time either, leading to a high negative correlation between *Extension* and *Total merger time(plan).*

[Insert Table 4 here]

Table 5 presents regression models with the inclusion of various time frame specifications. In Column (1), the variable *Total merger time (plan)* is integrated. This information is disclosed in the early life of SPACs so investors can have a projection of the SPAC's merger timeline. Interestingly, I find that the *Total merger time (plan)* is negatively associated with the redemption rate, while the Search time is positively associated with the redemption rate. On the one hand, investors perceive faster target-locating SPACs as the ones with better management and quality. On the other hand, investors might harbour reservations if the planned time for SPACs to finish the merger is unduly short. Such a compact time frame could be perceived as SPAC sponsors' relative indifference to target quality, with a predominant focus on hastening the merger's closure. Therefore, this perception is reflected by a negative relationship between the *Total merger time (plan)* and *Redeemed*.

[Insert Table 5 here]

Column (2) of Table 5 presents the regression with the second time frame variable – Pre-closing period, measured as the number of months from the merger announcement date to the merger closing date. The length of the pre-closing period can vary depending on the complexity of the merger, regulatory requirements, and other factors. This period is typically characterized by intense activity and detailed planning by all stakeholders. From the results in Column (2), I find that the Pre-closing period is positively related to the redemption rate at a high significant level, meaning that SPACs with longer pre-closing periods experience higher share redemption. This result shows the same pattern as the target searching time in the baseline model. The interpretation from past literature is that investors perceive a longer pre-closing period as a deal with higher complexity, longer negotiation, more potential problems, and other related negative factors. Consequently, a prolonged pre-closing period is associated with a heightened redemption rate (Luypaert and De Maeseneire, 2015).

Column (3) of Table 5 presents the regression including the third time frame variable – the number of extended months. The variable is defined as the actual total number of months to finish the merger minus the planned total number of months to finish the merger (*Total merger time (plan)*). The comparison between Column (1) and Column (3) of Table 4 provides important implications for investor behaviors. The findings from Column (1) reveal a negative correlation between the projected duration for merger completion and the redemption rate. This finding suggests that SPAC shareholders are wary of SPACs that appear to expedite their mergers, possibly compromising the quality of the transactions. However, results in Column (3) show that SPAC shareholders dislike the SPACs with protracted merger extensions. Such SPACs might be perceived

as incapable of efficiently executing their initial plans and necessitating extended durations to identify suitable targets, conduct negotiations, and finalize mergers. Given the constraints of time and the looming threat of liquidation, these SPACs are more inclined to finalize mergers of potentially poor quality by the end of their extensions. Consequently, shareholders are more inclined to redeem their shares in SPACs with extended durations.[5]

4.4 Differences in redemption determinants based on the target's location

In the baseline model, the geographic location of the target exhibits a significant correlation with the redemption rate. Relative to targets based in the US, foreign targets face higher redemption rates for their shares. One crucial rationale for this trend is the disparity in the information barriers between domestic and foreign target firms. Building on this premise, I investigate the specific information investors prioritize for domestic and foreign target firms when making redemption decisions.

Table 6 presents the outcomes of the subsample regression analysis. Column (1) shows the regression outcomes for the 382 domestic target firms, while Column (2) displays the results for the remaining 117 foreign target firms. When comparing the results of domestic target firms to the baseline model encompassing the full sample, there are few differences. The main distinction in the subsample regression illustrated in Column (1) is that the target firm age is positively associated with the redemption rate at a significant level. At the same time, there is no significant relationship between the firm age and redemption rate in the baseline mode.

[Insert Table 6 here]

The results in Column (2) of Table 6 exhibit substantial discrepancies with those in the baseline model. Specifically, when the targets are foreign firms, all variables — both from the target's perspective and the broader market and merger dynamics — are statistically insignificant. It's worth noting that all target firms were privately held before the merger. A plausible explanation for this phenomenon could be the inherent challenges SPAC shareholders face when accessing information about private entities. These challenges are exacerbated when the target companies are foreign due to hurdles like language barriers, disparate regional regulations, and other complicated factors. Yet, it's intuitive to observe that three particular elements — the proceeds from the SPAC's IPO, the experience of the SPAC sponsor, and the at-risk capital — remain significantly related to the redemption rate. This finding is logical considering that SPACs are public firms; thus, gathering

[5] For further verification, I modified the Extension to a binary variable, assigning it a value of one if the SPAC requires an extension beyond their initially projected merger time frame and zero otherwise. The dummy variable demonstrates a significant positive correlation with the redemption rate, suggesting that when compared to SPACs without extensions, those with extensions witness a higher rate of share redemption. This finding is consistent with that of Column (3).

information on SPACs is more straightforward than foreign target firms. Further, the proceeds from the SPAC's IPO display a positive correlation with the redemption rate. This suggests that when confronted with a foreign target, shareholders are more inclined to redeem their shares if the SPAC boasts a larger scale. Then, the experience of the SPAC sponsors inversely correlates with the redemption rate. This implies that shareholders place considerable faith in sponsors with a proven track record in SPACs. Consequently, this established trust leads to lower redemption rates. Lastly, the At-risk capital in Column (2) shows a positive relationship with the redemption rate, which aligns with the baseline model's findings.

5. POST-MERGER PERFORMANCE

The results of pervious section show that SPAC shareholders make redemption decisions based on various information streams, including characteristics intrinsic to the SPAC, attributes of the target firms, and prevailing market conditions. Additionally, the behavior observed in shareholder share redemption offers insights into their confidence level in the newly merged entity. Existing literature posits the redemption rate as an indicator of the SPAC's success (Fu et al., 2023). With this premise in mind, the subsequent section of this paper seeks to examine the power of the redemption rate as a predictive tool for forecasting the future performance of newly merged firms. Some past studies have discussed the immediate market response, especially around the merger announcement date (e.g., Chamberlain, 2021; Kiesel et al., 2023). Vulanovic (2017), Gahng et al. (2021), and some related studies investigate the long-term post-merger performance. Still, they either did not focus on the redemption rate or did not find a significant relationship between it and post-merger performance. More specifically, Gahng et al. (2021), while analyzing from an optimal redemption standpoint, found an absence of any significant linkage between the redemption rate and post-merger equity performance.[6] In this section, I use the most extensive sample compared to previous studies. I find that the redemption rate can serve as a predictive tool for the newly merged company's operational and stock market performance within specific periods.

5.1 Post-merger operational performance

I begin by examining the effects of redemption rate on post-merger operational performance. Specifically, I evaluate the return on assets (ROA) as an indicator of firm profitability and the cash ratio, defined as the proportion of cash and short-term investments to current liabilities, as a metric for firm liquidity. I undertake quarterly and annual data analyses to ensure a comprehensive

[6] For in-depth explorations of the long-term post-merger performance of SPACs, also see Kolb and Tykvova (2016), Dimitrova (2017), Chamberlain (2021), Gisselbæk et al. (2022).

operational performance assessment. Both these variables are adjusted by the industry medians to yield more precise outcomes. I generate the firm-level control variables from Compustat and merge them with the SPAC dataset. From the newly merged firm level, I control the market-to-book ratio, the firm leverage, the R&D intensity defined as the R&D expenses to total assets, and the tangibility defined as the tangible assets to total assets. From the SPAC and merger transaction level, I control the merger transaction value as a proxy of firm size, the target firm age, the target founding region dummy, the total time for SPAC to finish the merger, the PIPE weight as a percentage to SPAC IPO proceeds, and the lock-up period for sponsor shares.[7] Table 7 shows the descriptive statistics of all variables in the following regression analysis. For the firm-level control variables, Panel A presents the quarterly data, and Panel B presents the yearly data.

[Insert Table 7 here]

Panel A of Table 7 delineates the variables correlated with SPAC post-merger operational performance, spanning four quarters after the merger's completion. The findings in the table reveal that the median ROA for SPACs falls behind the industry median by 9.3%. While the median cash ratio for SPACs slightly surpasses the corresponding industry figure, it is noteworthy that the variance of the cash ratio across various SPACs is pretty considerable. Panel B presents the yearly statistics of the current fiscal year and the next fiscal year after the merger closing date. Both the ROA and cash ratios show the same pattern as those in the quarterly data. While the adjusted ROA appears negative for most observations, it is essential to note that these newly merged entities have only recently transitioned to public firms. Thus, such metrics might not necessarily reflect their overall health or future potential.

Table 8 presents a quarterly regression analysis. Panel A shows the impact of the redemption rate on the adjusted ROA, while Panel B delineates its effects on the adjusted cash ratio.[8] Columns (1) to (4) represent the four fiscal quarters succeeding the SPAC merger's closure. Due to the presence of missing values across various quarters, there are observable fluctuations in the number of data points; however, each quarter consistently comprises over 300 observations. Panel A shows a negative correlation between the SPAC share redemption rate and ROA in the initial four quarters after the merger. This suggests that firms exhibiting high redemption rates before the merger tend to have lower ROAs after the merger. The significance of this relationship manifests robustly in

[7] In an additional test, I regress the dependent variables on the difference between the merger transaction value and total assets with all control variables, and I find no significant relationship between them, which means the firm operational performance is not affected by the merger premium, indicating that using merger transaction value as the proxy of firm size is appropriate.

[8] For the post-merger operational performance and stock performance, I also control for year- and industry-fixed effects. Notably, the year-fixed effects are based on the fiscal year end of the newly merged company. The industry-fixed effects are based on Global Industry Classification Standard (GICS). The reason why I use GICS instead of other classificationsis because the adjusted ROA and cash ratio is defined as the difference between firm's raw number and the GIC industry median number.

Column (1) and Column (2) at a 1% significance level, while Column (3) and Column (4) show lower significance levels. Notably, this progression indicates a diminishing association between the redemption rate and the firm's ROA as the post-merger timeline extends. Moreover, beyond the decreasing correlation, the coefficients associated with the redemption rate incrementally approach zero with the progression of time after the merger. This trend implies that the predictive potency of the redemption rate to the firm's ROA attenuates as the time length after the merger increases.

[Insert Table 8 here]

Panel B presents the quarterly regressions focusing on the cash ratio of the newly merged firms. The results reveal a consistently significant negative association between the SPAC share redemption rate and the cash ratio throughout the initial four quarters following the merger. Notably, the coefficients of the redemption rates for the initial two quarters exceed those observed in the subsequent two quarters. Drawing parallels to the relationship between redemption rate and ROA, the magnitude of the negative influence exerted by the redemption rate on the cash ratio – serving as an indicator of firm liquidity – diminishes over time. Furthermore, in Panel B, there is no pronounced fluctuation in the redemption rate's significance levels across the four quarters.

Table 9 displays the outcomes of this yearly regression analysis. Given that mergers occur at different times throughout the year and the fiscal year-ends of the newly merged firms vary, I employ regression analysis across three distinct time frames to comprehensively capture all potential scenarios. Panel A presents the regressions on ROA, whereas Panel B presents the regressions on cash ratio. Column (1) in both panels presents results when the year difference is zero, meaning that the fiscal year of the dependent and control variables align with the merger's closing year. For example, if a SPAC finalized the merger in 2020, then the dependent and control variables pertain to the fiscal year 2020. Given that the fiscal year-end in my dataset consistently follows the merger's closing date, there are no time reversal issues in the regressions. The second time frame, represented by Column (2), corresponds to a year difference of one, meaning that the fiscal year of the dependent variable and other control variables is one year after the merger's closing year. To illustrate, if a SPAC concluded its merger in 2020, the dependent and control variables would be from the fiscal year 2021. Column (3), on the other hand, focuses on regressions delineated by the number of days following the merger. These regressions incorporate observations with fiscal year-ends between 179 and 545 days after the merger. The minimum threshold of 179 days ensures all data points are at least half a year post-merger, whereas the maximum limit of 545 days guarantees that each company is represented only once in the dataset.

[Insert Table 9 here]

Upon analyzing Table 9, it is evident that the share redemption rate consistently

demonstrates a negative correlation with both ROA and cash ratio. Notably, as the year difference transitions from zero to one, the magnitude of the negative coefficients associated with redemption rates approaches zero. This trend mirrors the findings from the quarterly data, suggesting that the magnitude of the negative effects of the redemption rate diminishes over time following the merger. Combining insights from both the quarterly and yearly analyses, it becomes clear that the redemption rate is a valuable predictor for a SPAC's post-merger operational performance as it consistently manifests significant negative correlations with a firm's profitability and liquidity metrics.

5.2 Post-merger stock market performance

In addition to operational performance, I also investigate the potential of the SPAC redemption rate as a predictor for the stock performance of newly merged firms. The extant literature offers a range of findings on this matter. While some studies have found no significant correlation between the redemption rate and long-term stock returns, others have identified a pronounced relationship between the two (e.g., Gahng et al., 2021; Feng et al., 2023). Such disparities in conclusions may arise from variations in sample sizes, employed methodologies, and the specific definitions applied to long-term stock returns. Within this section, I conduct a detailed analysis of the stock returns post-SPAC merger, focusing particularly on divergent investor perceptions.

In addition to the primary explanatory variable, the share redemption rate, several control variables have been incorporated in this study from the SPAC firm, the newly- merged firm, and the stock market condition. From the perspective of the SPAC, data has been sourced from SPACInsider. The variables controlled include the target's geographical origin, the duration taken by the SPAC to conclude the merger, the proportion of the PIPE weight to the SPAC's IPO proceeds, the dilution of the SPAC shares, and the lock-up period for sponsor shares. At the level of the newly-merged firm, I collect the following data from Compustat: the size of the firm, the market-to-book ratio, the firm's leverage, and its profitability. It is worth noting that the data for the newly merged firm is sourced from the closest quarterly report prior to the month of the stock performance data. This methodological choice ensures the elimination of potential time reversal complications. On the stock market side, the cumulative return of the newly merged firm over the past six months is controlled, considering it as a momentum effect.[9] Additionally, both year-fixed effects and industry-fixed effects are controlled for in the analysis. The robust standard errors are clustered on the firm level.

Regarding the dependent variable, I use the S&P 500 index adjusted buy-and-hold return to

[9] In the analyses focusing on three-month and six-month stock performances – given there are less than six months after the merger closing date – the momentum effect initiation is marked as the first month after merger.

measure the stock performance. The data is collected from the CRSP monthly stock file. Unlike the shareholders of normal companies, the initial SPAC shareholders purchase the shares at around $10, meaning their "buy price" is $10. In this case, I use the same stock return definition as Feng et al. (2023). Then, the market-adjusted buy-and-hold return can be expressed as:

$$Return_{i,t} = \frac{P_{i,t}-10}{10} - R_{m,t} \qquad (3)$$

where $P_{i,t}$ denotes the price of the newly merged firm i at the end of the month t after the merger and $R_{m,t}$ is the S&P 500 cumulative return from month zero to month t after the merger. Equation (3) provides an accurate post-merger market-adjusted return formula. Table 10 shows the regressions of three-month, six-month, and twelve-month adjusted buy-and-hold return on redemption rate and other control variables with this dependent variable.

[Insert Table 10 here]

The table shows that in Columns (1) and (2), the redemption rate exhibits a significant negative association with both three-month and six-month post-merger stock returns. This suggests that SPACs with elevated redemption rates are more likely to underperform in the stock price in the short term, particularly within the six months following the merger's conclusion. In contrast, the regression of the twelve-month return in Column (3) does not yield any significant result. This observation aligns with the intuitive notion that after a SPAC completes its merger, the redemption rate can indicate the merger's perceived quality, subsequently influencing stock performance in the ensuing months. Nevertheless, as the post-merger timeline extends, other factors show more pronounced impacts on the newly formed entity's stock performance, diluting the redemption rate's predictive potency. The diminishing t-values from Columns (1) through (3) corroborate this assertion. Moreover, a comparison of the coefficients between Table 10 and Table 9 reveals a consistent trend: post-merger, the magnitude of the negative effects of SPAC share redemption rate on post-merger performance wane progressively with time.

It is important to notice that the market-adjusted buy-and-hold stock return primarily pertains to those shareholders who acquired the original SPAC shares prior to any public announcement regarding the merger. This is primarily because up until that point, the share prices of most SPACs tend to remain relatively stable. However, starting around the merger announcement date, the SPAC's share price can be more volatile because of the characteristics of the acquisition target, market sentiment, and other related factors. Consequently, the correlation between the share redemption rate and stock market performance in Table 10 does not apply to investors who venture into buying a new company's shares after the merger. To further corroborate this understanding, I

conduct another regression analysis, particularly focusing on those investors who acquired shares after the merger. The market-adjusted buy-and-hold return formula tailored for this segment of investors can be expressed as follows:

$$Return\ (New\ Shareholders)_{i,t} = \frac{P_{i,t} - P_{i,0}}{P_{i,0}} - R_{m,t} \qquad (4)$$

whereas the "buy price" changes from \$10 in Equation (3) to $P_{i,0}$, which is the price of firm *i* at the end of the month of the SPAC merger closing date – month zero. Notably, in an unreported table, when applying the same control variables and conditions, I find no significant association between the redemption rate and the buy-and-hold return for shareholders of the newly merged entities regardless of the evaluation periods—three months, six months, or twelve months.

6. CONCLUSIONS

The SPAC market witnessed a meteoric rise from 2018 to 2021. While the number of SPAC IPOs began to decrease from 2022, it is still one of the major channels for private firms to go public. In this study, I investigate the redemption decisions of SPAC shareholders to understand the process, both before and after the merger.

The first segment of this study focuses on the factors influencing the SPAC share redemption rate. Drawing from a sample of 499 SPACs that successfully merged between 2010 and April 21st, 2023, I find that investors' responses vary depending on information from the SPAC, the target company, market conditions, and specifics of the merger deal. In particular, I find that the at-risk capital, duration of the target search, and share dilution positively correlate with the redemption rate. Conversely, the media coverage on target firms, market volatility, and short-to-medium-term market returns are negatively related to the redemption rate. Additionally, foreign target companies face a higher share redemption rate than their domestic counterparts. These findings illustrate the notion that shareholders rely on diverse information sources regarding SPAC share redemption, and the information garnered from these sources subsequently influences their redemption decisions pertaining to SPAC shares.

The insights gleaned from the first segment of this study suggest that the share redemption rate can be interpreted as a reflection of SPAC shareholders' confidence in both the merger and its post-merger performance. Building on this premise, the second segment focuses on the predictive capability of the SPAC share redemption rate in relation to post-merger performance. The results show that a higher SAPC share redemption rate is associated with lower profitability and liquidity

of the newly merged firm. Meanwhile, a higher redemption rate is also negatively correlated with three-month and six-month post-merger buy-and-hold returns. However, it is important to notice that the relationship between the redemption rate and the SPAC's post-merger stock return is primarily pertinent to the original SPAC shareholders. This is due to their purchasing shares at an approximate value of $10. This specific association does not hold statistical significance for shareholders who invest after the merger conclusion. Their "buy price" has experienced fluctuations post the SPAC merger announcement, making the predictive relationship inapplicable.

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Appendix A: Variable Definitions

Variable	Data source	Definitions
Dependent variables		
Redeemed	SPACInsider	Number of shares redeemed to total number- of redeemable shares outstanding invested by SPAC shareholders.
ROA	Compustat	Earnings before interest, taxes, depreciation and amortization (EBITDA) to total assets, adjusted by industry median.
Cash ratio	Compustat	Cash and short-term investments to current liabilities, adjusted by industry median.
BHAR-three months	CRSP	Stock price at the end of third month after merger date minus ten, scaled by ten, adjusted by S&P 500 stock return.
BHAR-six months	CRSP	Stock price at the end of sixth month after merger date minus ten, scaled by ten, adjusted by S&P 500 stock return.
BHAR-twelve months	CRSP	Stock price at the end of twelfth month after merger date minus ten, scaled by ten, adjusted by S&P 500 stock return.
Explanatory variables		
IPO proceeds	SPACInsider	Natural logarithm of total SPAC IPO proceeds.
Sponsor experience	SPACInsider (manual)	Number of SPACs that have been raised by the same sponsors in the past.
At-risk capital	SPACInsider	At-risk investment by sponsors to SPAC total IPO proceeds
Top underwriter dummy	SPACInsider (manual)	Indicator equals one if the SPAC IPO underwriter is one of the top seven underwriters from 2010 - 2022 and equals zero otherwise
Search time	SPACInsider	Natural logarithm of the number of days between SPAC IPO date and SPAC merger announcement date.
Share dilution	SPACInsider	The exercise ratio of one unit of warrant to stock shares.
Media coverage	Factiva (manual)	Number of relevant news on the target firm to the number of days between SPAC merger announcement date and last vote date.
Target location dummy	SPACInsider	Indicator equals one if the target is based in the US and equals zero otherwise.
Target lifespan	Factiva / Google (manual)	Natural logarithm of the number of years from target firm founding year to merger announcement year.
Voluntary disclosure dummy	Refinitiv (manual)	Indicator equals one if there is any voluntary corporate conference call-related transcript and equals zero otherwise.

Market return - six months	CRSP	Six-month value-weighted market portfolio return before the merger announcement date.
Market volatility - six months	CRSP	Six-month value-weighted market portfolio standard deviation before the merger announcement date.
Merger transaction value	SDC Platinum	Natural logarithm of the SPAC merger transaction value
Conditional variables		
Total merger time (plan)	SPACInsider	Scheduled number of months from SPAC IPO date to SPAC merger closing date
Pre-closing period	SPACInsider	Number of months from SPAC merger announcement date to SPAC merger closing date.
Extension	SPACInsider	Number of months extended from scheduled total merger time to actual total merger time.
Market-to-book	Compustat	The market value of assets (book assets plus market value of equity minus book value of equity) scaled by book assets.
Leverage	Compustat	Long-term debt plus debt in current liabilities, scaled by total assets.
R&D intensity	Compustat	R&D expenses to total assets.
Tangibility	Compustat	Property, plant and equipment to total assets.
Total merger time (actual)	SPACInsider	actual number of months from SPAC IPO date to SPAC merger closing date
PIPE size	SPACInsider	Total PIPE proceeds to total SPAC IPO proceeds.
Sponsor lockup period	SPACInsider	Number of months that prohibit SPAC sponsors from trading their shares after the merger closing.
Firm size	Compustat	Natural logarithm of total assets.
Raw ROA	Compustat	EBITDA to total assets.
Momentum	CRSP	Cumulative return of the newly merged firm over the past six months (for some newly merged firms, if there are less than six months after the merger closing date, then the momentum effect initiation is marked as the first month post-merger).

Figure 1: Redemption rate, SPAC liquidation, and PIPE investments

The figure shows the relationship between the mean redemption rate (with liquidated SPACs), the ratio of liquidated SPACs to SPAC IPOs, and the ratio of PIPE investments to SPAC IPO proceeds from 2010 to 2022. The red line represents the mean redemption rate of all SPACs each year. For liquidated SPACs, the redemption rate is 1. The green line represents the ratio of the number of liquidated SPACs to the number of SPAC IPOs. The blue bar represents the mean ratio of PIPE investments to SPAC IPO proceeds each year.

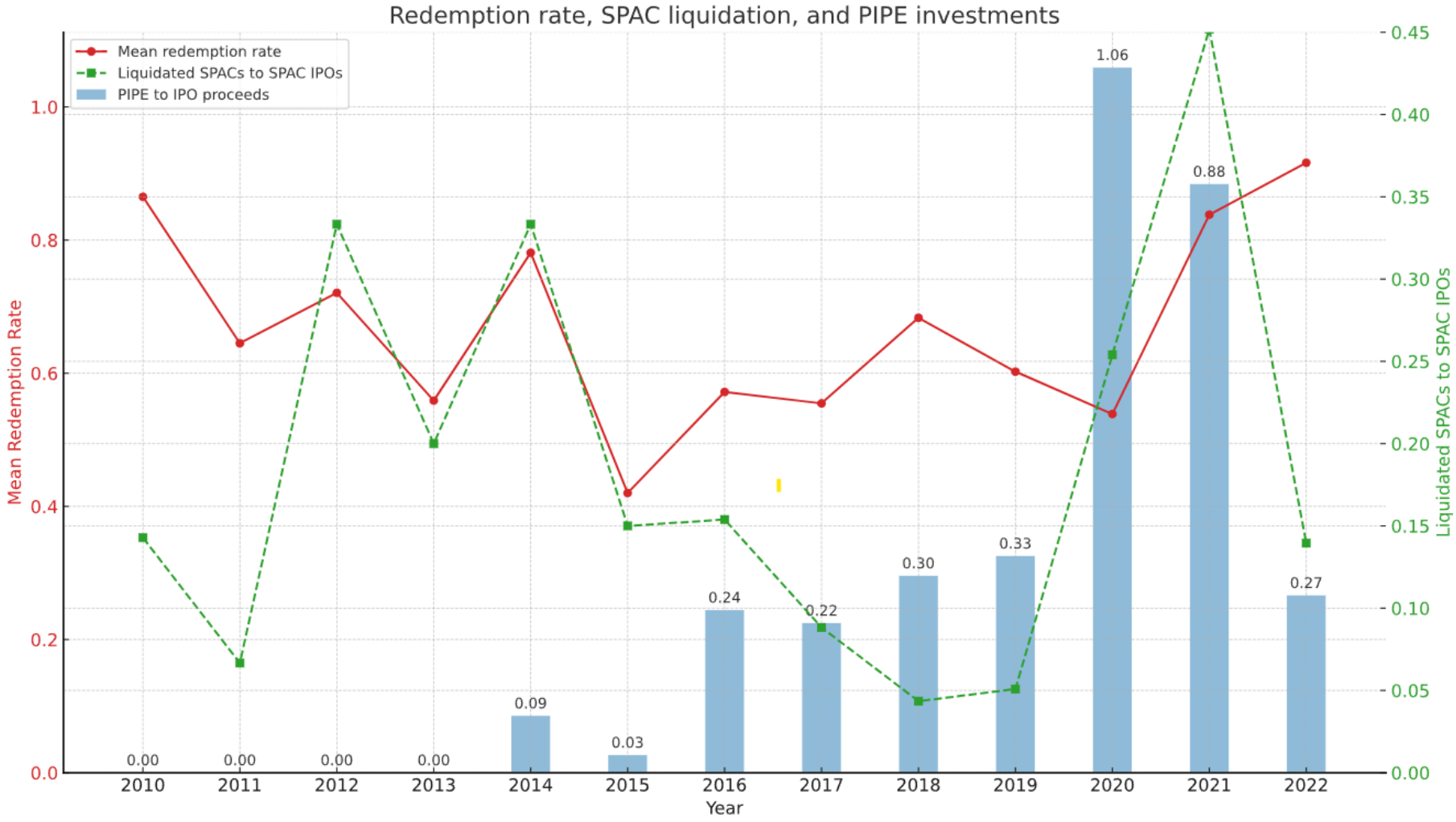

Table 1: Descriptive statistics of variables in share redemption regression analysis

The table presents the descriptive statistics of the variables in the SPAC share redemption analysis. The redemption rate below is the dependent variable, whereas the rest are explanatory variables. Certain variables are winsorized or presented in the natural logarithm form. The SPAC IPO underwriter, target location, and target voluntary disclosure are dummy variables, and the rest are continuous variables. The specific definition of each variable can be found in Appendix A. The baseline regression includes a six-month value-weighted stock market return and standard deviation before the SPAC merger announcement date. The full sample contains 499 SPACs with their successful merger transactions. The sample period covers from 2010 to April 21st, 2023.

Variable	N	Mean	Median	STD	P25	P75
Redeemed	499	0.568	0.680	0.370	0.170	0.910
IPO proceeds	499	5.228	5.298	0.734	4.787	5.704
Sponsor experience	499	0.591	0.000	1.164	0.000	1.000
At-risk capital	499	0.033	0.029	0.012	0.026	0.037
Top underwriter dummy	499	0.417	0.000	0.494	0.000	1.000
Search time	499	5.598	5.591	0.697	5.056	6.194
Share dilution	499	0.520	0.500	0.302	0.330	0.750
Media coverage	499	0.412	0.355	0.306	0.228	0.500
Target location dummy	499	0.766	1.000	0.424	1.000	1.000
Target lifespan	499	2.214	2.197	0.949	1.609	2.708
Voluntary disclosure dummy	499	0.138	0.000	0.346	0.000	0.000
Market return - six months	499	0.018	0.023	0.018	0.007	0.030
Market volatility - six months	499	0.046	0.047	0.022	0.029	0.059
Merger transaction value	499	6.678	6.782	1.160	5.898	7.434

Table 2: Determinants of SPAC share redemption rate

The table presents the full sample regression results on the determinants of the SPAC share redemption rate. The dependent variable is the redemption rate. Column (1) shows the results with the inclusion of merger announcement year-fixed effects; Column (2) shows the results with the inclusion of merger announcement year- and target industry-fixed effects; And Column (3) shows the results with the inclusion of SPAC IPO year-fixed effects and target industry-fixed effects. I compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)
VARIABLES	Redeemed	Redeemed	Redeemed
IPO proceeds	0.006	0.007	0.029
	(0.165)	(0.207)	(0.763)
Sponsor experience	-0.012	-0.009	-0.010
	(-0.935)	(-0.679)	(-0.777)
At-risk capital	5.736***	5.943***	7.564***
	(3.502)	(3.504)	(4.470)
Top underwriter dummy	0.031	0.033	0.037
	(0.925)	(0.953)	(1.030)
Search time	0.124***	0.124***	0.210***
	(5.198)	(5.199)	(6.984)
Share dilution	0.125**	0.132**	0.211***
	(2.008)	(2.160)	(3.233)
Media coverage	-0.112**	-0.100**	-0.118**
	(-2.348)	(-2.030)	(-2.370)
Target location dummy	-0.061**	-0.057**	-0.059*
	(-2.152)	(-1.991)	(-1.893)
Target lifespan	0.016	0.017	0.020
	(1.204)	(1.263)	(1.314)
Voluntary disclosure dummy	0.057*	0.034	0.013
	(1.714)	(0.980)	(0.349)
Market return - six months	-2.714**	-2.539**	-0.741
	(-2.446)	(-2.236)	(-0.726)
Market volatility - six months	-2.889***	-2.761***	-2.763***
	(-3.593)	(-3.530)	(-3.842)
Merger transaction value	-0.025	-0.026	-0.013
	(-1.407)	(-1.421)	(-0.722)
Announcement year FE	Yes	Yes	No
IPO year FE	No	No	Yes
Industry FE	No	Yes	Yes
Observations	499	499	499
R-squared	0.472	0.496	0.445

Table 3: Contemporary market condition alternatives

The table presents the full sample regression results on the SPAC share redemption rate determinants when considering the overall financial market condition with different time specifications. The dependent variable is the redemption rate. Column (1) and Column (2) present the regression results when considering the three-month financial market return and volatility preceding the merger announcement date, whereas Column (3) and Column (4) present the regression results when considering the twelve-month financial market return and volatility preceding the merger announcement date. Columns (1) and Column (3) show the results with the inclusion of merger announcement year-fixed effects, whereas Columns (2) and Column (4) show the results with the inclusion of merger announcement year- and target industry-fixed effects. I compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)	(4)
VARIABLES	Redeemed	Redeemed	Redeemed	Redeemed
Market return - three months	-1.286*	-1.225		
	(-1.702)	(-1.608)		
Market volatility - three months	-1.636***	-1.669***		
	(-2.827)	(-2.916)		
Market return - twelve months			0.505	0.109
			(0.234)	(0.050)
Market volatility - twelve months			-5.339***	-5.195***
			(-4.906)	(-4.762)
IPO proceeds	0.015	0.016	0.012	0.011
	(0.439)	(0.441)	(0.334)	(0.305)
Sponsor experience	-0.014	-0.011	-0.016	-0.013
	(-1.113)	(-0.822)	(-1.311)	(-1.022)
At-risk capital	6.187***	6.389***	5.453***	5.607***
	(3.664)	(3.674)	(3.293)	(3.273)
Top underwriter dummy	0.026	0.029	0.032	0.034
	(0.758)	(0.813)	(0.969)	(0.990)
Search time	0.136***	0.135***	0.118***	0.117***
	(5.787)	(5.778)	(4.970)	(4.923)
Share dilution	0.103*	0.108*	0.133**	0.136**
	(1.651)	(1.747)	(2.151)	(2.244)
Media coverage	-0.116**	-0.103**	-0.100**	-0.087*
	(-2.416)	(-2.040)	(-2.052)	(-1.721)
Target location dummy	-0.067**	-0.061**	-0.058**	-0.054*
	(-2.307)	(-2.128)	(-2.062)	(-1.907)
Target lifespan	0.015	0.017	0.013	0.013
	(1.105)	(1.249)	(0.946)	(0.973)
Voluntary disclosure dummy	0.049	0.025	0.050	0.029
	(1.480)	(0.747)	(1.507)	(0.835)
Merger transaction value	-0.026	-0.028	-0.024	-0.026
	(-1.414)	(-1.493)	(-1.358)	(-1.392)
Announcement year FE	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Observations	499	499	499	499
R-squared	0.467	0.493	0.488	0.511

Table 4: Different Time frame variables throughout the life of a SPAC

The table presents four different time frame variables throughout the life of a SPAC. Panel A shows the descriptive statistics, whereas Panel B displays the pairwise correlations among four time frame variables. The *Search time* represents the natural logarithm form of the number of days between SPAC IPO date and SPAC merger announcement date; The *Total merger time (plan)* represents the projected number of months from SPAC IPO date to SPAC merger closing date; The *Pre-closing period* represents the number of months between SPAC merger announcement date to SPAC merger closing date; And the *Extension* represents the number of months extended from *Total merger time (plan)* to finish the merger. The number of observations for the variables is 499. The specific definition of each variable can be found in Appendix A.

Panel A: Descriptive statistics of time frame variables

Variables	N	Mean	Median	STD	P25	P75
Search time	499	5.598	5.591	0.697	5.056	6.194
Total merger time (plan)	499	21.146	24.000	4.115	18.000	24.000
Pre-closing period	499	5.593	5.300	2.363	4.100	6.500
Extension	499	2.174	0.000	4.232	0.000	3.000

Panel B: Pairwise correlations of time frame variables

Variables	1	2	3	4
Search time	1.000			
Total merger time (plan)	-0.134	1.000		
Pre-closing period	-0.089	-0.211	1.000	
Extension	0.404	-0.597	0.281	1.000

Table 5: The effects of different time frames on redemption rate

The table presents the regression results of the SPAC share redemption rate when including different time frame variables. The dependent variable is the redemption rate. Column (1) includes the projected time length of the SPAC merger, specifically from the SPAC IPO date to the SPAC merger closing date. Column (2) includes the pre-closing period, defined as the time length between the SPAC merger announcement date and the SPAC merger closing date. Column (3) includes the SPAC merger extension, measured as the difference between the actual SPAC merger time and the projected SPAC merger time shown in Column (1). I compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)
VARIABLES	Redeemed	Redeemed	Redeemed
Total merger time (plan)	-0.010**		
	(-2.241)		
Pre-closing period		0.019***	
		(3.532)	
Extension			0.012***
			(3.048)
IPO proceeds	0.024	0.011	0.021
	(0.667)	(0.308)	(0.610)
Sponsor experience	-0.010	-0.012	-0.011
	(-0.792)	(-0.931)	(-0.848)
At-risk capital	4.915***	5.596***	4.948***
	(2.732)	(3.309)	(2.888)
Top underwriter dummy	0.041	0.043	0.033
	(1.186)	(1.225)	(0.954)
Search time	0.129***	0.120***	0.097***
	(5.407)	(5.064)	(3.947)
Share dilution	0.098	0.119**	0.107*
	(1.536)	(1.976)	(1.757)
Media coverage	-0.115**	-0.073	-0.114**
	(-2.276)	(-1.491)	(-2.389)
Target location dummy	-0.055*	-0.048*	-0.059**
	(-1.932)	(-1.723)	(-2.077)
Target lifespan	0.018	0.019	0.017
	(1.289)	(1.407)	(1.233)
Voluntary disclosure dummy	0.029	0.036	0.029
	(0.844)	(1.057)	(0.846)
Market return - six months	-2.372**	-2.596**	-2.447**
	(-2.079)	(-2.315)	(-2.202)
Market volatility - six months	-2.761***	-2.376***	-2.894***
	(-3.572)	(-3.038)	(-3.762)
Merger transaction value	-0.027	-0.031*	-0.026
	(-1.496)	(-1.649)	(-1.459)
Announcement year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	499	499	499
R-squared	0.501	0.506	0.508

Table 6: Differences in redemption determinants based on the target's location

The table presents the regression results of the SPAC share redemption rate using two subsamples based on the location of the target firm. Column (1) shows the results using the subsample of 382 domestic target firms, whereas Column (2) shows the results using the subsample of 117 foreign target firms. The rest of the explanatory variables remain the same as the baseline model. I compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)
VARIABLES	Redeemed	Redeemed
IPO proceeds	-0.010	0.172**
	(-0.236)	(2.008)
Sponsor experience	-0.002	-0.055***
	(-0.094)	(-2.780)
At-risk capital	4.972**	13.577***
	(2.533)	(3.902)
Top underwriter dummy	0.037	-0.003
	(0.895)	(-0.040)
Search time	0.128***	0.076
	(4.633)	(1.255)
Share dilution	0.153**	0.116
	(2.052)	(1.102)
Media coverage	-0.109**	-0.091
	(-1.970)	(-0.912)
Target lifespan	0.033*	-0.031
	(1.910)	(-1.206)
Voluntary disclosure dummy	0.023	0.025
	(0.588)	(0.284)
Market return - six months	-2.861**	-0.854
	(-2.199)	(-0.376)
Market volatility - six months	-2.918***	-2.550
	(-3.142)	(-1.368)
Merger transaction value	-0.031	-0.039
	(-1.254)	(-1.103)
Announcement year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	382	117
R-squared	0.488	0.659

Table 7: Summary statistics of SPAC post-merger operational performance variables

The table presents the descriptive statistics of all the variables in the SPAC post-merger operational performance models. Panel A shows the quarterly data statistics and covers four quarters after the merger closing. Panel B shows the yearly statistics and covers the current year and the next fiscal year after the merger closes. The main variables are collected from Compustat and SPACInsider. Appendix A presents the detailed variable definitions.

Panel A: Descriptive statistics of quarterly data						
Variables	N	Mean	Median	STD	P25	P75
ROA	1467	-0.076	-0.093	0.160	-0.150	-0.030
Cash ratio	1445	4.883	0.711	10.425	-0.283	5.790
Redeemed	1669	0.513	0.600	0.369	0.070	0.860
Market-to-book	1573	3.006	2.127	2.480	1.405	3.662
Leverage	1525	0.264	0.160	0.287	0.021	0.436
R&D intensity	1669	0.025	0.003	0.051	0.000	0.030
Tangibility	1595	0.146	0.061	0.197	0.017	0.196
Merger transaction value	1669	6.774	6.888	1.144	6.006	7.523
Target lifespan	1669	2.232	2.197	0.934	1.792	2.708
Target location dummy	1669	0.791	1.000	0.407	1.000	1.000
Total merger time (actual)	1669	23.463	24.000	3.612	24.000	24.000
Pipe size	1669	0.761	0.515	1.063	0.045	1.000
Sponsor lockup period	1667	10.001	12.000	5.252	6.000	12.000
Panel B: Descriptive statistics of yearly data						
Variables	N	Mean	Median	STD	P25	P75
ROA	737	-0.213	-0.133	0.387	-0.330	-0.002
Cash ratio	696	3.675	0.511	8.665	-0.314	4.149
Redeemed	765	0.487	0.570	0.367	0.040	0.840
Market-to-book	756	2.607	1.848	2.169	1.199	3.039
Leverage	757	0.285	0.204	0.295	0.027	0.454
R&D intensity	762	0.089	0.015	0.164	0.000	0.109
Tangibility	759	0.159	0.074	0.205	0.021	0.224
Merger transaction value	765	6.769	6.907	1.163	5.972	7.531
Target lifespan	765	2.257	2.197	0.954	1.792	2.773
Target location dummy	765	0.792	1.000	0.406	1.000	1.000
Total merger time (actual)	765	23.554	24.000	3.765	24.000	24.000
Pipe size	765	0.792	0.521	1.103	0.000	1.054
Sponsor lockup period	764	10.034	12.000	5.326	6.000	12.000

Table 8: SPAC Post-merger operational performance analysis with quarterly data

The table presents the SPAC post-merger operational performance regressions every quarter. Panel A shows the predictive power of the SPAC share redemption rate on the ROA of the newly merged firm. Panel B shows the predictive power of the share redemption rate on the cash ratio of the newly merged firm. Column (1) to Column (4) represents the first to fourth quarters after the merger. Year-fixed and industry-fixed effects are included to mitigate the concerns related to omitted variables. I compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

Panel A: The effects of SPAC share redemption rate on ROA

	(1)	(2)	(3)	(4)
VARIABLES	ROA	ROA	ROA	ROA
Redeemed	-0.054***	-0.047***	-0.032**	-0.025*
	(-2.841)	(-3.775)	(-2.132)	(-1.965)
Market-to-book	-0.005**	-0.008***	-0.007*	0.001
	(-2.227)	(-2.729)	(-1.767)	(0.313)
Leverage	-0.022	0.044**	-0.007	-0.001
	(-0.633)	(2.066)	(-0.271)	(-0.062)
R&D intensity	-1.405***	-1.125***	-1.485***	-1.580***
	(-6.264)	(-9.978)	(-8.163)	(-8.374)
Tangibility	0.067*	0.003	0.044	0.006
	(1.747)	(0.123)	(1.633)	(0.257)
Merger transaction value	0.009	0.013**	0.013**	0.007
	(1.360)	(2.554)	(2.248)	(1.364)
Target lifespan	0.007	0.012***	0.010***	0.002
	(1.601)	(2.825)	(2.676)	(0.403)
Target location dummy	0.010	-0.003	-0.012	-0.005
	(0.520)	(-0.200)	(-0.985)	(-0.499)
Total merger time (actual)	-0.001	0.000	0.001	-0.001
	(-0.425)	(0.162)	(0.271)	(-0.851)
Pipe size	0.002	-0.006	-0.006	-0.008
	(0.334)	(-0.872)	(-0.826)	(-1.236)
Sponsor lockup period	-0.003**	-0.001	-0.000	-0.001
	(-2.286)	(-1.142)	(-0.468)	(-0.899)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	357	364	336	315
R-squared	0.686	0.789	0.790	0.830

Panel B: The effects of SPAC share redemption rate on cash ratio

	(1)	(2)	(3)	(4)
VARIABLES	Cash ratio	Cash ratio	Cash ratio	Cash ratio
Redeemed	-4.444**	-4.350**	-2.939*	-2.844**
	(-2.094)	(-2.129)	(-1.877)	(-2.072)
Market-to-book	0.487**	0.554**	0.361	0.677***
	(1.990)	(2.240)	(1.440)	(2.670)
Leverage	-12.083***	-10.377***	-8.448***	-6.710***
	(-6.844)	(-6.195)	(-6.694)	(-5.468)

				Con't
R&D intensity	-27.650***	-15.667**	-6.629	-3.742
	(-2.785)	(-2.059)	(-0.905)	(-0.471)
Tangibility	-3.577	-5.265**	-3.255*	-3.775**
	(-1.224)	(-2.193)	(-1.825)	(-2.187)
Merger transaction value	-0.089	0.115	-0.199	0.062
	(-0.146)	(0.223)	(-0.456)	(0.144)
Target lifespan	-1.813***	-1.059**	-0.583	-0.544
	(-3.021)	(-1.982)	(-1.473)	(-1.358)
Target location dummy	3.035**	2.415*	1.216	1.436
	(2.186)	(1.772)	(1.171)	(1.460)
Total merger time (actual)	-0.094	-0.032	-0.093	-0.008
	(-0.710)	(-0.232)	(-0.812)	(-0.082)
Pipe size	1.227	1.643	0.779	0.750
	(1.298)	(1.588)	(1.004)	(1.163)
Sponsor lockup period	0.069	0.111	0.076	0.045
	(0.678)	(0.850)	(0.755)	(0.372)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	366	364	341	315
R-squared	0.275	0.276	0.237	0.232

Table 9: SPAC Post-merger operational performance analysis with yearly data

The table presents the annual SPAC post-merger operational performance regressions. Panel A shows the SPAC share redemption rate's predictive power on the newly merged firm's ROA. Panel B shows the predictive power of the share redemption rate on the cash ratio of the newly merged firm. Column (1) presents results when the year difference is zero, meaning that the dependent and control variables' fiscal year aligns with the merger's closing year. Column (2) presents results when the year difference is one, meaning that the fiscal year of the dependent variable and the control variables is one year after the merger's closing year. Column (3) presents results with fiscal year-ends between 179 and 545 days after the merger. Year- and industry-fixed effects are included to mitigate the concerns related to omitted variables. I compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

Panel A: The effects of SPAC share redemption rate on ROA

	(1)	(2)	(3)
VARIABLES	ROA	ROA	ROA
Redeemed	-0.111**	-0.101*	-0.120***
	(-2.301)	(-1.896)	(-2.637)
Market-to-book	-0.017**	-0.014	-0.049***
	(-2.356)	(-0.982)	(-2.962)
Leverage	0.062	-0.050	-0.007
	(1.079)	(-0.632)	(-0.101)
R&D intensity	-1.641***	-1.534***	-1.421***
	(-11.035)	(-11.196)	(-11.367)
Tangibility	-0.005	0.174	0.104
	(-0.063)	(1.619)	(1.195)
Merger transaction value	0.019	0.027	0.030*
	(1.244)	(1.475)	(1.838)
Target lifespan	0.041***	0.054***	0.054***
	(3.057)	(3.432)	(3.792)
Target location dummy	-0.063*	-0.001	-0.028
	(-1.880)	(-0.032)	(-0.760)
Total merger time (actual)	-0.002	-0.004	0.005
	(-0.358)	(-0.675)	(0.782)
Pipe size	-0.009	-0.018	-0.017
	(-0.587)	(-0.974)	(-0.967)
Sponsor lockup period	-0.004	0.000	0.000
	(-1.465)	(0.006)	(0.142)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	412	320	375
R-squared	0.583	0.556	0.609

Panel B: The effects of SPAC share redemption rate on cash ratio

	(1)	(2)	(3)
VARIABLES	Cash ratio	Cash ratio	Cash ratio
Redeemed	-3.703**	-2.152**	-2.569**
	(-2.539)	(-2.164)	(-2.527)
Market-to-book	0.677***	0.572**	0.540***
	(3.663)	(2.239)	(2.593)

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Leverage	-7.862***	-5.444***	-5.773***
	(-7.100)	(-5.873)	(-6.025)
R&D intensity	-3.310	1.957	-0.620
	(-1.478)	(1.063)	(-0.346)
Tangibility	-3.689**	-3.703***	-3.564***
	(-2.054)	(-2.679)	(-2.767)
Merger transaction value	0.310	0.551	0.335
	(0.734)	(1.564)	(1.035)
Target lifespan	-0.760*	-0.313	-0.499*
	(-1.902)	(-1.272)	(-1.850)
Target location dummy	1.755*	1.465**	1.260*
	(1.928)	(2.458)	(1.949)
Total merger time (actual)	-0.073	-0.041	-0.082
	(-0.846)	(-0.661)	(-1.075)
Pipe size	1.024	0.497	0.519
	(1.529)	(1.190)	(1.036)
Sponsor lockup period	-0.021	-0.007	-0.006
	(-0.263)	(-0.112)	(-0.105)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	393	299	352
R-squared	0.305	0.260	0.253

Table 10: Predictive power of SPAC share redemption rate on post-merger stock performance
The table presents the SPAC post-merger stock performance regressions. The main explanatory variable is the SPAC share redemption rate. Column (1) shows its predictive power on the three-month buy-and-hold abnormal return (BHAR). Column (2) shows its predictive power on the six-month BHAR. Column (3) shows the predictive power of the share redemption rate on the twelve-month BHAR. Year-fixed effects (the year of stock performance data) and industry-fixed effects are included to mitigate the concerns related to omitted variables. I compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity. Appendix A presents the variable definitions.

	(1)	(2)	(3)
VARIABLES	BHAR-three months	BHAR-six months	BHAR-twelve months
Redeemed	-0.447***	-0.204**	-0.061
	(-5.243)	(-2.297)	(-0.592)
Firm size	0.214***	0.191***	0.221***
	(4.957)	(4.064)	(4.294)
Market-to-book	0.121***	0.118***	0.236***
	(5.686)	(7.900)	(7.768)
Leverage	0.038	0.068	-0.161
	(0.430)	(0.827)	(-1.349)
Raw ROA	0.194	0.529**	1.084**
	(1.095)	(2.194)	(2.590)
Target location dummy	0.033	0.001	0.113*
	(0.507)	(0.014)	(1.699)
Total merger time (actual)	-0.003	-0.007	-0.014
	(-0.497)	(-1.274)	(-1.456)
Pipe size	-0.031	-0.025	-0.023
	(-0.996)	(-0.829)	(-0.615)
Share dilution	0.384***	0.209*	-0.032
	(3.079)	(1.835)	(-0.192)
Sponsor lockup period	0.001	0.002	-0.004
	(0.134)	(0.624)	(-0.975)
Momentum	0.005	0.009	0.017
	(0.163)	(0.411)	(0.578)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	364	371	345
R-squared	0.505	0.535	0.497

Chapter 3

Firm-Level Political Risk and Stock Repurchases

1. INTRODUCTION

Studies show that policy-related uncertainty affects various managerial decisions and economic outcomes such as firm investment (An, Chen, Luo, & Zhang, 2016; Baker, Bloom, & Davis, 2016; Nick, Bond, & van Reenen, 2007), entrepreneurial financing (Cumming & Zahra, 2016; Kellard, Kontonikas, Lamla, & Maiani, 2022; Wright, Wilson, Gilligan, Bacon, & Amess, 2016), firms' financing decisions (Dai & Ngo, 2021), cash holdings (Gao & Zhang, 2015; Gulen & Ion, 2015; N. Xu, Chen, Xu, & Chan, 2016), and market valuation (Brogaard & Detzel, 2015; Pástor & Veronesi, 2013). In one branch of related studies, mixed results have been found regarding the relationship between political uncertainty and firms' payout policy. Some studies claim that dividend payout is positively associated with political uncertainty as it helps mitigate agency problems during those periods (Attig, El Ghoul, Guedhami, & Zheng, 2021; Baker et al., 2016). Others find a negative relationship between dividends and political risk, suggesting precautionary managerial responses through more conservative dividend distributions during such periods (T. Huang, Wu, Yu, & Zhang, 2015). Ahmad, Aziz, El-Khatib, and Kowalewski (2023), in their recent paper, point out a positive and significant effect of firm-level political risk on dividend payouts, particularly in uncertainties related to economics, institutions, technology, trade, and security. The authors argue that these results support the signaling role of dividends rather than the role of agency theory in explaining dividend payouts when firms are associated with higher levels of political risk.

While there have been some studies focusing on the dividend payout and firm political uncertainty, few studies discuss stock repurchases, which has been viewed as a substitute for dividend payout (e.g.,Grullon & Michaely, 2002; Jiang, Kim, Lie, & Yang, 2013; Skinner, 2008). Many studies regard stock repurchases as a tool for delivering signals to the shareholders and market (e.g.,Constantinides & Grundy, 1989; D. L. Ikenberry & Vermaelen, 1996; McNally, 1999). However, the lack of comprehensive research on the impact of political uncertainty on stock repurchase decisions leaves a significant gap in the literature. Understanding this relationship is crucial, as it can provide deeper insights into corporate financial strategies and market behavior under varying political climates. In this paper, we aim to address this gap by examining how political uncertainty influences firms' decisions to repurchase stocks, thereby contributing to a more nuanced understanding of corporate payout policies. Using a sample of U.S. publicly listed firms from 2004 – 2018, in this paper, we study the relationship between stock repurchases and firm-level political risk, which is defined by Hassan, Hollander, Van Lent, and Tahoun (2019). This direct firm-specific measure is based on a textual-search technique that quantifies the proportion of the quarterly earnings conference call that focuses on general political risk. The same measure has also been used in related studies (Choi, Chung, & Wang, 2022; Gyimah, Danso, Adu-Ameyaw, & Boateng, 2022;

Jeon, Mun, & Han, 2022). With the monthly open-market repurchases data we collected from AcademicEDGAR, we find a positive association between firm-level political risk and contemporary quarterly stock repurchases through our baseline analysis. We also adopt different fixed effects specifications to ensure the robustness of the primary findings. Our results indicate that if the firm exhibits higher political risk, it is more likely to conduct higher stock repurchases. In the analysis, we use the interactions between firm-level political risk and control variables to investigate whether and how the firm-level characteristics affect the risk-repurchases relationship as intermediaries. We find that the volatility of firm's ROA and the sales growth show moderating effects, and all the other variables do not affect the significant positive relationship between firm-level political risk and repurchases.

Further, to identify the source of political uncertainty associated with those significant results, we study how different categories of political risk affect the open-market stock repurchases (tax, economics, environment, technology, institutions, security, trade, and health). Our results indicate that political risks regarding tax, economics, environment, technology, institutions, and security are positively associated with firm's stock repurchases at a significant level, while political risks regarding trade and health are not significantly related firm's stock repurchases.

Next, we conduct subsample analysis based on different specifications regarding economic conditions. Prior studies suggest that financial crisis can affect the firm's payout policies (e.g.,Floyd, Li, & Skinner, 2015; Hauser, 2013; Iyer & Rao, 2017). In the first subsample test, we examine the relationship between firm-level risk and stock repurchases both during the 2007-2009 financial crisis period and out of the financial crisis period. We find that when excluding the financial crisis period, the significant relationship between political risk and stock repurchases is more pronounced and the magnitude is larger. Meanwhile, we find no significant relationship using the subsample during financial crisis period. In the second test, we classify the original sample into the different economic conditions, poor and good, using the Chicago Fed National Activity Index (CFNAI), and we find that the significant positive relationship between firm-level political risk and repurchases is more consistent when the overall economic condition is poor. Our results indicate that political risk plays a more critical role in influencing stock repurchases during non-crisis periods and in weaker economic conditions. This finding suggests that firms are more likely to use stock repurchases as a signaling mechanism to reassure shareholders and stabilize stock prices when political uncertainty is high and economic conditions are challenging.

In the following section, we divide firms into different categories based on their buyback histories. We separately run the subsample regression analysis on firms that have above-zero buyback activities in the past 6, 12, 24, and 36 months. Our results show that while all the

subsamples are showing bigger magnitudes on the share repurchases – political risk effect comparing to the full sample regression, the coefficients on firm-level risk are even higher when firms have more recent buyback activities such as in the past six or twelve months.

We perform several robustness tests to examine the validity of our findings. First, to ensure the relationship between repurchases and political risk is not affected by potential omitted variables, we include several CEO-level and board-level variables as additional control variables. From CEO level, we include the CEO gender, CEO age, CEO tenure, and CEO duality. From board level, we include the board size, average tenure of board members, percentage of female directors, board independence, percentage of busy directors, and percentage of outside directors. We find that there is still a significant positive relationship between firm political risk and repurchases after including all potential omitted variables. Therefore, we believe that CEO-level and board-level characteristics do not affect our main findings.

To further test the robustness of the primary findings, we conduct a propensity score matching test to avoid the selection bias issue. We use the top quartile as the treatment group and match with the rest of observations. After one-to-one matching all the firm-, CEO-, and board-level control variables, we find that the significant positive relationship between repurchases and firm-level political risk remains after applying the baseline models to the matched sample.

Then, we conduct a two-stage least-squares (2SLS) instrumental variable regression analysis. Specifically, we use the political polarization as our instrument. This instrumental variable is used in previous related literature as well (Z. Xu, 2020). Through our test, we find that the first-stage and second-stage regressions both show significant results. The instrumental regression analysis further validates our primary findings regarding the relationship between firm-level political risk and stock repurchases.

Finally, we conduct a subsample test regarding firm's operating scope. We divide firms into S&P firms and non-S&P firms and conduct the baseline regression analysis. We find that the significant and positive relationship between firm-level political risk and stock repurchases remains in the S&P subsample but not in the non-S&P subsample. The result is intuitive because firms with larger operating scopes usually have better liquidity and more excess cash so that they can react quickly regarding high or increased political risk by conducting more stock repurchases.

This study contributes to the literature in two different ways. First, this paper extends the growing literature on firm-level political risk that originates from Hassan et al. (2019) and Pan, Wang, and Yang (2019). It shows that political risk of individual firms, rather than sector-level or industry-level political uncertainty, plays an important role in affecting firm's features and policies. Second, this study adds to the long-standing literature on factors affecting firm's stock repurchases

(e.g.,Asquith & Mullins Jr, 1986; Brockman, Khurana, & Martin, 2008; Grullon & Ikenberry, 2000; Skinner, 2008). As we show that firms with higher individual political risks are more likely to conduct higher open-market repurchases under firm's repurchase programs, it underscores the significant role of political uncertainty in shaping corporate payout policies and highlights the strategic use of stock repurchases as a tool for mitigating the adverse effects of such risks. Overall, our research highlights the importance of considering firm-level variables in financial studies, aligning with the broader trend in the literature that emphasizes micro-level analyses over macro-level generalizations. This study not only fills a gap in the existing research but also sets a foundation for future studies to explore the interplay between political risk, economic conditions, and corporate financial decisions.

The rest of the paper is organized as follows. Section 2 summarizes past related literature and introduces our hypotheses. Section 3 explains the data for this study. Section 4 presents the main results on the relationship between firm-level political risk and stock repurchases and additional tests. Section 5 concludes.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Stock repurchases

Stock repurchases have been regarded as one of the most common ways to distribute cash to shareholders. Although many firms use dividends to pay out cash, the proportion of listed US firms paying regular cash dividends declined from 66.5% in 1978 to 20.8% in 1999 (Fama & French, 2001). Repurchases are increasingly used in place of dividends, even for firms that continue to pay dividends (Skinner, 2008). Within the context of stock repurchases, researchers have found many firm-level factors that could affect a firm's repurchase policies such as firm size, non-operating cash flows, cash dividends, ownership concentration, and overall corporate governance (e.g.,Andriosopoulos & Hoque, 2013; H.-H. Huang, Wang, Lin, & Jhao, 2010; Jagannathan, Stephens, & Weisbach, 2000; Jansson & Larsson-Olaison, 2010).

From an individual level, Banerjee, Humphery-Jenner, and Nanda (2018) find that overconfident-CEOs are more inclined to conduct stock repurchases and respond more to stock-price declines. Overconfident-CEOs are also more likely to substitute repurchases for dividends or capital expenditure. Cook and Zhang (2022) find that high CEO option sensitivity to stock prices causes more share buybacks and fewer cash dividends.

Among the repurchase-related studies, a group of literature focuses on the effects of uncertainty to repurchase activities. Walkup (2016) finds that the market-level uncertainty, gauged

through a GARCH estimate of volatility and the Chicago Board Options Exchange Volatility Index, significantly influences firms' payout policy decisions. This effect varies between dividends and share repurchases and depends on the firms' cash flow levels. When market uncertainty rises, firms with low cash flows tend to tighten their dividend policies to conserve cash, whereas firms with high cash flows take advantage of the situation by increasing share repurchases. In another paper, Brockman, Howe, and Mortal (2008) argue that stock market liquidity influences payout policy through a first-order effect on the share repurchase decision, and a second-order or residual effect on the dividend decision. All else equal, higher market liquidity encourages the use of repurchases over dividends.

2.2 Political risk

According to conventional models of investment under uncertainty, any increase in any form of risk can lead to a decline in firm-level investment and employment growth (An et al., 2016; e.g.,Bernanke, 1983; e.g.,Bloom, Bond, & Van Reenen, 2007). Same as studies that focus on other types of uncertainties, earlier studies regarding political risk and uncertainty use measures from market or industry level. In recent studies, researchers have converted the aggregate-level measures to individual firm-level measures and investigate how firm-level political risk and uncertainty affect firms in different ways.

The firm-level political risk is developed by Hassan et al. (2019). Their measures of risk use simple tools from computational linguistics to quantify the share of the earnings call devoted to discussing risks associated with politics and risks associated with particular political topics.[1] Specifically, they include eight different risk topics: economic policy & budget, environment, trade, institutions & political process, health care, security & defense, tax policy, and technology & infrastructure.

After the measure became available, more studies started to use it in their studies. Pan et al. (2019) find that political uncertainty is negatively associated with debt maturity and leverage, and the negative effects of political uncertainty on debt maturity and leverage are more pronounced for firms with greater investment reversibility and a lower credit rating. Their results suggest that political uncertainty deteriorates the external financing environment, leading to firms using more short-term debt and having lower leverage. In another study, Gyimah et al. (2022) also discuss the relationship between firm-level political risk and corporate leverage decisions. Besides the similar findings regarding the negative political risk – total leverage association, the authors also show that

[1] Also see https://sites.google.com/view/firmrisk/risk#h.p_Auykt33b1147 and Hassan et al. (2019) for the Specific construction of political risk and related variables.

firm-level political risk is positively related to debt specialisation, suggesting that firms are more inclined to adopt fewer debt types when they face high political risk. Their further analysis reveals that firms with high political risk are associated with a faster speed of adjustment to target than those with low political risk.

Some studies have touched on the relationship between political risk and corporate social responsibility, corporate tax, and other related firm-level features (Chatjuthamard, Treepongkaruna, Jiraporn, & Jiraporn, 2021; Liu, Jin, Zhang, & Zhao, 2022). Nevertheless, quite a few studies focus on corporate investment and cash retention perspectives, Choi et al. (2022) show that firms with higher political exposure and political risk spend less on capital investment. Ahmad et al. (2023) show supportive results as they find a positive relationship between the firm-level political risk and firm's dividend payouts. Jeon et al. (2022)'s findings indicate that firm-level political risk has a positive (negative) relationship to excess cash (cash value) and that the managerial ability and CEO overconfidence of managers have a negative (positive) moderating effect on excess cash holdings (cash value).

2.3 Firm-level political risk and stock repurchases

Agency theory and signaling theory are the fundamental theories that explain firms' stock repurchase activities (e.g.,D. Ikenberry, Lakonishok, & Vermaelen, 1995; Jensen & Ruback, 1983; Nohel & Tarhan, 1998). Drawing on the insights of those theories, recent studies have been attempting to explain the impact of political risk on firms' payout policies.

Researchers have found a positive relationship between the political risk and dividend payouts both on aggregate level and individual firm level (Ahmad et al., 2023; Attig et al., 2021). However, no study has focused on the relationship between political risk and stock repurchases. In Ahmad et al. (2023), the authors document a moderate significant relationship between the yearly average firm-level political risk and yearly total repurchases ratio.[2] As their study focuses mostly on dividend payouts instead of stock repurchases, there is no further explanation or tests regarding the relationship between political risk and stock repurchases. Hasan, Alam, Paramati, and Islam (2022) find that cash holdings is higher for firms with greater exposure to firm-level political risk. The positive relationship between firm political risk and cash holdings is consistent for financially constrained and non-constrained firms, high and low growth firms, pro-cyclical and counter-cyclical and competitive industries. From this perspective, firms with higher political risk should retain more cash, and they would like to adopt more conservative financial policies. Therefore, we formulate our

[2] The share repurchases ratio is the ratio of purchases of common and preferred stock minus any decrease in the value of preferred stock outstanding divided by net income before extraordinary items as of year-end.

first hypothesis as follows:

H1a: Firms with higher (lower) firm-level political risk are associated with lower (higher) stock repurchases.

On the other hand, as the political uncertainty increases, some studies find that there is more likely to be in lack of new investment opportunities for the firms (e.g.,Khan & Akbar, 2013). In this case, firms that retain large amounts of cash may want to return it to shareholders for signaling purpose or tax purpose. In this case, we have our second hypothesis as follows:

H1b: Firms with higher (lower) firm-level political risk are associated with higher (lower) stock repurchases.

3. DATA AND METHODOLOGY

3.1 Data and variable construction

To understand the relationship between firm-level political risk and stock repurchases, our measure of firm-level political risk comes from Hassan et al. (2019). This metric indicates the percentage of a company's earnings conference call devoted to discussions about political risks. It helps pinpoint political risk at the individual firm level rather than in the aggregate, allowing for variations in political risk across different firms and time periods. As we have mentioned above, this measure has also been adopted by many other studies. Besides the primary firm-level political risk variable, we also use the eight distinct subindices introduced by Hassan et al. (2019). These subindices are derived by measuring the time spent discussing specific political risk topics during the quarterly earnings conference call. The topics include economics, institutions, technology, trade, taxes, environment, health, and security. The original political risk data varies from hundreds to tens of thousands. To avoid the large dispersion and outliers, we standardize all the firm-level political risk data for better observation (Ahmad et al., 2023).

For the main explanatory variable – stock repurchases, we differentiate our study from others by collecting firms' monthly open-market stock repurchases from 2002 to the first quarter of 2018 from AcademicEDGAR. We focus on the repurchases under the firm's repurchase program and measure it as the total quarterly repurchased shares as a percentage of the total number of shares outstanding.

The control variables we include in the baseline regressions come from Ahmad et al. (2023). Specifically, we include the firm size, market-to-book value, corporate leverage, cash ratio, cash flow, sales growth, return on asset (ROA), research & development (R&D) intensity, capital

expenditure, tangibility, ROA volatility, and Altman's Z-score dummy (Altman, 1968).[3] In the analysis, we exclude the financial firms (SIC code 6000 – 6999) and utility firms (SIC code 4900 – 4999) as they have unique corporate payout regulations. After eliminating the observations with missing variables, the final sample consists of 2,109 unique firms and 29,717 firm-quarter observations throughout the entire sample period. Table 1 shows the descriptive statistics of all the relevant variables in our baseline regressions. It includes the repurchases, overall political risk, sub-categorical political risk, and all control variables. What we observe from the table is that while the mean value of share repurchases ratio is 0.81%, the 25th percentile on stock repurchases is 0.00. There are 37.0% of quarterly observations with zero repurchase in our data sample.

[Insert Table 1]

3.2 Methodology

We employ panel data regression to examine the relationship between firm-level political risk and stock repurchases. We include the time-fixed effects, industry-fixed effects, and firm-fixed effects to help mitigate concerns related to omitted variables, Finally, we adjust the standard errors for heteroskedasticity, and they are clustered at the firm level to account for the potential non-independence and non-identical distribution of errors. The baseline model is presented as follows:

$$Stock\ Repurchases_{i,t} = \alpha + \beta Political\ Risk_{i,t} + \gamma Control\ Variables_{i,t} + Fixed\ Effects + \varepsilon \qquad (1)$$

As the firm-level political risk data is calendar-quarterly data, we make sure the date of earning conference call falls in the same fiscal quarter as stock repurchases and control variables. We believe the lagged effects of firm-level political risk will not last till next quarter because most companies hold a conference call each quarter and the firm-level risk will be adjusted by that time. Therefore, we investigate the relationship between the political risk and the contemporary stock repurchases of the firm. For a better observation on the relationship between firm-level political risk and stock repurchases, we use our repurchases to total shares outstanding times 100 as our dependent variable in the regression analysis.

4. MAIN RESULTS AND ADDITIONAL TESTS

4.1 Impact of firm-level political risk on stock repurchases

[3] The detailed definition of variables is presented in Appendix A.

We include the firm-level control variables that referred from Ahmad et al. (2023). The main results with different fixed effects are presented in Table 2. From Column (1) to (4), we separately control for time-fixed effects, time- and industry-fixed effects, time- and firm-fixed effects, and time × industry- and firm-fixed effects. In all four specifications, the coefficient on firm-level political risk is positive and significant. Using Column (4) as the baseline regression model, through our sample, we find that firms with higher leverage, cash, ROA, R&D intensity, tangibility, and higher risk (measured by ROA volatility and Z-score dummy) tend to conduct more open-market stock repurchases under their repurchase programs. Meanwhile, we find that firms with higher market-to-book ratio and sales growth tend to have lower stock repurchases. With the inclusion of the control variables and the time × industry- and firm-fixed effects, we identify a positive relationship between the firm-level political risk and firm's open-market stock repurchases at 5% significance level, indicating that firms with higher political risk are more likely to conduct higher stock repurchases in the concurrent period. In Column (5) and (6), we include the interactions between political risk and firm-level control variables. From Column (5), we find that political risk does positively influence the repurchases, but this effect might be moderated by the interaction with ROA volatility, resulting in a less pronounced overall impact when ROA volatility is high. This finding is intuitive because when the firm performance is volatile, they may not be able to have enough cash to conduct repurchases even if the individual political risk is high. The result in Column (6) suggests that comparing to firms with lower sales growth, firms with higher sales growth should have more available cash, and therefore tend to conduct more repurchases when they face high individual political risk.

[Insert Table 2]

Following the analysis regarding the overall firm-level political risk and stock repurchases, we further identify the relationship between each sub-categorical political risk and stock repurchases. Table 3 shows the eight sub-categorical political risks – economic policy & budget, environment, trade, institutions & political process, health care, security & defense, tax policy, and technology & infrastructure – and their association with stock repurchases. To be consistent with the baseline model, we include the same control variables and fixed effects as Model 4 in Table 2.

[Insert Table 3]

As shown in Table 3, Column (1) to Column (8) corresponds to the eight different sub-categorical political risks. We find that the political risk arising from trade is not closely associated with stock repurchases. Among the others, the health-related political risk shows a positive relationship with stock repurchases at a moderate significance level, and the rest six - economic policy & budget, environment, institutions & political process, security & defense, tax, and

technology & infrastructure are positively associated with stock repurchases at a significance level of 5% or 1%.

4.2 Financial crisis and economic condition

To further investigate the relationship between firm-level political risk and firm's open-market stock repurchases, we investigate how uncertainty at aggregate level – market level – affects the relationship between individual-level political uncertainty and repurchases. We first look at financial crisis and non-financial crisis periods. Specifically, we define the financial crisis period as dummy variable, which equals to one if the repurchases happen from the first calendar quarter of 2007 to the second quarter of 2009 and equals to zero otherwise.[4] Column (1) and (2) of Table 4 show the results of the subsample regressions.

[Insert Table 4]

Column (1) shows the financial crisis period result, and Column (2) shows the non-financial crisis period result. We find that during the financial crisis, there is no significant relationship between political risk and stock repurchase. This finding is intuitive because firms need to consider other factors, policies, and regulations during the financial crisis. Meanwhile, firms are likely to reserve cash during the financial crisis period as they may face liquidity problems. Therefore, the political risk loses its statistical significance in Column (1). As Column (2) shows, during the non-financial crisis period, the positive association between firm-level political risk and repurchases is significant at 1%, which is consistent with our baseline regression results. Interpreting from Table 4, we believe that part of the reasons why our baseline model exhibits a 5% statistical significance level instead of a higher statistical significance level is that we include the financial crisis period, a period with high uncertainties and other noises.

Further, we divide our sample into two groups with different economic conditions – good condition and poor condition. Follow Ahmad et al. (2023), we divide into poor vs. better economic conditions based on the Chicago Fed National Activity Index (CFNAI) from the Federal Reserve Bank of Chicago. The CFNAI equals the weighted average of 85 monthly indicators of national economic activity. A positive index value characterizes better economic conditions and corresponds to growth above the trend, while a negative index value characterizes poor economic conditions and corresponds to growth below the trend. As Column (3) and Column (4) of Table 4 shows, the positive association between firm-level risk and repurchases is significant and more pronounced when the

[4] As some of the past literature uses different financial crisis period definitions, we also test our results with different dates. The results are significant and consistent with our model presented here.

economic condition is poor. From this analysis, we note that the significant positive effect of firm-level political risk is prevalent in poor economic conditions. This finding also aligns with repurchase signaling theory, showing that all else equal, firms tend to send good signals and enhance investors' confidence when the economic condition is poor. (e.g.,Asquith & Mullins Jr, 1986; McNally, 1999). Finally, we do not find this result being controversial with what we find during financial crisis and non-financial crisis periods as the financial crisis is a one-time shock and does not last very long. In this case, firms may be panic and therefore reserve more cash instead of distributing to shareholders, leading to an insignificant relationship between political risk and repurchases.

4.3 Stock repurchase history

In this section, we investigate the differences among firms with varying repurchase histories. What we want to understand is how firm-level political risk affects the firms with different repurchase preferences and habits. We first divide firms into repurchase firms and non-repurchase firms. We define the firms with above-zero repurchases in the past six months as repurchase firms, and firms with zero repurchase in the past six months as non-repurchases firms. The results are presented in Column (1) and Column (2) of Table 5. Column (1) shows the results using the sample of non-repurchase firms, and Column (2) shows the results using the sample of repurchase firms. We find that the firm-level political risk of non-repurchase firms does not closely associate with their repurchases, while the regression on the subsample of repurchase firms show a larger magnitude on the coefficient comparing to the regression on the full sample in Column (4) of Table 2. We interpret this finding as that for the firms that have repurchase habits and recent repurchase history, they are more likely to conduct higher repurchases when they show higher political risk. For those who do not have repurchase habits or recent repurchase history, they are not inclined to use repurchase as a responding tool even when they face high political risk.

[Insert Table 5]

Next, we further divide firms into another three different categories – firms with above-zero repurchases in the past twelve months, twenty-four months, and thirty-six months. It is intuitive that as the months we include increases, the number of observations increases. Column (3), Column (4), and Column (5) of Table 5 present the results of these three repurchases history specifications.

From Column (2) to Column (5), we find that the coefficients of firm-level political risk from all above-zero repurchase regressions are positive and significant. However, as the number of months increases, the coefficient decreases. The regression on the subsample with firms who have above-zero repurchases in the past six months shows a coefficient that 11.8% higher than the

subsample with firms who have above-zero repurchases in the past thirty-six months.[5] This finding indicates that the positive relationship between political risk and stock repurchases is more pronounced in firms that have conducted open-market repurchases more recently compared to those that have done so less recently.

4.4 CEO characteristics and corporate governance

As the features of CEOs and boards may also affect the share repurchases, in this section, we include the CEO-level and board-level variables as possible omitted variables to check the robustness of our primary results. From CEO level, we include the CEO gender, CEO age, CEO tenure, and CEO duality. From board level, we include the board size, average tenure of board members, percentage of female directors, board independence, percentage of busy directors, and percentage of outside directors. The descriptive statistics of CEO- and board-level variables is presented in Table 6.[6]

[Insert Table 6]

After including all the possible omitted variables, we conduct the regression analysis with the inclusion of CEO- and board-level variables. Table 7 shows the regression results. The regression in Column (1) includes all the CEO-level variables. Among the four CEO-level variables, only the CEO tenure exhibits a significant positive association with stock repurchases, and the inclusion of CEO-level variables does not affect the statistical significance on the coefficient of firm-level political risk. Column (2) of Table 8 shows the regression with the inclusion of board-level variables. We find that firms with a large board size and higher female director ratio tend to conduct more stock repurchases. We also find a moderate negative relationship between the percentage of outside directors and stock repurchases. The result from Column (2) indicates that several board-level features can affect stock repurchases, but they do not affect the relationship between the political risk and stock repurchases. Column (3) shows the regression with the inclusion of both CEO- and board-level variables. The result is consistent with that of Column (1) and Column (2), proving that the significant positive association between firm-level political risk and stock repurchases is not affected by the CEO- and board-level characteristics.

[Insert Table 7]

4.5 Sample selection bias

In this section, we conduct a propensity score matching (PSM) test to alleviate the concern

[5] The numbers presented in Table 5 only display to three decimal places. From the original table, the coefficients of firm-level risk in Column (2), (3), (4) and (5) of Table 5 are 0.03028, 0.03008, 0.02723, and 0.02673.
[6] The detailed definition of CEO- and board-level variables is presented in Appendix A.

of selection bias in the original sample. We use the observations with top quartile of firm-level political risk as the treatment group and match them with the rest of observations on a non-replaceable one-to-one basis. We match all the firm-, CEO-, and board-level control variables to make sure our results are consistent. Panel A of Table 8 shows the before- and after-matching descriptive statistics. After matching, the control variables in the baseline regression have no significant difference between treatment group and control group.

[Insert Table 8]

Panel B of Table 8 shows the regression analysis using the matched sample. The specifications in four columns are the same as the ones in Table 2. The results show a consistent positive association between firm-level political risk and stock repurchases at a statistical significance of 5%, further enhancing the robustness of our primary findings.

4.6 Instrumental Variable Regression Analysis

In this section, we further address the endogeneity issue by conducting a 2SLS instrumental variable regression analysis. Referring from Baker et al. (2016) and Z. Xu (2020), we use political polarization as the instrument variable. Specifically, the instrumental variable – political polarization – is defined as $\frac{1}{n}\sum_{n=1}^{N} 1 - |Yea_{n,t}\% - Nay_{n,t}\%|$, where $Yea_{n,t}\%$ ($Nay_{n,t}\%$) is the percentage of Yea (Nay) votes among all house votes for bill n at time t. N is the total number of bills in quarter t. We believe that the political polarization is endogenous to firm-level risk. Meanwhile, we believe this instrument is also exogenous to the dependent variable as the political polarization based on the house votes should not directly affect individual firm's repurchase activities especially the repurchases under the firm's repurchase programs. We include firm-, CEO-, and board-level control variables in the regressions. Table 9 shows the results of the instrumental variable regression.

[Insert Table 9]

Column (1) of Table 9 shows the first-stage regression and we find that our instrument is showing significant and positive association with firm-level risk. Which is intuitively correct. Then using the fitted value of firm-level political risk, we show the second-stage regression in Column (2). We believe that the significant result from 2SLS instrumental variable regression analysis further strengthens the robustness of our primary findings.

4.7 Subsample Test

In this section, we conduct the subsample test regarding the operating scope of the firms to better understand the relationship between firm-level political risk and stock repurchases. From our

original sample, we divide firms into S&P firms and non-S&P firms. For the S&P firms sample, we have firms that belong to S&P 500, S&P Midcap Index, and S&P Smallcap Index. The rest are non-S&P firms. We have 15,129 firm-year observations in the S&P sample and 14,588 observations in the non-S&P sample. Table 10 provides the regression results of the two subsamples.

[Insert Table 10]

As expected, we find out that the significant and positive association between firm-level risk and stock repurchases is more pronounced in the S&P sample instead of non-S&P sample. Firms with larger operating scopes normally also have better liquidity and excess cash flow. In this case, when the political risk is high, the larger ones have stronger ability to conduct more stock repurchases compared to the small-scope firms. On the contrary, the small firms, because of the limitations on liquidity and cash flow, may not react in a quick manner or just decide not to react from the perspective of stock repurchases even when the firm-level political risk increases or becomes higher.

5. CONCLUSION

The rising political uncertainty has pressurized researchers to study the impacts of political risk on various firm policies and decisions. In this paper, we investigate the relationship between firm level risk that is developed by Hassan et al. (2019) and firms' open-market stock repurchases under their repurchase programs. With our manual-collected repurchases data from 2002 to 2018, we find that firms with higher political risk tend to conduct more stock repurchases, and this finding is consistent with our Hypothesis H1b. As repurchases are also regarded as a common substitute for dividends. The positive association between firm-level political risk and repurchases is also consistent with Ahmad et al. (2023) regarding their findings on the positive impact of political risk to dividend payouts.

Except for the overall political risk, we also check the political risk under eight sub-categories. We find that the political risk arising from trade and health care is not closely associated with stock repurchases while the risk related to tax policy, economic policy & budget, environment, institutions & political process, security & defense, and technology & infrastructure are positively associated with stock repurchases at a significant level. Further, we test the relationship between firm-level political risk and repurchases when considering financial crisis and economic condition. The results indicate that firms with higher individual-level political risk tend to repurchase more when the market condition is stable and healthy. From the firms themselves, we find that firms with above-zero repurchases in a more recent period tend to be more pronounced to this positive

relationship than those with above-zero repurchases in less recent periods.

Finally, to check the robustness of our primary findings, we also include possible omitted variables – CEO- and board-level characteristics in the baseline regressions. Further, we conduct the PSM test and 2SLS instrumental variable regression analysis to alleviate the selection bias and endogeneity problems. Our main results remain significant after the robust tests. This paper provides deeper insights into the impact of firm-level political risk on a company's repurchase policies. We highlight the critical role that political risk plays in shaping corporate decisions and behaviors, emphasizing its practical implications for various stakeholders. Our analysis underscores how firms use share repurchases to signal future growth prospects, even in the presence of high political risk.

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Appendix A: Variable Definitions

Variable	Definition (Compustat variable name in parentheses)
Firm-level variables	
Share Repurchases	Number of shares repurchased to total number of shares outstanding (CSHOQ).
Political Risk	Standardized value of political risk that defined by Hassan et al. (2019).
Sub-Categorical Political Risk	Standardized value of sub-categorical political risk that defined by Hassan et al. (2019).
Firm Size	Natural logarithm of total assets (ATQ).
Leverage	Long-term debt (DLTTQ) plus debt in current liabilities (DLCQ), scaled by total assets (ATQ).
Market-to-Book Value	The market value of assets (book assets (AT) plus market value of equity (PRCCQ*CSHOQ) minus book value of equity (CEQQ), scaled by book assets (ATQ).
Cash/Total Assets	Cash and short-term investments (CHEQ), scaled bytotal assets (ATQ)
Cash Flow	Sum of total income before extraordinary items and depreciation expense (IBQ), scaled by total assets (ATQ).
Sales Growth	Sales (SALEQ) from quarter minus sales from previous quarter, scaled by sales from previous quarter.
ROA	Operating income before depreciation (OIBDQ) to total assets (ATQ).
R&D Intensity	R&D expenses (XRDQ) to total assets (ATQ).
Capital Expenditure	Quarterly capital expenditure generated from yearly accumulative capital expenditure (CAPXY), scaled by total assets (ATQ).
Tangibility	Property, plant and equipment (PPENTQ) to total as-sets (ATQ).
ROA Volatility	Standard deviation of last four quarters' ROA.
Z-Score Dummy	Indicator equals to one if a firm's Z-score ≤ 1.81 (Altman's bankruptcy threshold) and equals to zero otherwise. Altman's Z-score is calculated as 1.2A + 1.4B + 3.3C + 0.6D + 1.0E, where: A) is the working capital (WCAPQ) divided by total assets (ATQ). B) is the retained earnings (REQ) divided by total as-sets (ATQ). C) is the income before interest and tax (OIADPQ) divided by total assets (ATQ). D) is the market value of equity (CSHOQ*PRCCQ) divided by total liabilities (LTQ).
CEO-level variables	
CEO Age	CEO age.
CEO Gender	Indicator equals to one if CEO is female and equalsto zero if CEO is male.
CEO Tenure	Number of years for working as CEO in the firm.
CEO Duality	Indicator equals to one if CEO is also the board member and equals to zero otherwise.
Board-level variables	
Board Size	Number of board members (exclude executives).

Con't

Board Tenure	Average time length of being board members in thefirm (exclude executives).
Board Independence	The proportion of non-executive directors on the board.
Busy Directors	Number of directors who are sitting on three or morethan three company boards, scaled by total number ofboard members (include executives).
Outside Directors	Number of outside directors to total number of board members (include executives).
Board Gender Ratio	Number of female directors to total number of board members (include executives).
Conditional variables	
Financial Crisis	Indicator equals to one for all observations from thefirst quarter of 2007 to the second quarter of 2009 andequals to zero otherwise.
Economic Condition	The Chicago Fed National Activity Index (CFNAI) equals the weighted average of 85 monthly indicatorsof national economic activity. A positive index value characterizes better economic conditions and corresponds to growth above the trend, while a negative index value characterizes poor economic conditions and corresponds to growth below the trend (Source: Federal Reserve Bank of Chicago).
Political Polarization	The same variable from Xu (2020), defined as $\frac{1}{N}\sum_{n=1}^{N}(1-\lvert Yea_{n,t}\%-Nay_{n,t}\%\rvert)$, where $Yea_{n,t}\%$ ($Nay_{n,t}\%$) is the percentage of Yea (Nay) votes among all house votes for bill *n* at time *t*.

Table 1: Descriptive statistics of main variables

The table presents the descriptive statistics of the share repurchases, firm-level political risks,and all the firm-level control variables. It contains 29,717 firm-quarter observations from 2002 to the first quarter of 2018. We present the number of observations, the mean, median,standard deviation, 25th percentile, and 75th percentile. Appendix A presents the variable definitions.

	N	Mean	Median	STD	P25	P75
Share Repurchases	29717	0.008	0.002	0.013	0.000	0.011
Political Risk	29717	-0.031	-0.266	0.724	-0.448	0.066
Political Risk - Economics	29717	-0.032	-0.271	0.717	-0.426	0.046
Political Risk - Environment	29717	-0.033	-0.189	0.456	-0.274	-0.001
Political Risk - Trade	29717	-0.028	-0.136	0.317	-0.186	-0.015
Political Risk - Institutions	29717	-0.036	-0.241	0.634	-0.356	-0.004
Political Risk - Security	29717	-0.037	-0.246	0.637	-0.376	0.018
Political Risk - Health	29717	-0.039	-0.158	0.362	-0.220	-0.027
Political Risk - Technology	29717	-0.036	-0.238	0.597	-0.353	0.009
Political Risk - Tax	29717	-0.038	-0.230	0.573	-0.332	-0.009
Firm Size	29717	7.581	7.549	1.781	6.421	8.717
Leverage	29717	0.227	0.206	0.200	0.043	0.339
Market-to-Book Value	29717	2.082	1.725	1.197	1.294	2.460
Cash/Total Assets	29717	0.168	0.105	0.170	0.040	0.241
Cash Flow	29717	0.012	0.015	0.032	0.005	0.025
Sales Growth	29717	0.026	0.016	0.176	-0.044	0.076
ROA	29717	0.035	0.035	0.030	0.023	0.049
R&D Intensity	29717	0.008	0.000	0.015	0.000	0.012
Capital Expenditure	29717	0.012	0.008	0.013	0.004	0.015
Tangibility	29717	0.242	0.164	0.221	0.078	0.335
ROA volatility	29717	0.011	0.007	0.013	0.004	0.013
Z-Score Dummy	29717	0.652	1.000	0.476	0.000	1.000

Table 2: Firm-level political risk and share repurchases

The table presents the relationship between the firm-level political risk and share repur- chases. Column (1) to (4) correspond to the regressions with different fixed effects spec- ifications. Column (5) includes the interaction between firm-level risk and ROA volatility, and Column (6) includes the interaction between firm-level risk and sales growth. The firmsize is defined as the natural logarithm form. The dependent variable and the rest of the control variables are winsorized at 1st and 99th percentile to avoid extreme values. The de-pendent variable in the regression analysis is the shares of repurchases scaled by total numberof shares outstanding, times 100. We compute t-statistics (in parentheses) using robust stan-dard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levelsis indicated by *, **, and ***, respectively. The constant is not shown for brevity.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Political Risk	0.028*	0.032**	0.021*	0.025**	0.039***	0.022*
	(1.758)	(2.012)	(1.833)	(2.125)	(2.747)	(1.930)
Risk*ROA Volatility					-1.392*	
					(-1.724)	
Risk*Sales Growth						0.094*
						(1.660)
Firm Size	0.031***	0.037***	-0.013	-0.006	-0.006	-0.006
	(2.845)	(3.365)	(-0.316)	(-0.154)	(-0.148)	(-0.152)
Leverage	0.120	0.171	0.347**	0.321**	0.319*	0.321**
	(1.042)	(1.445)	(2.059)	(1.971)	(1.959)	(1.970)
Market-to-Book Value	-0.129***	-0.119***	-0.150***	-0.149***	-0.150***	-0.150***
	(-8.484)	(-7.552)	(-7.946)	(-7.808)	(-7.813)	(-7.834)
Cash/Total Assets	0.451***	0.480***	0.189	0.111	0.110	0.111
	(3.682)	(3.899)	(1.154)	(0.677)	(0.668)	(0.675)
Cash Flow	1.114**	1.184***	0.868**	0.783*	0.794*	0.783*
	(2.424)	(2.625)	(2.007)	(1.842)	(1.867)	(1.841)
Sales Growth	-0.436***	-0.410***	-0.258***	-0.265***	-0.265***	-0.260***
	(-8.967)	(-8.465)	(-5.727)	(-5.721)	(-5.734)	(-5.567)
ROA	6.525***	6.167***	3.738***	3.791***	3.792***	3.809***
	(9.162)	(8.794)	(5.636)	(5.592)	(5.603)	(5.612)
R&D Intensity	3.411***	3.275***	3.921***	4.054***	4.030***	4.034***
	(2.888)	(2.777)	(2.686)	(2.719)	(2.704)	(2.707)
Capital Expenditure	2.971**	1.140	1.002	1.400	1.420	1.393
	(2.440)	(0.931)	(0.846)	(1.130)	(1.146)	(1.124)
Tangibility	-0.234**	-0.172	0.841***	0.796**	0.796**	0.795**
	(-2.199)	(-1.614)	(2.727)	(2.518)	(2.522)	(2.517)
ROA Volatility	3.728***	3.969***	2.271**	2.164*	2.194*	2.183*
	(3.341)	(3.603)	(2.112)	(1.920)	(1.944)	(1.940)
Z-Score Dummy	0.072*	0.069*	0.104***	0.112***	0.112***	0.112***
	(1.883)	(1.808)	(2.824)	(3.028)	(3.013)	(3.026)
Time FE	No	Yes	Yes	No	No	No
Industry FE	Yes	Yes	No	No	No	No
Time*Industry FE	No	No	No	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	Yes	Yes
Observations	29,717	29,717	29,717	29,717	29,717	29,717
R-squared	0.045	0.070	0.324	0.336	0.336	0.336

Table 3: Sub-categorical firm-level political risk and share repurchases

The Table presents eight different kinds of sub-categorical firm-level political risk and their associations with repurchases. Each of them is defined in Section 3.1. The firm-level political risk is standardized in the regression. The firm size is definedas the natural logarithm form. The dependent variable and the rest of the control variables are winsorized at 1st and 99th percentile to avoid extreme values. The dependent variable in the regression analysis is the shares of repurchases scaled by total number of shares outstanding, times 100. We compute t-statistics (in parentheses) using robust standard errors clusteredat the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PR - Economics	0.035***							
	(3.066)							
PR - Environment		0.038**						
		(2.258)						
PR - Trade			0.005					
			(0.187)					
PR - Institutions				0.029**				
				(2.363)				
PR - Health					0.036*			
					(1.698)			
PR - Security						0.035***		
						(2.841)		
PR - Tax							0.028**	
							(1.980)	
PR - Technology								0.039***
								(2.923)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time*Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,717	29,717	29,717	29,717	29,717	29,717	29,717	29,717
R-squared	0.336	0.336	0.336	0.336	0.336	0.336	0.336	0.336

Table 4: Political risk and repurchases by financial crisis and economic condition

The table presents the relationship between firm-level political risk and repurchases using subsamples regarding financial crisis (FC) and economic condition (EC). Column (1) and Column (2) show the subsample regressions for financial crisis period and non-financial crisis period. Column (3) and Column (4) show the subsample regressions when the economic condition is poor and good. The firm-level political risk is standardized in the regression. The firm size is defined as the natural logarithm form. The dependent variable and the rest of the control variables are winsorized at 1st and 99th percentile to avoid extreme values. The dependent variable in the regression analysis is the shares of repurchases scaled by totalnumber of shares outstanding, times 100. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity.

	FC	FC	EC	EC
	Yes	No	Poor	Good
VARIABLES	(1)	(2)	(3)	(4)
Political Risk	0.004	0.032***	0.045**	0.007
	(0.091)	(2.657)	(2.551)	(0.434)
Firm Size	-0.443*	0.031	-0.063	0.034
	(-1.655)	(0.718)	(-1.123)	(0.663)
Leverage	0.864*	0.258	0.378*	0.215
	(1.844)	(1.580)	(1.743)	(1.153)
Market-to-Book Value	-0.065	-0.142***	-0.152***	-0.144***
	(-1.058)	(-7.065)	(-6.210)	(-6.155)
Cash/Total Assets	-1.778**	0.025	0.133	-0.016
	(-2.454)	(0.148)	(0.562)	(-0.077)
Cash Flow	0.119	1.156***	0.398	0.963
	(0.115)	(2.602)	(0.669)	(1.633)
Sales Growth	-0.241	-0.237***	-0.243***	-0.261***
	(-1.542)	(-4.959)	(-3.539)	(-4.023)
ROA	3.486*	3.251***	4.211***	3.588***
	(1.812)	(4.645)	(4.805)	(4.103)
R&D Intensity	0.175	4.463***	3.362*	4.280**
	(0.032)	(2.877)	(1.677)	(2.387)
Capital Expenditure	3.612	1.305	3.542**	-0.708
	(1.040)	(1.057)	(1.987)	(-0.429)
Tangibility	-0.591	0.943***	0.880**	0.875**
	(-0.443)	(2.840)	(2.341)	(2.339)
ROA Volatility	1.506	2.491**	0.855	2.967**
	(0.409)	(2.137)	(0.583)	(1.964)
Z-Score Dummy	-0.150	0.111***	0.094*	0.120***
	(-1.260)	(2.861)	(1.791)	(2.632)
Time*Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	3,820	25,897	15,349	14,368
R-squared	0.496	0.347	0.381	0.378

Table 5: Firm-level political risk and repurchases by recent repurchase history

The table presents the relationship between firm-level political risk and repurchases using subsamples regarding different recent repurchase history. Column (1) represents the observa-tions with zero repurchase in the past six months. Column (2) to (5) correspond to the firms with above-zero repurchases in the past six months, twelve months, twenty-four months, andthirty-six months. The numbers presented in the table only display to three decimal places. From the original regressions, the coefficients of firm-level risk in Column (2), (3), (4) and (5) of Table 5 are 0.03028, 0.03008, 0.02723, and 0.02673. The firm-level political risk is standardized in the regression. The firm size is defined as the natural logarithm form. The dependent variable and the rest of the control variables are winsorized at 1st and 99th per- centile to avoid extreme values. The dependent variable in the regression analysis is the shares of repurchases scaled by total number of shares outstanding, times 100. We computet-statistics (in parentheses) using robust standard errors clustered at the firm level. Statisticalsignificance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity.

VARIABLES	(1)	(2)	(3)	(4)	(5)
Political Risk	0.011	0.030**	0.030**	0.027**	0.027**
	(1.024)	(2.073)	(2.169)	(2.034)	(2.016)
Firm Size	-0.013	0.009	0.005	0.014	0.021
	(-0.523)	(0.174)	(0.088)	(0.285)	(0.425)
Leverage	-0.104	0.537**	0.490**	0.432**	0.413**
	(-1.207)	(2.537)	(2.437)	(2.228)	(2.148)
Market-to-Book Value	-0.023	-0.206***	-0.198***	-0.183***	-0.176***
	(-1.594)	(-9.084)	(-8.944)	(-8.474)	(-8.222)
Cash/Total Assets	-0.139	0.176	0.200	0.195	0.210
	(-0.888)	(0.861)	(1.009)	(1.040)	(1.139)
Cash Flow	-0.200	0.825	1.007	1.151**	1.103**
	(-0.901)	(1.247)	(1.597)	(2.044)	(2.032)
Sales Growth	-0.102***	-0.247***	-0.316***	-0.322***	-0.319***
	(-3.483)	(-3.574)	(-4.952)	(-5.398)	(-5.521)
ROA	1.059***	4.555***	4.927***	4.868***	4.803***
	(3.180)	(4.662)	(5.308)	(5.564)	(5.636)
R&D Intensity	2.327*	3.722**	3.912**	4.277**	4.226**
	(1.866)	(1.979)	(2.108)	(2.370)	(2.361)
Capital Expenditure	0.398	1.193	1.866	2.112	1.937
	(0.522)	(0.643)	(1.075)	(1.281)	(1.205)
Tangibility	-0.139	1.216***	1.021**	1.012**	1.047***
	(-0.753)	(2.862)	(2.536)	(2.528)	(2.649)
ROA Volatility	0.383	2.960	2.313	2.586	2.261
	(0.755)	(1.639)	(1.314)	(1.576)	(1.420)
Z-Score Dummy	-0.001	0.036	0.049	0.073*	0.078*
	(-0.026)	(0.792)	(1.120)	(1.704)	(1.851)
Time*Industry FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	8,136	21,581	23,173	24,572	25,203
R-squared	0.425	0.334	0.324	0.323	0.324

Table 6: Descriptive statistics of CEO- and board-level variables

The table presents the Descriptive statistics of CEO- and board-level variables. The numbers of observations vary among the variables because of the incompleteness of BoardEx database. The sample contains observations from 2002 to the first quarter of 2018. We present the number of observations, the mean, median, standard deviation, 25th percentile, and 75th percentile. Appendix A presents the variable definitions.

Variables	N	Mean	Median	STD	P25	P75
CEO Gender	26946	0.041	0.000	0.198	0.000	0.000
CEO Age	26942	56.108	56.000	7.114	51.000	61.000
CEO Tenure	27465	5.314	3.600	5.775	1.600	7.000
CEO Duality	27465	0.489	0.000	0.500	0.000	1.000
Board Size	28096	9.138	9.000	2.199	8.000	11.000
Board Tenure	28096	6.372	6.065	2.890	4.378	8.000
Board Gender Ratio	27465	0.141	0.125	0.112	0.000	0.200
Board Independence	27465	0.877	1.000	0.141	0.733	1.000
Busy Directors	27465	0.544	0.571	0.253	0.375	0.750
Outside Directors	27465	0.738	0.722	0.128	0.643	0.875

Table 7: Regressions with inclusions of additional CEO- and board-level variables

The table presents the regression analysis with the inclusion of additional CEO- and board- level variables. Column (1) includes all the CEO-level variables, Column (2) includes all theboard-level variables, and Column (3) includes both CEO- and board-level variables. The numbers of observations vary because of the incompleteness of BoardEx database. Variableswith extreme outliers are winsorized at 1st and 99th percentile. The dependent variable in the regression analysis is the original shares of repurchases scaled by total number of sharesoutstanding, times 100. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicatedby *, **, and ***, respectively. The constant is not shown for brevity.

VARIABLES	(1)	(2)	(3)
Political Risk	0.027**	0.027**	0.026**
	(2.245)	(2.303)	(2.139)
CEO Gender	0.071		0.012
	(0.795)		(0.134)
CEO Age	-0.004		-0.004
	(-1.076)		(-1.220)
CEO Tenure	0.012***		0.014***
	(3.041)		(3.296)
CEO Duality	0.023		0.034
	(0.555)		(0.809)
Board Size		0.039***	0.041***
		(3.180)	(3.325)
Board Tenure		0.001	-0.013
		(0.076)	(-1.518)
Board Independence		-0.008	0.063
		(-0.026)	(0.207)
Busy Directors		0.057	0.076
		(0.530)	(0.712)
Outside Directors		-0.563*	-0.623*
		(-1.773)	(-1.946)
Board Gender Ratio		0.792***	0.737***
		(3.634)	(3.362)
Firm-level Control Variables	Yes	Yes	Yes
Time*Industry FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	26,942	27,465	26,942
R-squared	0.333	0.342	0.335

Table 8: Propensity score matching (PSM) test

The table presents the PSM test. Panel A presents the matching results. We conduct an one-to-one matching on all the firm-, CEO-, and board-level control variables. After matching, there is no significant difference in variables between the treatment group and control group.Panel B presents the regression analysis on alternative measures of dividend payouts using the matched sample. Column (1) to (4) correspond to the regressions with different fixed effects specifications. The firm-level political risk is standardized in the regression. Variables with extreme outliers are winsorized at 1st and 99th percentile. The dependent variable in the regression analysis is the original shares of repurchases scaled by total number of sharesoutstanding, times 100. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicatedby *, **, and ***, respectively. The constant is not shown for brevity.

Panel A

	Before PSM				After PSM			
	Treated	Control	diff	t-statistic	Treated	Control	diff	t-statistic
Firm Size	7.668	7.552	0.116	4.67	7.694	7.657	0.037	1.16
Leverage	0.218	0.230	-0.011	4.34	0.213	0.213	0.000	0.04
Market-to-Book Value	2.063	2.088	-0.025	1.53	2.061	2.060	0.001	0.04
Cash/Total Assets	0.183	0.163	0.020	8.44	0.182	0.186	-0.004	1.21
Cash Flow	0.011	0.012	-0.002	3.90	0.112	0.109	0.003	0.68
Sales Growth	0.020	0.027	-0.008	3.35	0.021	0.021	0.000	0.02
ROA	0.034	0.036	-0.002	5.35	0.034	0.034	0.000	0.82
R&D Intensity	0.009	0.008	0.001	4.66	0.009	0.009	0.000	0.11
Capital Expenditure	0.012	0.013	-0.001	4.22	0.012	0.012	0.000	0.97
Tangibility	0.234	0.245	-0.011	3.74	0.234	0.236	-0.002	0.53
ROA Volatility	0.011	0.011	0.000	1.87	0.011	0.011	0.000	0.92
Z-Score Dummy	0.640	0.657	-0.017	2.66	0.647	0.645	0.002	0.22
CEO Gender	0.034	0.043	-0.009	3.52	0.034	0.034	0.000	0.10
CEO Age	56.270	56.054	0.216	2.18	56.216	56.183	0.033	0.63
CEO Tenure	5.300	5.319	-0.019	0.24	5.329	5.289	0.040	0.40
CEO Duality	0.494	0.487	0.006	0.88	0.493	0.482	0.011	1.19
Board Size	9.209	9.114	0.095	3.12	9.230	9.182	0.048	1.26
Board Tenure	6.373	6.371	0.002	0.04	6.406	6.347	0.059	1.21
Board Gender Ratio	0.136	0.142	-0.006	4.18	0.137	0.136	0.001	0.61
Board Independence	0.873	0.878	-0.005	2.67	0.874	0.873	0.001	0.22
Busy Directors	0.556	0.540	0.017	4.70	0.554	0.554	0.000	0.06
Outside Directors	0.739	0.738	0.001	0.22	0.739	0.738	0.001	0.43

Panel B

VARIABLES	(1)	(2)	(3)	(4)
Political Risk	0.033*	0.037**	0.026**	0.031**
	(1.844)	(2.113)	(1.977)	(2.325)
Control Variables	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	No
Industry FE	Yes	Yes	No	No
Time*Industry FE	No	No	No	Yes
Firm FE	No	No	Yes	Yes
Observations	13,372	13,369	13,077	13,032
R-squared	0.056	0.079	0.361	0.381

Table 9: 2SLS instrumental variable regression analysis

The table presents the 2SLS instrumental variable regressions. Column (1) presents the first-stage regression with the political polarization as the instrumental variable. Column (2) presents the second-stage regression using the fitted value of political risk that we get from first stage. Firm-, CEO-, and board-level characteristics are controlled. The first-stage regression shows a Kleibergen-Paap Wald rk F statistic of 7.801. Variables with extreme outliers are winsorized at 1st and 99th percentile. The dependent variable in the regression analysis is the original shares of repurchases scaled by total number of shares outstanding, times 100. We compute t-statistics (in parentheses) using robust standard errors clustered atthe firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity.

	First Stage	Second Stage
	(1)	(2)
VARIABLES	Political Risk	Sahre Repurchases
Political Polarization	0.220***	
	(2.820)	
Political Risk (fitted)		1.441**
		(2.410)
Control Variables	Yes	Yes
Time*Industry FE	Yes	Yes
Firm FE	Yes	Yes
Kleibergen-Paap Wald rk F statistic	7.801	
Observations	24,016	24,016
R-squared	0.289	0.338

Table 10: Subsample test on firm's operating scope

The table presents the subsample test regarding firm's operating scope. Column (1) presents the regression results for the S&P firms. Column (2) presents the regression results for the non-S&P firms. Variables with extreme outliers are winsorized at 1st and 99th percentile. The dependent variable in the regression analysis is the original shares of repurchases scaled by total number of shares outstanding, times 100. We compute t-statistics (in parentheses) using robust standard errors clustered at the firm level. Statistical significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. The constant is not shown for brevity.

	S&P Sample	Non-S&P Sample
VARIABLES	(1)	(2)
Political Risk	0.031**	0.016
	(1.988)	(0.957)
Firm Size	-0.066	0.034
	(-0.938)	(0.679)
Leverage	0.144	0.429**
	(0.573)	(2.136)
Market-to-Book Value	-0.215***	-0.096***
	(-8.056)	(-3.436)
Cash/Total Assets	0.025	0.157
	(0.096)	(0.734)
Cash Flow	1.304*	0.553
	(1.938)	(1.051)
Sales Growth	-0.287***	-0.258***
	(-3.770)	(-4.434)
ROA	4.660***	2.949***
	(3.951)	(3.637)
R&D Intensity	2.809	5.235**
	(1.301)	(2.574)
Capital Expenditure	-0.535	3.085*
	(-0.297)	(1.824)
Tangibility	0.920*	0.599*
	(1.822)	(1.750)
ROA Volatility	3.406	0.624
	(1.530)	(0.506)
Z-Score Dummy	0.079	0.125**
	(1.513)	(2.356)
Time*Industry FE	Yes	Yes
Firm FE	Yes	Yes
Observations	15,042	14,342
R-squared	0.312	0.372