Dividend policy, systematic liquidity risk, and the cost of equity capital

Rabab Ibrahim, Khelifa Mazouz, Abhiji Sharma, Steve Wu

Abstract

This paper examines a new channel through which dividend policy can affect firm value. We find that firms that pay dividends exhibit lower systematic liquidity risk than those that do not. We also report a significant negative relationship between dividend payment and systematic liquidity risk. The liquidity improvement associated with dividend payments translates into an economically meaningful reduction in the cost of equity capital. Our results are robust to endogeneity concerns, to alternative measures of liquidity risk and dividend payouts, and to alternative model specifications. Further analysis suggests that the reduction in liquidity risk associated with dividend payouts is more pronounced for weakly governed firms and firms with opaque informational environment. Finally, we find that the recent financial crisis led to a greater increase in systematic liquidity risk for firms with no or low dividend payouts. Overall, our study implies that dividend policy can be used by corporate managers to shape liquidity risk and mitigate the adverse impact of economic downturns on the value of their firms.

Keywords: dividend policy; systematic liquidity risk; cost of equity capital; firm value

JEL codes: G12, G32, G35

1. Introduction

Corporate dividend policies continue to puzzle financial economists. Miller and Modigliani (1961) argue that, in a frictionless world, shareholders' wealth is determined merely by a firm's investment opportunities and is independent of payout policy. However, in the real world, trading frictions can make it costly and difficult for investors who need cash to create homemade dividends. Thus, dividend payouts play a role in mitigating trading frictions by allowing investors to satisfy their liquidity needs with less or no trading. Consistent with this view, Banerjee et al. (2007), Michaely and Qian (2022), and Jiang et al. (2017) show that stock liquidity is an important determinant of dividend policy. Specifically, Banerjee et al. (2007) and Michaely and Qian (2022) document that firms with less liquid stocks are more likely to pay dividends and argue that stock liquidity and dividends are substitutes. However, Jiang et al. (2017) find opposite evidence and maintain that stock liquidity plays an informational role in motivating managers to pay out dividends.[1] Although prior studies focus on the relationship between dividend policy and firm-specific liquidity, research on the effect of dividend payouts on liquidity risk, namely, the sensitivity of stock returns to unexpected changes in market liquidity, is relatively scarce.

The empirical link between dividend payouts and liquidity risk is based on the premise that dividend-paying stocks are potentially more valuable than their non-dividend paying counterparts when market liquidity dries up (e.g., Acharya and Pedersen, 2005; Hartzmark and Solomon, 2019; Hameed and Xie, 2019). In such a situation, investors shift their holdings to dividend-paying stocks to avoid trading frictions (e.g. Fuller and Goldstein, 2011; Goldstein et al., 2015). The increased demand of dividend-paying stocks, in turn, reduces the sensitivity of the stocks' returns to market liquidity. This study is also motivated by prior research which

[1] Earlier studies also find that dividend payments have a positive relationship with stock liquidity, implying that dividend policy is relevant for liquidity (e.g., Howe and Lin, 1992; Mitra and Rashid, 1997; Gurgul et al., 2003; Dasilas and Leventis, 2011)

shows that liquidity risk (i.e., the sensitivity of stock returns to unexpected changes in market liquidity), a source of non-diversifiable risk, needs to be reflected in expected returns (e.g., Chordia et al., 2000; Pastor and Stambaugh, 2003; Li et al., 2014). Amihud and Mendelson (1986) and Amihud (2002) show that expected return is a decreasing function of liquidity, as investors require compensation for the higher transaction costs in less liquid markets. In a similar vein, Bekaert et al. (2007), Lam and Tam (2011), and Amihud et al. (2015) find that stocks with a high sensitivity of returns to market liquidity experience a decrease of investor welfare in periods of low market liquidity, and are expected to have high future returns, consistent with liquidity risk being an important determinant of stock returns. Thus, to the extent that dividends are relevant to investors' demand during periods of low market liquidity, dividend-paying stocks should exhibit lower systematic liquidity risk. By focusing on the systematic component of liquidity, this study provides a new channel through which dividend policy affects firm value.

We propose two interrelated and non-mutually exclusive hypotheses to explain the potential link between dividend policy and liquidity risk. The uncertainty hypothesis builds upon prior studies showing that non-dividend paying firms exhibit greater uncertainty than their dividend paying counterparts (Gordon, 1963; Fuller and Goldstein, 2011; Goldstein et al., 2015). It is widely documented that stocks experience high selling pressure during periods of low market liquidity (Pastor and Stambaugh, 2003; Ng, 2011). This pressure is expected to be higher for stocks with no or low dividends due to their higher uncertainty and greater information asymmetry. More specifically, when market liquidity is low, risk-averse investors mitigate risk by selling stocks with high levels of uncertainty, such as those with no or low dividend payouts (e.g., Grullon et al., 2002; Hoberg and Prabhala, 2009; Eije et al., 2014).

Furthermore, as dividend payments help investors who need cash to avoid the trading costs associated with the homemade dividends, investors would be more attracted to dividend paying firms and firms with high dividends when market liquidity is low (Banerjee et al. 2007; Kuo et al. 2013). The increased demand for these firms during periods of low aggregate liquidity would reduce their stock prices' exposure to shocks to market liquidity. As a consequence of the decreased liquidity risk, investors would require a low liquidity premium, which in turn would decrease the cost of equity capital (CEC hereafter). Thus, the uncertainty hypothesis predicts that to the extent that dividends provide information about firms' fundamentals (Howe and Lin, 1992; Hussainey and Walker, 2009; Hail et al., 2014; Lin and Lee, 2021), payout policies have the potential to reduce stock price exposure to innovations in aggregate liquidity.

The agency hypothesis also predicts a negative association between dividend payouts and liquidity risk, but for different reasons. It suggests that high dividend payouts can mitigate liquidity risk by reducing the agency conflicts between insiders and outside shareholders. Black (1976) argues that paying out dividends can mitigate agency problems by reducing the amount of free cash flow that can be wasted by entrenched managers who are more interested in empire-building and extracting private benefits than value creation. Even when a firm does not possess free cash flow, paying out dividends can still be a useful mechanism for controlling overinvestment problems. This is because dividend payouts can increase the frequency with which firms visit the stock market to raise additional funding (Easterbrook, 1984). In the process of selling new equity, firms expose themselves to greater scrutiny and market discipline. In a similar vein, Lang and Lundholm (2000) find that issuing firms dramatically increase their disclosure activity before visiting the market.

Johnson et al. (2000) and Moin et al. (2020) also argue that minority shareholders are exposed to greater expropriation by firm insiders during periods of economic downturn. Because of the heightened fear of expropriation, and to the extent that dividend payouts mitigate agency conflicts and reduce information asymmetry between insiders and outsiders, investors may fly to safety by holding dividend paying stocks and selling non-dividend paying stocks. The decline in demand for non-dividend paying stocks during downturn periods would increase the vulnerability of the price of these stocks to the aggregate market liquidity, resulting in higher liquidity risk. As such, investors would require a higher liquidity premium for holding non-dividend paying stocks. Consistent with this view, several studies show that highly liquid stocks are traded at premium and have lower expected returns (Brennan and Subrahmanyam, 1996; Brennan et al., 1998; Amihud, 2002). Others also show that dividend payments can improve liquidity by attracting greater interest from analysts and investors (Basiddiq and Hussainey, 2012) and reducing information asymmetry (Bhattacharya, 1979; Miller and Rock, 1985). As the liquidity environment improves, stock prices should become more resilient and less sensitive to innovations in market liquidity. Consequently, investors would face lower liquidity risk and require a lower liquidity premium, which in turn lowers CEC.

We use a sample of 1,124 listed firms in the UK during the period 1996-2018 to investigate the impact of a firm's dividend policy on its systematic liquidity risk and CEC. We use Liu's (2006) trading continuity measure (LM12), defined as the standardized turnover-adjusted number of days with zero trading volume over the prior 12 months, as a proxy for liquidity. Liu argues that unlike other liquidity measures that typically focus on one dimension of liquidity, LM12 captures four dimensions of liquidity, namely trading cost, trading quantity, trading speed, and the price impact of trades. Following Liu (2006) and Lin et al. (2009), we define liquidity risk as the loading on the liquidity mimicking factor, constructed as the return difference between a low-liquidity portfolio (containing stocks with high LM12) and a high-liquidity portfolio (containing stocks with low LM12), in Liu's (2006) liquidity-augmented capital asset pricing model (LCAPM). This mimicking factor is shown to be highly correlated with other market-wide liquidity measures, reflecting its nature as a state variable, i.e., as economic downturns cause liquidity to be low, investors demand a high liquidity premium to compensate them for assuming high liquidity risk (Liu, 2006).

Our results suggest that non-dividend paying firms exhibit significantly higher systematic liquidity risk than their dividend paying counterparts. We also find that the systematic liquidity risk is significantly negatively associated with the amounts of dividends. Similar results are reported for firms that use share repurchases as an alternative mechanism for distributing cash. These findings are robust to endogeneity checks, to alternative estimation methods and to alternative measures of liquidity risk and dividend payouts. To gain further insight into the economic importance of our results, we also investigate the extent to which dividend policy decisions can affect CEC through liquidity risk. Based on the two-factor LCAPM in which a firm's expected excess return is explained by the covariance of its return with the market and the liquidity factors, we estimate CEC using historical market and liquidity betas and the realized market and liquidity risk premiums (e.g., Lin et al., 2009; Ng, 2011). We find that the CEC of dividend payers is lower than that of non-dividend payers through lower market risk and lower liquidity risk. The reduction of CEC via the liquidity risk channel, in particular, contributes to 25% of the difference in CEC between dividend payers and non-dividend payers. This evidence highlights the importance of liquidity risk as a mechanism linking dividend payouts and CEC.

We further examine whether the impact of dividend policy decisions on the systematic liquidity risk depends on firms' informational environment and governance structure. Consistent with the information uncertainty hypothesis, we find that the relationship between dividend payouts and liquidity beta is significantly negative only in firms with low analyst coverage, more dispersed earnings forecasts, and more volatile returns. The finding that the negative association between dividend payouts and systematic liquidity risk is dominant in weakly governed firms also implies that this relationship is driven, at least partly, by the role of dividends in mitigating agency conflicts between corporate insiders and outside shareholders. In addition, we explore the relative strength between governance and information uncertainty channels. We find that the governance channel is particularly strong for firms in less competitive industries, while the information uncertainty channel is more pronounced for firms with high accruals. Finally, we examine the effect of financial crisis on the relationship between dividend payouts and systematic liquidity risk. Recent literature documents that liquidity risk is more pronounced during extreme negative market conditions (Brunnermeier and Pedersen, 2009; Hameed et al., 2010). We show that, during the recent financial crisis of 2007-2009, non-dividend (low-dividend) firms experienced higher liquidity risk than their dividend paying (high-dividend) counterparts.

Our contribution to the literature is three-fold. First, we shed light on the impact of dividend policy on the non-diversifiable component of liquidity. Chordia et al. (2000, p.6) state that "...there are potentially two different channels by which trading costs influence asset pricing, one static and one dynamic: a static channel influencing average trading costs and a dynamic channel influencing risk." While prior research focuses on the effect of dividend payout on the average liquidity (i.e., static channel) (e.g., Howe and Lin 1992; Gurgul et al., 2003; Bozos et al. 2011), we examine the impact of dividends on liquidity risk (i.e., dynamic channel). Furthermore, unlike prior research, which focuses on conventional liquidity measures, such as bid-ask spread and trading volume, our liquidity risk measure is based on trading continuity (i.e. LM12), which simultaneously captures the trading speed, the trading quantity, and the trading cost dimensions of liquidity. Liu (2006) argues that due to the multi-dimensional nature of liquidity, conventional liquidity measures do not fully reflect stock liquidity.

Second, many studies relate systematic liquidity risk to corporate decision making, such as stock splits (Lin et al., 2009), disclosure quality (Ng, 2011), seasoned equity offerings (Bilinski et al., 2012), and ownership structure (Cao and Petrasek, 2014). We contribute to this growing literature by showing that corporate dividend policy decisions shape systematic liquidity risk. Thus, our study is different from Banerjee et al. (2007), who focus mainly on how liquidity affects dividend payouts using Pastor and Stambaugh's (2003) measure of liquidity risk.[2] We also contribute to the literature on the valuation effect of dividend policy (Al-Yahyaee et al., 2011; Bozos et al., 2011; Dasilas and Leventis, 2011; Liu and Chen, 2015) by identifying systematic liquidity risk as a new channel through which dividend policy affects firm value.

Third, our study contributes to the literature on the determinants of liquidity risk. For example, Ng (2011) reports a negative relationship between information quality and systematic liquidity risk. Cao and Petrasek (2014) also show that high institutional ownership is negatively associated with liquidity beta, consistent with Baker and Stein's (2004) argument that institutional ownership reduces stock price exposure to fluctuations in market liquidity because institutional trades are less likely to be driven by market sentiment than individual trades. Huang and Mazouz (2018) find that excess cash improves trading continuity and reduces both liquidity risk and CEC. We extend this line of research by identifying dividend policy as another determinant of systematic liquidity risk and CEC. Our findings also relate to Balakrishan et al. (2014), who show that corporate managers can influence the information environment of their firms by voluntarily disclosing information. We complement their work by showing that dividend policy can serve as a useful mechanism for corporate managers to shape the information environment and mitigate the adverse impact of economic downturns on the value of their firms.

The remainder of this study is organized as follows. Section 2 describes our data. Section 3 outlines our methodology. Section 4 presents our empirical findings and Section 5 concludes.

[2] Although Pastor and Stambaugh's measure is known to reflect the sensitivity of stock returns to innovations in aggregate liquidity, the measure is designed to capture the illiquidity that relates to the price impact of trades rather than the liquidity risk arising from trading continuity (Lin et al., 2009) and works better for portfolios than individual stocks (Pastor and Stambaugh, 2003).

2. Data

Our sample firms are based on the annual constituents of FTSE All Shares Index over the period of 1996-2018. Market information on stocks' daily returns and trading volume is downloaded from the Datastream. Information about institutional ownership, analyst following, and earnings forecasts are extracted from Thomson Reuter Eikon. We use the following procedure to compile our final sample. First, we exclude financial and utility firms, which are heavily regulated and possess financial fundamentals that are not comparable with other firms. Second, we require that firms have complete accounting information about book assets, short- and long- term debt, book equity, and earnings before interest and taxes to be included in the sample. Our final sample includes 1,124 firms with 11,501 firm-year observations. To alleviate the impact of outliers, we winsorize all continuous variables at the 1st and 99th percentiles[3].

3. Methodology

In this section, we introduce Liu's (2006) liquidity measure, systematic liquidity risk estimated by the liquidity augmented CAPM (LCAPM), and the procedure that is adopted to estimate the relationship between dividend payouts and liquidity risk.

First, based on the premise that a greater likelihood of no trading implies higher latent costs of trading and that non-trading indicates illiquidity, we measure stock liquidity using Liu's LM12, which is the standardized turnover-adjusted number of days with zero trading volume over the prior 12 months and defined as follows:

$$LM12 = \left[ZEROS + \frac{1/TURNOVER}{DEFLATOR}\right] \times \frac{252}{TRAD} \quad (1)$$

[3] However, our results are still held if we do not winsorize all continuous variables.

where $ZEROS$ is the total number of zero daily trading volume over the prior 12 months; $TURNOVER$ is the sum of daily turnover over the prior 12 months; $DEFLATOR$ is set to 32,000 as in Liu (2006) to ensure that $0 < \frac{1/_{TURNOVER}}{DEFLATOR} < 1$ for all sample stocks; and $TRAD$ is the total number of trading days over the prior 12 months. Liu (2006) shows that LM12 reflects multiple dimensions of liquidity and is highly correlated with conventional liquidity measures such as bid-ask spread, turnover, and the price impact of trades.

Second, based on the illiquidity measure of LM12, Liu (2006) develops a two-factor LCAPM that includes the market factor and a mimicking liquidity factor (LIQ). LIQ is the return difference between a low liquidity portfolio and a high liquidity portfolio. As Liu (2006) demonstrates, the two-factor LCAPM performs better than Fama and French's (1996) three-factor model and Pastor and Stambaugh's (2003) asset pricing model in explaining anomalous returns associated with the cash-flow-to-price ratio, dividend yield, earnings-to-price ratio, book-to-market ratio, and long-term past performance. Following Liu (2006), we construct the mimicking liquidity factor (LIQ) as follows: from January 1996 to December 2018, we sort all FTSE All shares ordinary common stocks in ascending order based on LM12 to form two portfolios. The first portfolio contains stocks with the lowest liquidity measure (35% of the total sample), whereas the second portfolio includes stocks with the highest liquidity measure (35% of the total sample). The two portfolios are held for six months. We then define LIQ as the daily profits from buying one pound of equally weighted low-liquidity portfolio (containing stocks with high LM12) and selling one pound of equally weighted high-liquidity portfolio (containing stocks with low LM12). To estimate liquidity risk, we run the following time-series regression for each stock over a one-year period:

$$r_{i,d} - r_{f,d} = \alpha_i + \beta_{m,i}(r_{m,d} - r_{f,d}) + \beta_{l,i}\, LIQ_d + \varepsilon_{i,d} \quad (2)$$

where $(r_{i,d} - r_{f,d})$ is stock i's return in excess of the 3-month UK T-bill rate ($r_{f,d}$) (i.e., a risk-free rate) on day d; $(r_{m,d} - r_{f,d})$ is the market return proxied by the FTSE All-Share Index in excess of the risk-free rate on day d; LIQ_d is the liquidity factor, constructed as the difference in returns between stocks in the low and high liquidity portfolios on day d. The parameter estimates $\beta_{m,i}$ and $\beta_{l,i}$ in Eq (2) represent the stock i's market risk (i.e. market beta) and systematic liquidity risk (i.e. liquidity beta), respectively.

Finally, to test our main hypothesis that dividend payouts affect systematic liquidity risk, we regress liquidity betas on dividend policy decisions and other control variables:

$$\beta_{li,t+1} = \gamma_0 + \gamma_1 Dividend\ policy_{i,t} + \gamma_2 Controls_{i,t} + u_{i,t+1} \quad (3)$$

where $\beta_{li,t+1}$ is the liquidity beta for stock i in year t+1. We define $Dividend\ policy_{i,t}$ in two ways: (i) as a dummy variable (*DIV*) that is equal to one if a firm's dividend per share is positive (i.e. a dividend payer), and zero otherwise (i.e. non-dividend payers); and (ii) as a continuous variable of dividend yield (*DVP*) that is the ratio of dividend per share over a stock's price at the end of fiscal-year (e.g., Fama and French, 2001). $Controls_{i,t}$ is a vector of variables that have been shown to affect liquidity risk. These variables include firm age, firm size, institutional ownership, analyst following, profitability, leverage, market-to-book ratio, stock liquidity (LM12), past returns over the prior 12 months, daily return volatility over the prior 12 months, membership of FTSE100, and R&D[4] (e.g., Pastor and Stambaugh, 2003; Acharya and Pedersen, 2005; Bloom, 2007; Cao and Petrasek, 2014). The dependent variable of liquidity beta leads independent variables by one year to ensure that fundamental information is available for investors before the covariation between stock returns and changes in market liquidity takes place.

[4] See Appendix for the definitions of variables.

4. Empirical results

4.1. Descriptive statistics

Table 1 reports the summary statistics of our main variables. The dependent variable is the liquidity risk, which is estimated by LCAPM (Liu, 2006) using daily returns over a 12-month period. The mean value of the liquidity risk is -0.03. As LCAPM is constructed upon the liquidity measure of LM12, we also report the statistics for LM12. The mean of LM12 is 4.141, suggesting that our sample firms, on average, have four days with zero trading volume over the past 12-month period. Another component of LM12 is the turnover ratio, with a mean of 0.974. As for profitability, an average firm has 1.9% earnings before interest and taxes to total assets. The standard deviation of daily returns in the UK market is 2.3%, which is slightly lower than the 3.9% reported in the U.S. (e.g., Cao and Petrasek, 2014). In terms of dividend payout, 74% of the sample firm-years pay dividends, while an average dividend yield is 0.029.

[**Insert Table 1 about here**]

4.2. Core findings

4.2.1. Dividends and liquidity risk

Table 2 presents the results from our univariate analysis. Panel A shows that dividend payers have a mean (median) systematic liquidity risk of -0.09 (-0.045), which is lower than the mean (median) of 0.232 (0.100) associated with the non-dividend payers. The differences of the mean and median in the systematic liquidity risk across the two groups are statistically significant at less than 1% level. Panel B shows that high-dividend payers (i.e. firms with *DVP* above the median) have lower liquidity risk (with a mean of -0.124 and a median of -0.067) than low-dividend payers (with a mean of 0.069 and a median of 0.041). The difference in the systematic liquidity risk between the two groups is also highly significant. Thus, at a first glance, these findings support our central prediction that dividend payouts reduce systematic liquidity risk.

[**Insert Tables 2 & 3 about here**]

Next, we perform the multivariate analysis by running regressions with control variables and report the results in Table 3. We use the dummy variable of *DIV* to measure whether or not a firm pays dividends in columns (1) and (2). Column (1) shows *DIV* is significantly negative when firm-level controls are not included. In column (2), we add firm-level control variables. The coefficient on *DIV* is -0.112 and highly significant, implying that dividend paying firms have a lower liquidity beta than non-dividend paying counterparts by 11%. In columns (3) and (4), we use the continuous variable *DVP* to measure the magnitude of dividend payout. Column (3) shows that *DVP* has a significantly negative coefficient when firm-level controls are not included. When the controls are added in column (4), *DVP* remains significantly negative. The coefficient on *DVP* is -1.417, suggesting that one standard deviation increase in *DVP* (i.e. 0.07) reduces the liquidity beta by 10%. These findings support our prediction that high-dividend paying stocks tend to have lower liquidity risk than low-dividend paying stocks.

The results on the control variables are broadly consistent with prior literature. The illiquidity measure of LM12 has a positive coefficient, indicating that illiquid stocks on average have a higher degree of systematic liquidity risk (Pastor and Stambaugh, 2003; Cao and Petrasek, 2014). The effect of firm size on liquidity risk is negative and significant at the 1% level, consistent with the findings of earlier studies that large firms are less affected by market-wide liquidity shocks than small firms (e.g., Acharya and Pedersen, 2005; Ng, 2011). Furthermore, liquidity betas are larger for stocks with higher leverage ratios and lower return volatility (Ng, 2011). Finally, stocks that are the constituents of the FTSE100 index have low liquidity risk.

4.2.2 Dividends and cost of equity capital

This section quantifies the extent to which dividend payout affects CEC through liquidity risk. The liquidity augmented CAPM (LCAPM) developed by Liu (2006) indicates that a firm's expected excess return is explained by the covariance of its return with the market and the liquidity factors. Indeed, Liu (2006) finds that the historical liquidity betas have a positive relationship with future returns, implying that liquidity can be a priced risk factor. Following Liu (2006) and Lin et al. (2009), we estimate a firm's CEC by using LCAPM as follows:

$$E(r_i) - r_f = \beta_{m,i}\left[E(r_m) - r_f\right] + \beta_{l,i}E(LIQ) \quad (4)$$

where $E(r_i)$ is firm i's expected return, r_f is a risk-free rate, $E(r_m)$ is the expected return of the market portfolio, $E(LIQ)$ is the expected value of the mimicking liquidity factor, and $\beta_{m,i}$ and $\beta_{l,i}$ are firm i's market beta and liquidity beta, respectively, estimated from the time-series regression Eq (2). Based on Eq (4), a firm's CEC or the required return is affected by both liquidity risk and market risk. In particular, the effect of systematic liquidity risk on CEC can be measured by a firm's liquidity beta multiplied by the liquidity risk premium, while the effect of systematic market risk on CEC can be measured by the firm's market beta multiplied by the market risk premium. Following Lin et al. (2009) and Ng (2011), we use historical betas, which are estimated from Eq (2), and the realized market and liquidity risk premiums on a yearly basis as proxies for $\left(E(r_m) - r_f\right)$ and $E(LIQ)$, respectively, to estimate the annual CEC effects. Our CEC estimates are reported in Table 4. Panels A and B report the results for dividend and non-dividend payers, and high- and low-dividend payers, respectively.

[**Insert Table 4 about here**]

Columns (1) and (2) of Panel A show that dividend payers have lower market risk and lower liquidity risk than non-dividend payers. In column (3), the effect of liquidity risk on the dividend payers' CEC is economically small (i.e., 0.39% per year), while its impact on the non-dividend payers' CEC is relatively large (i.e., 1.12% per year). The difference between the two effects is 0.73% and significant at the 10% level. Column (4) of Table 4 shows the CEC effect attributed to the market risk. The effect of market risk on the dividend payers' CEC and the non-dividend payers' CEC are 10.46% and 12.61% per year, respectively. The difference of 2.15% between the two effects is also significant. Thus, our results indicate that dividend payouts can reduce a CEC through both the market risk and the liquidity risk channels. Despite the market risk being the main channel of the CEC reduction, the liquidity risk channel contributes to 25% (0.73/(0.73+2.15)) of the overall CEC difference between dividend payers and non-dividend payers. In Panel B, high-dividend payers exhibit lower market risk and lower liquidity risk than their low-dividend counterparts. Similar to our earlier results, the CEC reductions caused by the decline in both liquidity risk and market risk are statistically and economically significant. The overall reduction in CEC for the high- dividend payers is 4.69% (1.13%+3.56%) per year. The reduction that can be attributed to the decline in liquidity risk is 1.13%, representing 24% (1.13/(1.13+3.56)) of the overall CEC reduction.

Our results constitute evidence that dividend payouts play a key role in reducing CEC through the liquidity risk channel. The effect of dividend payout decisions on CEC is also in line with Redding (1997) and Amihud (2002), who find that dividend payouts have a negative effect on stock returns, indicating that investors often prefer receiving dividends. The magnitude of the CEC reduction via the liquidity risk channel appears to be reasonable given the findings of prior literature. For example, Acharya and Pedersen (2005) find that the cost of equity for US firms is lower by about 1.1% per year for stocks with low liquidity risk.[5] Our findings are also consistent with the view that investors who hold a stock with high liquidity risk would face difficulty in selling the stock quickly or at low cost. The resulting higher liquidity risk premium increases the firm's CEC, drives down the stock's price, and decreases the firm's value (Pastor and Stambaugh, 2003; Acharya and Pedersen, 2005; Lee, 2011).

4.3 Mitigating endogeneity concerns

The empirical challenge to our primary results is the possibility that systematic liquidity risk and dividend payout are endogenously determined. For example, risk-averse investors may opt for stocks with low liquidity risk because they expect these stocks to pay more dividends. We address endogeneity concerns in two ways. First, we use the propensity score matching approach in which firms with dividend payouts are matched with those without dividend payouts to test differences in systematic liquidity risk within the matched sample. Second, we employ a difference-in-difference (DiD) approach to compare changes in liquidity risk following dividend initiations and omissions.[6]

4.3.1 Propensity score matching (PSM)

PSM can be used in non-experimental studies to alleviate a particular source of endogeneity associated with functional form misspecification. Using the estimated likelihood of receiving treatment to match observations from treatment and control groups on several dimensions,

[5] Acharya and Pedersen (2005) decompose liquidity risk into three components. The first one implies that the expected return is higher for assets with a higher covariance between the liquidity of the stock and the liquidity of the general market (β_1^L). The second one accounts for the covariance between the return of the stock and the liquidity of the general market (β_2^L). The third one considers the covariance between the liquidity of the stock and the return on the general market (β_3^L). The estimated 1.1% difference in cost of equity capital is due to the total liquidity risk premium from the three components, out of which the return premium due to the covariance between stock return and market liquidity (β_2^L) is 0.16%.

[6] Considering the limited number of the events based on dividend omissions and initiations, we also estimate the impact of the change of dividend payouts on liquidity risk. In untabulated results, we find that the change of dividend payouts also exhibits a significant and negative relationship with liquidity risk, consistent with our baseline results based on the level of dividend payouts.

PSM yields treatment effects with relaxed assumptions regarding the functional relation between variables (Shipman et al., 2017). We estimate the treatment effect of dividend payouts on liquidity risk, i.e. the difference in liquidity risk between dividend payers and non-dividend payers, and proceed as follows. First, we use a probit model to estimate the probability of a firm to pay dividends. The dependent variable is *DIV* and the control variables are the same as those used in Eq.(3). The predicted value of *DIV* is the propensity score. The probit regression results are reported in column (1) in Panel A of Table 5. Consistent with Fama and French (2001), we find that large, mature, and profitable firms are more likely to pay dividends. The pseudo *R*-square is reasonably high with a value of 0.33.

[**Insert Table 5 about here**]

Next, we undertake the nearest neighbor (i.e. one-to-one) matching without replacement. Specifically, a dividend payer (i.e., the treatment firm) is matched to a non-dividend payer (i.e., the control firm) that has the closest score within a distance of 0.001 from the dividend payer's propensity score. If the propensity score matching is successful, each dividend payer will have similar observable characteristics to its matched control firm. To validate our matching, we conduct two diagnostic tests. First, we re-estimate the probit model for the post-match sample. Column (2) of Panel A shows that none of the coefficients is statistically significant, implying that no single variable explains the behavior of dividend payout. In addition, the pseudo *R*-square drops substantially from 0.33 in the pre-match sample to 0.01 in the post-match sample, suggesting that our matching successfully removes all observable differences other than the decision to pay or not to pay dividends. Second, we test all the observable characteristics between the treatment and the control groups. The balancing test in Panel B shows that none of the differences in observable characteristics is statistically significant. Thus, the observed differences in covariates have been removed after the matching and any difference in the outcome variable, namely systematic liquidity risk, is more likely to be attributable to the decision to pay dividends. The last row in Panel B reports the propensity score matching estimates. The treatment group has a liquidity beta of -0.055, while the control group has a liquidity beta of 0.049. The difference in liquidity beta between the treatment and the control groups is -0.104 and significant at the 1% level, implying that dividend payers and non-dividend payers differ significantly in terms of their exposure to the aggregate market liquidity.

Finally, we run the regression on the matched sample. Panel C shows that the variable DIV is significantly negative, implying that dividend payers exhibit significantly lower liquidity risk than non-dividend payers. The PSM results suggest that the reduction in a firm's liquidity risk is more likely due to its dividend payouts rather than its observable firm-specific characteristics. In sum, although the treatment (i.e., paying dividends) may not be strictly exogenous, the PSM results increase our confidence in the validity of our baseline evidence.

4.3.2 Difference-in-difference (DiD) analysis

We use the DiD analysis around dividend initiations or omissions to further mitigate the effect of endogeneity on our results. The DiD approach compares the outcomes for two similar groups with and without the treatment effect, but both groups are subject to similar influences from unobservable variables over a testing period. Thus, the benefit of the DiD approach is to increase the likelihood that any difference in the changes in an outcome variable before and after the treatment between the two groups is due to the impact of the treatment rather than the difference between the two groups prior to the treatment. We conduct the DiD test for two typical events, namely dividend initiations and dividend omissions.

Following prior studies (e.g. DeAngelo et al. 2006), we define a dividend initiator (i.e. the treated firm) as a firm that pays dividends in year *t*, but has not paid any dividend between year *t-5* and year *t-1*. The control group for dividend initiations includes firms that pay no dividends between year *t-5* and year *t*. We match each treated firm with a control firm using propensity score matching in year *t*. The matching procedure is analogous to that described in section 4.2.1. Considering that dividend initiations are rare, we require a control firm to have the closest score within a distance of 0.005 from the treated firm's propensity score. This procedure yields a total of 72 pairs of matched firms.

For dividend omissions, we define a dividend omitter (i.e., the treated firm) as a firm that has continuously paid dividends over the period from year *t-5* to year *t-1*, but does not pay any dividend in year *t*. The control group for dividend omissions consists of firms that continuously pay dividends over the period from year *t-5* to year *t*. We match each treated with a control firm in year *t* by using propensity score matching. Similar to the case of dividend initiations, a control firm must have the closest score within a distance of 0.005 from the treated firm's propensity score. This approach results in 150 pairs of matched firms. A firm's liquidity beta is estimated over two periods, the pre-treatment period from year *t-1* to *t*, and the post-treatment period from year *t* to year *t+1*.[7]

[**Insert Table 6 & 7 about here**]

Before performing our formal DiD analysis, we validate the matching procedure by examining the differences in observable covariates between the control and the treatment groups at the

[7] For example, assuming that a firm has a fiscal year end of December, the firm pays dividends over the period from 2001 January to 2001 December. We estimate the liquidity beta over the pre-treatment period from 2000 January to 2000 December and over the post-treatment period from 2002 January to 2002 December.

end of the pre-treatment period. Panels A of Tables 6 and 7 report the results of the dividend initiations and the dividend omissions, respectively. Both panels suggest that there is no significant difference in the observable covariates between the treatment and the control groups. In addition, dividend omitters on average perform worse than dividend initiators in terms of profitability, confirming the findings of DeAngelo et al., (2006). Then, we estimate the following regression based on the closely matched samples:

$$\beta_{li,t+1} = \alpha + \beta_1 \times Treat_{i,t} + \beta_2 \times Treat_{i,t} \times Post_t + \gamma Z_{i,t} + Industry_i + Year_t + \varepsilon_{i,t+1} \quad (5)$$

where *Post* is an indicator variable that equals one if a sample year falls in the post-treatment period, and zero otherwise. *Treat* is an indicator variable that equals one for firms in the treatment group and zero otherwise. *Z* is a vector of control variables the same as in Eq.(3). Because we control for year fixed effects, we omit the single time dummy variable *Post* in the regression model. We run the above model separately for dividend initiations and omissions. When a firm initiates dividends, we expect its liquidity beta to decrease over the post-treatment period relative to the pre-treatment period and the DiD estimate, β_2, to be negative. Conversely, when a firm omits dividends, we expect its liquidity beta to increase and the DiD estimate, β_2, to be positive.

Panels B of Table 6 shows that *Treat*Post* is significantly negative, suggesting that dividend initiations reduce liquidity risk. In contrast, Panel B of Table 7 reports that the interaction term *Treat*Post* is significantly positive, implying that dividend omissions increase liquidity risk. Taken together, our DiD results are suggestive of the causal impact of dividend payouts on systematic liquidity risk, given that dividend initiations or omissions may not be perfectly exogenous.

In sum, we use PSM and the DiD approach to mitigate the concern of endogeneity and our results point to the same conclusion that the negative relation between dividend payouts and liquidity risk is less likely to be spurious. However, we have to acknowledge that neither of the methods is perfect and we should not rely entirely on them to rule out endogeneity. In the next section, we conduct additional analysis to shed light on the channels that lead dividend payouts to affect liquidity risk, which can further alleviate endogeneity concerns.

4.4. Heterogeneity in the relationship between dividend payout and liquidity risk

4.4.1 Channels

In this section, we examine the extent to which information uncertainty and agency conflicts can moderate the relation between dividend policy decisions and liquidity risk. In a more transparent information environment, adverse selection costs are low and dividend policy should have little effect on systematic liquidity risk. To test this prediction, we adopt three commonly used proxies of information uncertainty. The first proxy is analyst coverage. Analysts communicate with market participants by issuing earnings forecasts, setting target prices, and making buying and selling recommendations. When a firm is covered by more analysts, the information asymmetry between the firm's managers and outside shareholders will be largely reduced (Yu, 2008; Bowen et al. 2008). Our second proxy is the dispersion of earnings forecasts, which is the differences of analysts' opinions about a firm's future prospects (Diether et al., 2002; Johnson, 2005; Guntay and Hackbarth, 2010). A higher dispersion of earnings forecasts reflects greater uncertainty about a firm's future prospects. Following Diether et al. (2002), we define the dispersion of earnings forecasts as the standard deviation of earnings forecasts for the next fiscal year scaled by the mean value of the earnings forecasts made during the same year [8]. The third proxy is the return volatility measured by the standard deviation of daily returns over the past year. High price volatility indicates high uncertainty about valuation, leading to an increase in adverse selection costs (e.g. Baker and Wurgler, 2006). Under the information uncertainty view, the negative effect of dividend payout on the systematic liquidity risk will be more pronounced in stocks with more opaque information environments.

[**Insert Table 8 about here**]

To test the information uncertainty hypothesis, each year we divide our sample into two sub-samples according to the median of each proxy of information uncertainty. In line with the earlier analysis, we also use two measures for dividend payouts, namely the payout dummy (*DIV*) and the dividend yield (*DVP*). Panel A of Table 8 shows the results of the three proxies of information uncertainty. The relationship between dividend payout (measured as *DIV* and *DVP*) and liquidity beta is significantly negative only in firms with low analyst coverage (columns (1) and (2)), more dispersed earnings forecast (columns (7) and (8)) and more volatile returns (columns (11) and (12)). These findings suggest that the reduction in systematic liquidity risk induced by dividend payouts is more pronounced for firms with a more opaque information environment, consistent with the information uncertainty channel.

We also investigate the extent to which governance quality moderates the relationship between dividend payout and systematic liquidity risk. When agency conflicts between shareholders and managers are severe, the latter have strong incentives to satisfy their own interests by

[8] We require that a stock must be followed by at least three analysts to be included in the sample for this analysis.

wasting the firm's free cash flow (La Porta et al., 2000; Officer, 2011). If large dividend payouts reduce liquidity risk by mitigating agency conflicts, one would expect that the negative relation between dividend payout and liquidity risk is more pronounced for firms with severe agency problems. To test this prediction, we use three proxies for corporate governance. The first proxy is corporate governance score supplied by Thomson Reuters. This score is a weighted average of management score (62%), shareholder score (23%), and social responsibility score (15%)[9]. A higher score indicates a sound governance structure and more effective monitoring of managerial actions (Weisbach, 1988; Hart, 1983; Gompers et al., 2003; Bebchuk et al., 2008). Our second proxy is the percentage of independent directors on the board (Sharma, 2011). A high portion of independent directors on the board suggests that managers' interests are more likely to align with shareholders'. The third proxy is CEO duality, i.e., whether a CEO is also the chairman of the board. CEOs with dual roles tend to be more powerful and are more likely to seek private benefits (e.g., Chen et al., 2017).

If the negative association between dividend payouts and liquidity risk is driven by the governance role of dividend policy, such a relationship would be stronger for firms with low governance scores, few independent directors, and CEO duality. To test this proposition, each year we separate our sample firms in two subsamples by median values of each proxy. Again, we use the payout dummy (*DIV*) and dividend yield (*DVP*) as proxies for dividend policy.

The results in Panel B of Table 8 suggest that the significantly negative association between dividend payouts and liquidity beta is present only in weakly governed firms. Specifically, the

[9] The Management Score measures a company's commitment and effectiveness towards following best practice corporate governance principles. The Shareholders Score measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices. The CSR Strategy Score reflects a company's practices to communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes.

coefficients on *DIV* and *DVP* are significantly negative only for the subsamples of firms with low governance scores (columns (1) and (2)), few independent directors (columns (5) and (6)), and CEO duality (columns (11) and (12)). This evidence suggests that the negative relationship between dividend payouts and liquidity risk is driven, at least partly, by the role of dividends in improving firms' governance structure and reducing agency conflicts between corporate insiders and outside investors.

4.4.2 The relative strength between uncertainty and governance channels

Our previous results reveal that both information uncertainty and corporate governance can explain the negative relationship between dividend payout and liquidity risk. Although these two channels are not mutually exclusive, one may wonder about the relative strength of these channels under a specific circumstance or for firms with some common characteristics. To this end, we begin our analysis by investigating the extent to which industry competitiveness affects the role of governance in the dividend-liquidity risk relationship. Specifically, we hypothesize that the governance channel will be more pronounced for firms in less competitive industries. Prior theoretical and empirical studies show that managers of firms in competitive industries have strong incentives to work hard for the interest of shareholders by maximizing profits (Hart, 1983; Giroud and Mueller, 2011). However, due to the lack of competitive pressure, rivalry is unlikely to enforce discipline on managers in less competitive industries. Thus, the benefits of good governance should be greater for firms in less competitive industries. To measure competitiveness, we follow prior studies and use the Herfindahl–Hirschman Index (HHI), which is computed as the sum of squared market shares (i.e., sales) in a given industry (e.g., Hou and Robinson, 2006; Giroud and Mueller, 2011). High and low competitive industries are defined as industries with the HHIs below (above) the median, respectively. To the extent that governance quality moderates the relation between dividend payout and liquidity risk, we expect such a moderating effect to be greater for firms in less competitive industries.

We also examine whether the moderating role of information uncertainty depends on accruals. We hypothesize that the information uncertainty channel will be more pronounced for firms with high accruals. Accruals convey important accounting information to the market, while understanding accrual based information by adjusting operating cash flows and earnings consumes cognitive resources (e.g. time, attention). Sloan (1996) and Hirshleifer et al. (2012) show that accrual based information has not been fully incorporated into prices because investors have limited cognitive resources to process value-relevant information. Thus, accruals may represent a barrier to the fair valuation of a firm arising from the information asymmetry between the firm and outside investors. We use Sloan's (1996) measure of accruals[10] and separate the sample firms into high and low accrual groups based on the median. To the extent that information uncertainty moderates the relation between dividend payout and liquidity risk, we expect such a moderating effect to be stronger for firms with high accruals.

Our main interest is the coefficients on the four interaction terms (i.e., DIV*Analyst, DIV*Gov_score, DVP*Analyst and DVP*Gov_score) in the whole sample as well as in the subsamples. Consistent with the results in Panels A and B of Table 8, Columns (1) and (2) of Panel C show that both analyst coverage and governance quality positively moderate the relation between dividend payout and liquidity risk. Columns (3) to (6) exhibit that the coefficients on DIV*Gov_score and DVP*Gov_score are only significant in low competitive industries, while those on DIV*Analyst and DVP*Analyst are highly significant in high

[10] Following Sloan (1996), we define accruals as follows. Accruals=((ΔCA−ΔCash)−(ΔCL−ΔSD−ΔTP)−DP), where ΔCA is the change in current assets, ΔCash is the change in cash and equivalents, ΔCL is the change in current liabilities, ΔSD is the change in short-term debt included in the current liabilities, ΔTP is the change in income tax payable, and *DP* denotes depreciation and amortization expenses. All of the numbers are scaled by lagged total assets.

competitive industries. This evidence confirms our hypothesis that the moderating role of governance is more pronounced for firms in less competitive industries. The coefficients on DIV*Analyst and DVP*Analyst in Columns (7) to (10) are significant in the subsample of firms with high accruals, implying that the information channel plays a more important role in firms with high opacity.

Overall, our results suggest that both governance and information channels play a role in the dividend-liquidity risk relationship, but the relative strength of these channels depends on firm circumstances and characteristics. Specifically, the moderating effect of governance is particularly strong for firms in less competitive industries, while that of information uncertainty is more pronounced for firms with high accruals.

4.4.3 The role of crisis

We further examine the effect of financial crisis on the relationship between dividend payout and systematic liquidity risk. Prior studies show that liquidity risk is a primary concern for investors to trade stocks especially during extreme negative market conditions (Brunnermeier and Pedersen, 2009; Hameed et al., 2010; Pastor and Stambaugh, 2003). When market liquidity dries up, a firm's dividend payout can serve as a positive signal about its performance and may attract more investors to trade the firm's shares, causing lower liquidity risk. However, investors may not trade shares of non-dividend paying firms until market liquidity improves.

Based on the above reasoning, we expect the relationship between dividend payouts and liquidity risk to be stronger in the crisis period (2007-2009). To test this prediction, we set a dummy variable of crisis to indicate the financial crisis during 2007-2009 and we interact this dummy with the two dividend payout variables (*DIV* and *DVP*). Panel C of Table 8 shows that *DIV*crisis* (column (1)) and *DVP*crisis* (column (2)) are significantly negative. In columns

(3) and (4), all control variables are interacted with the crisis dummy variable as it can be the case that the relation between systematic liquidity risk and these control variables changes during the crisis time. Once again, *DIV*crisis* and *DVP*crisis* are significantly negative. The negative relationship between dividend payouts and systematic liquidity risk is consistent with our prediction that investors interpret dividend signals more positively during extreme market downturns.

4.5 Additional analysis

4.5.1 Alternative measure of liquidity risk

In this subsection, we examine whether our main findings are held when using an alternative measure of liquidity risk. In addition to Liu's (2006) liquidity measure, which is developed to incorporate multi-dimensions of liquidity, we use Amihud's (2019) model to estimate liquidity betas. Amihud (2019) contends that higher illiquidity - the price impact on liquidation - may represent a source of undiversifiable risk as investors demand a risk premium on stocks with greater exposure to the illiquidity premium when market illiquidity is higher. Thus, we expect that dividend payout policy affects liquidity risk based on the price impact of trades.

[Insert Table 9 about here]

We follow Amihud (2019) to estimate Amihud's liquidity beta. Specifically, the illiquidity factor (ILM) is constructed upon the differential return on illiquid-minus-liquid stock portfolio[11]. Liquidity is measured by price impact (i.e. the absolute value of daily return divided by dollar trading volume). We run the five-factor model, which includes the ILM, market, size,

[11] See Amihud (2019) for the details on the construction of ILM. This factor is used by Amihud et al. (2013), Amihud et al., (2015), and Amihud and Noh (2017).

momentum, and value factors, and the coefficient on the ILM can be interpreted as liquidity risk or liquidity beta.

Panels A and B of Table 9 show that dividend payers and high-dividend paying firms have significantly lower liquidity beta than non-dividend payers and low-dividend paying firms, respectively, in the univariate analysis. In the regression analysis, Panel C shows that both DIV and DVP are significantly negatively associated with Amihud's liquidity beta. Our finding suggests that dividend payout policies can affect one important dimension of systematic liquidity risk, which relates to the price impact of trades.

4.5.2 Share repurchases

In this section, we investigate the relationship between stock repurchases and liquidity risk in an attempt to complement our main analysis. First, like paying dividends, repurchasing stocks is another method used by firms to distribute capital in excess of their investment opportunities (e.g., Dittmar, 2000; Michaely and Moin, 2022). Increasing the level of payout, in the form of dividends or repurchases, reduces the amount of free cash flow at management's disposal and the likelihood of overinvestment, resulting in a reduction in agency costs[12]. In addition, stock repurchase programs have an advantage over dividend payout policies as the market has no expectation that the distribution of capital in the form of buybacks will recur on a regular basis (Wang et al., 2021). However, paying out dividends may incur a penalty if the amount of dividend payouts is subsequently reduced (e.g., Kaplan and Reishus, 1990; and Denis et al.,

[12] In theory, the decisions to pay dividends or repurchase stocks should convey information about future earnings and profitability to the market (Dittmar, 2000; Grullon and Michaely, 2004). However, prior empirical studies find mixed results in support for the information based explanation of stock repurchases. For example, Grullon and Michaely (2004) and Wang et al. (2021) find that repurchasing firms experience no significant improvement in long-term performance and analysts do not change their expectations of the repurchasing firms through earnings forecasts. However, Lie (2005) finds that repurchasing firms incur improvements in operating performance following the quarters when the firms actually repurchase the stocks. Therefore, the information channel through which stock repurchases affect liquidity risk is not of a main focus in this section.

1994). Thus, repurchasing stocks can be a more flexible means of distributing capital than paying out dividends. To the extent that flexible payout policies play an important role in reducing agency costs, we expect a negative relationship between stock repurchases and liquidity risk.

Second, the dividend or repurchase announcements can be signals, which indicate that a firm undergoes the process of moving from a growth phase to a mature phase (Grullon and Michaely, 2004; Almeida et al., 2016). During this change in its life cycle, the repurchasing firm experiences a significant reduction in systematic risk due to the declines in both investment opportunities and the need for resources to undertake new investments (Berk et al., 1999). Prior studies focus on systematic risk proxied by the three betas in the Fama and French (1993) three-factor model (e.g., Grullon and Michaely, 2004). Whether the reduction of systematic risk manifests itself in a lower stock price sensitivity to aggregate market liquidity, namely liquidity risk, remains an open question.

Following Fama and French's (2001) and Almeida et al. (2016), we define net repurchases as the increase in common treasury stock if treasury stock is not recorded as zero or missing. If a treasury stock is recorded as zero in the current and prior year, we measure repurchase as the difference between stock purchases and stock issuances from the statement of cash flows. If either of these amounts is negative, repurchases are set to zero. Accordingly, we set up two variables to measure repurchases. The first one is a dummy variable (*Rep*) which equals one if the amount of net repurchase is greater than zero, and zero otherwise. The second one is a continuous variable (*Repv*), which is the ratio of the amount of net repurchases over total assets (Almeida et al., 2016). We begin by regressing liquidity beta on the two repurchase variables and firm-level controls in a similar way as in Eq (3). To mitigate endogeneity concerns, we examine the difference in the liquidity risk by performing the propensity score matching similar to Section 4.3.1. Finally, we estimate the CEC effects for firms with stock and without repurchases by following the procedure described in Section 4.2.2.

[**Insert Table 10 about here**]

The results of the analysis are reported in Table 10. Columns (1) and (2) in Panel A show that the coefficients on *Rep* and *Repv* are significantly negative, respectively, suggesting that stock repurchases reduce systematic liquidity risk. Column (3) shows that *Rep* and *DIV* are both significantly negative when included in the same regression, implying that the reduction in liquidity risk arising from the two payout methods is likely to be independent. As a further test of whether stock repurchases and dividend payouts generate a synergy effect on liquidity risk, we interact *DIV* with *Rep*. Column (4) shows that the interaction term of *DIV**Rep* is insignificant, implying that the two payout methods do not generate the synergy effect.

In Panel B, we use PSM similar to section 4.3.1 to test the impact of share repurchases on liquidity risk within the matched sample. The results show that our matching successfully removes differences in observable firm-specific characteristics between the treated (i.e., repurchasing firms) and control groups (i.e., non-repurchasing firms). In the last row of Panel B, the average treatment effect (i.e., the difference in liquidity risk between treated and control firms) is -0.068 and significant at 5% level. Panel C reports the regression results based on the matched sample. *Rep* is significantly negative, indicating that firms with share repurchases have significantly lower liquidity risk than their counterparts without repurchases after controlling for all observable covariates.

Panel D reports the results on the comparison of the annual CEC effects between firms with and without stock repurchases. We follow the CEC estimation approach which is described in 4.2.2. The results show that firms with stock repurchases have significantly lower CEC than their counterparts without stock repurchases due to the decline in liquidity risk. The CEC reduction of 1.90% per year is statistically and economically significant. Then, in terms of the market risk channel, repurchasing firms can lower CEC by 1.82% per year relative to non-repurchasing firms. In sum, our evidence shows that corporate payout policies can decrease systematic liquidity risk and play an important role in reducing CEC.

4.6 Robustness checks

[**Insert Table 11 about here**]

In this subsection, we conduct three robustness checks on our main findings. First, Liu's (2006) LCAPM model is constructed by two factors, namely the market and liquidity factors. The liquidity beta estimated by this two-factor model may be confounded with the information contained in the size and value factors. To deal with this issue, we augment the two-factor model by including the size, value, and momentum factors (Fama and French, 1993; Carhart, 1997)[13]. Then, we re-estimate the coefficient on the liquidity factor (i.e. FF_liquidity beta) and re-run the regression model in Eq (3). Panel A of Table 11 shows the results based on LCAPM augmented by the Fama-French factors. The coefficients on *DIV* (column (1)) and *DVP* (column (2)) are significantly negative. Thus, our main results are robust after controlling for other risk factors.

Second, our main results are based on two proxies for dividend payouts (i.e. *DIV* and *DVP*), while dividends to total assets, dividends to net income, dividends to sales and dividends to operational cash flow can be alternative dividend measures suggested by the literature (e.g., Fama and French, 2001; Chen et al., 2017). To check whether our results are robust to these four alternative measures of dividends, we obtain the estimates by re-running Eq (3). Panel B

[13] The daily Fama-French three factors and the momentum factor are obtained from Xfi Centre for Finance and Accounting, University of Exeter. See http://business-school.exeter.ac.uk/research/centres/xfi/famafrench/files/

of Table 11 reports the results. From columns (1) to (4), the four variables are all significantly negative. Therefore, our results are robust to alternative measures of dividend payouts.

Third, although we control for industry and year fixed effects, time-invariant omitted firm characteristics may still drive our main results. By controlling for omitted firm characteristics, the effect of dividend payouts on systematic liquidity risk is more likely to reflect, on average, within-firm changes over time rather than simple cross-sectional correlations. Thus, we implement firm fixed effects to override industry fixed effects in our main regressions. Columns (1) and (3) in Panel C show that *DIV* and *DVP* remain negative and statistically significant, respectively. Another concern is that some industries may have experienced transitory changes (e.g., industry deregulations and changes in unobservable macroeconomic conditions) over a particular period. These changes could simultaneously affect corporate payout policies. To alleviate this concern, we use industry-year fixed effects by interacting year dummies with industries dummies in addition to firm fixed effects (e.g., Gormley and Matsa, 2014). Columns (2) and (4) in Panel C of Table 11 show that the coefficients on *DIV* and *DVP* remain significantly negative, indicating that our main findings are robust to alternative model specifications.

5. Conclusion

In this paper, we offer a new perspective on the dividend irrelevance argument of Miller and Modigliani (1961). Our analysis is based on the premise that dividend policy improves stock liquidity and liquidity is a source of non-diversifiable risk that needs to be reflected in expected asset returns. Prior studies show that dividend payouts reduce uncertainty and enhance corporate transparency (e.g., Fuller and Goldstein, 2011). Since investors avoid trading stocks with high levels of uncertainty during difficult times (Chordia et al., 2000; Brunnermeier and

Pedersen, 2009), they may fly to safety by holding dividend paying stocks and selling non-dividend paying stocks. The increased demand for dividend paying stocks would, in turn, make their prices less sensitive to shocks to market-wide liquidity. Consistent with this view, we find that corporate payout policies reduce firms' exposure to liquidity risk and their CEC.

In further analyses, we provide evidence that the effect of dividend policy decisions on liquidity risk is stronger for weakly governed firms and firms with a high level of information opacity. Specifically, consistent with the information uncertainty hypothesis, we find that the benefit of dividend payout on systematic liquidity risk is only present in firms with low analyst coverage, more dispersed earnings forecasts, and more volatile returns. In line with the agency hypothesis, we also find that the negative association between dividend payouts and liquidity risk is significant only for firms with low governance scores, a low proportion of independent directors, and CEO duality. Finally, we show that during the recent financial crisis (2007-2009) no and low dividend firms have a higher liquidity risk than their counterparts with generous dividend payments. This implies that managers can use payout policy as a mechanism to mitigate the adverse impact of economic downturns on the value of their firms. Overall, our study contributes to the literature by identifying systematic liquidity risk as a new channel through which dividend payouts affect firm value.

References

Acharya, V. V. and Pedersen, L. H. (2005) Asset pricing with liquidity risk. *Journal of Financial Economics* 77 (2), 375-410

Almeida, H., Fos., V. and Kronlund, M. (2016) The real effect of share repurchase, *Journal of Financial Economics*, 119, 168-185

Al-Yahyaee, K. H., Pham, T. M. and Walter, T. S. (2011) The information content of cash dividend announcements in a unique environment. *Journal of Banking and Finance* 35 (3), 606-612.

Amihud, Y, Hameed, A., Kang, W., and Zhang, H. (2015) The illiquidity premium: International evidence, *Journal of Financial Economics* 117, 350–368

Amihud, Y, and Noh, J., (2017) The pricing of the illiquidity factor's systematic risk. Working paper, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2835992

Amihud, Y, Mendelson, H.,and Pedersen, L., (2013) Market Liquidity. Cambridge University Press, New York, NY.

Amihud, Y. (2002) Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets* 5 (1), 31-56.

Amihud, Y. and Mendelson, H. (1986) Asset pricing and the bid-ask spread. *Journal of Financial Economics* 17 (2), 223-249.

Amihud, Y.(2019) Illiquidity and stock returns: A revisit, *Critical Finance Review*, forthcoming

Baker, M. and Stein, J.C. (2004) Market liqudity as a sentiment indicator, *Journal of Financial Markets*, 7(3), 271-299

Baker, M. and Wurgler, J. (2006) Investor sentiment and the cross-section of stock returns, *Journal of Finance*, 61(4), 1645-1680

Balakrishan, K., Billings, M.B., Ljungqvist, A. (2014) Shaping liqudity: on the casual effects of voluntary disclosure, *Journal of Finance*, 69(5), 2237-2278

Banerjee, S., Gatchev, V. A. and Spindt, P. A. (2007) Stock market liquidity and firm dividend policy. *Journal of Financial and Quantitative Analysis* 42 (2), 369-397.

Basiddiq, H. and Hussainey, K. (2012) Does asymmetric information drive UK dividends propensity? *Journal of Applied Accounting Research* 13 (3), 284-297

Bebchuk, L., Cohen, A. and Ferrell, A. (2008), What matters in corporate governance? *Review of Financial Studies*, 22, 783-827

Bekaert, G., Harvey, C. R. and Lundblad, C. (2007) Liquidity and expected returns: Lessons from emerging markets. *Review of Financial Studies* 20 (6), 1783-1831.

Berk, J. B.,. Green, R. C., and Naik, V. (1999) Optimal investment, growth options, and security returns, *Journal of Finance* 54, 1553–1607

Bhattacharya, S. (1979) Imperfect information, dividend policy, and "the bird in the hand" fallacy. *The Bell Journal of Economics* 10 (1), 259-270

Bilinski, P., Liu, W. and Strong, N. (2012) Does liquidity risk explain low firm performance following seasoned equity offerings? *Journal of Banking and Finance* 36 (10), 2770-2785

Black, F. (1976) The dividend puzzle, *Journal of Portfolio Management*, 2, 5-8

Bloom, N.(2007) Uncertainty and dynamics of R&D, *American Economic Review*, 97, 250-255

Bowen, R., Chen, X. Chen, and Cheng. C. (2008) Analyst coverage and the cost of raising equity capital: evidence from underpricing of seasoned equity offerings, *Contemporary Accounting Research*, 25 (3), 657-700

Bozos, K., Nikolopoulos, K. and Ramgandhi, G. (2011) Dividend signaling under economic adversity: Evidence from the London Stock Exchange. *International Review of Financial Analysis* 20 (5), 364-374.

Brennan, M. J. and Subrahmanyam, A. (1996) Market microstructure and asset pricing: on the compensation for illiquidity in stock returns. *Journal of Financial Economics* 41, 441-464.

Brennan, M. J., Cordia, T. and Subrahmanyam, A. (1998) Alternative factor specifications, security characteristics, and the cross-section of expected stock returns. *Journal of Financial Economics* 49, 345-373

Brunnermeier, M. K. and Pedersen, L. H. (2009) Market liquidity and funding liquidity. *Review of Financial studies* 22 (6), 2201-2238.

Cao, C. and Petrasek, L. (2014) Liquidity risk and institutional ownership. *Journal of Financial Markets* 21, 76-97.

Carhart, M. M. (1997) On persistence in mutual fund performance. *Journal of Finance* 52 (1), 57-82.
Chen, J., Leung, W.S. and Goergen, M. (2017) The impact of board gender composition on dividend payouts, *Journal of Corporate Finance*, 43, 86-105
Chordia, T., Roll, R. and Subrahmanyam, A. (2000) Commonality in liquidity. *Journal of Financial Economics* 56 (1), 3-28.
Dasilas, A. and Leventis, S. (2011) Stock market reaction to dividend announcements: Evidence from the Greek stock market. *International Review of Economics and Finance* 20 (2), 302-311
DeAngelo, H., DeAngelo, L. and Stulz, R. M. (2006) Dividend policy and the earned/contributed capital mix: a test of the life-cycle theory, *Journal of Financial Economics*, 81(2), 227-254
Denis, D., Denis, D., and Sarin, A. (1994). Information content of dividend changes: Cash flow, signaling, overinvestment, and dividend clienteles. *Journal of Financial and Quantitative Analysis* 29:567–87
Diether, K. B, Malloy, C. and Scherbina, A. (2002) Differences in opinion and the cross section of stock returns, *Journal of Finance*,57 (5), 2113-2141
Dittmar, A.K. (2000) Why do firms repurchase stock. *Journal of Business*, *73*(3), pp.331-355.
Easterbrook, F. H. (1984) Two agency-cost explanations of dividends. *The American Economic Review* 74 (4), 650-659.
Eije, H. v., Goyal, A. and Muckley, C. B. (2014) Does the information content of payout initiations and omissions influence firm risks? *Journal of Econometrics* 183 (2), 222-229.
Fama, E and French, K, (2001) Disappearing dividends: changing firm characteristics or lower propensity to pay? *Journal of Financial Economics*, 60, 3-43
Fama, E. F. and French, K. R. (1993) Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33 (1), 3-56
Fama, E and French, K, (1996), Multifactor explanations for asset pricing anomalies, *Journal of Finance*, 51, pp.55-84
Fuller, K. P. and Goldstein, M. A. (2011) Do dividends matter more in declining markets? *Journal of Corporate Finance* 17 (3), 457-473
Giroud, X. and Mueller, H.M., (2011) Corporate governance, product market competition, and equity prices. *Journal of Finance*, *66*(2), pp.563-600.
Goldstein, M.A., Goyal, A., Lucey, B.M. and Muckley, C.B., (2015). The global preference for dividends in declining markets. *Financial Review*, *50*(4), pp.575-609.
Gompers, P., Ishii, J. and Metrick, A. (2003), Corporate governance and equity prices, *Quarterly Journal of Economics*, 118, 107-156
Gordon, M. J. (1963) Optimal investment and finance policy. *Journal of Finance* 18 (2), 264-272.
Gormley, T. A. and Matsa, D. A. (2014) How to (not to) control for unobserved heterogenity, Review of Financial Studies, 27(2), 617-661
Grullon, G. and Michaely, R, (2004) The information content of share repurchase programs, *Journal of Finance*, 59, 651-680
Grullon, G., Michaely, R. and Swaminathan, B. (2002) Are dividend changes a sign of firm maturity? *The Journal of Business* 75 (3), 387-424.
Guntay, L. and Hackbarth, D. (2010) Corporate bond credit spreads and forecast dispersion, *Journal of Banking and Finance*, 34(10), 2328-2345
Gurgul, H., Mestel, R. and Schleicher, C. (2003) Stock market reactions to dividend announcements: empirical evidence from the Austrian stock. *Financial Markets and Portfolio Management* 17 (3), 332-350.
Hail, L., Tahoun, A. and Wang, C. (2014) Dividend payouts and information shocks. *Journal of Accounting Research* 52 (2), 403-456
Hameed, A., Kang, W. and Viswanathan, S. (2010) Stock declines and liqudity, *Journal of Finance*, 65(1), 257-293
Hameed, A. and Xie, J., 2019. Preference for dividends and return comovement. *Journal of Financial Economics*, *132*(1), pp.103-125.
Hart, O.D. (1983) The market mechanism as an incentive scheme, *Bell Journal of Economics*, 14, 366-382
Hartzmark, S.M. and Solomon, D.H., 2019. The dividend disconnect. *Journal of Finance*, *74*(5), pp.2153-2199.

Hirshleifer, D., Hou, K. and Teoh, S.H. (2012) The accrual anomaly: risk or mispricing? *Management Science*, *58*(2), pp.320-335.
Hoberg, G. and Prabhala, N. R. (2009) Disappearing dividends, catering, and risk. *Review of Financial Studies* 22 (1), 79-116.
Hou, K. and Robinson, D.T., (2006) Industry concentration and average stock returns. *Journal of Finance*, *61*(4), pp.1927-1956.
Howe, J. S. and Lin, J.-C. (1992) Dividend policy and the bid ask spread: an empirical analysis. *Journal of Financial Research* 15 (1), 1-10.
Huang, W. and Mazouz, K. (2018) Excess cash, trading continuity and liquidity risk, *Journal of Corporate Finance*, 48, 275-291
Hussainey, K. and Walker, M. (2009) The effects of voluntary disclosure and dividend propensity on prices leading earnings. *Accounting and Business Research* 39 (1), 37-55.
Jiang, F., Ma, Y. and Shi, B. (2017) Stock liquidity and dividend payouts. *Journal of Corporate Finance* 42, 295-314.
Johnson, T. (2005) Forecast dispersion and the cross-section of expected returns, *Journal of Finance*, 59(5), 1957-1978
Johnson, S., Boone, P., Breach, A. and Friedman, E. (2000) Corporate governance in the Asian financial crisis, *Journal of Financial Economics*, 58(1), 141-186
Kaplan, S., and Reishus, D. (1990) Outside directorships and corporate performance. *Journal of Financial Economic*s 27:389–410
Kuo, J.-M., Philip, D. and Zhang, Q. (2013) What drives the disappearing dividends phenomenon? *Journal of Banking and Finance* 37 (9), 3499-3514
La Porta, R., Lopez-de-Silanes F., Shleifer, A. and Vishny, R. (2000), Agency problems and dividend policies around the world, *Journal of Finance*, 55, 1-33
Lam, K. S. and Tam, L. H. (2011) Liquidity and asset pricing: Evidence from the Hong Kong stock market. *Journal of Banking and Finance* 35 (9), 2217-2230.
Lang, M.H. and Lundholm, R.J. (2000) Voluntary disclosure and equity offering: reducing information asymmetry or hyping the stock? *Contemporary Accounting Research*, 17 (4), 623-662
Lee, K.-H. (2011) The world price of liquidity risk. *Journal of Financial Economics* 99 (1), 136-161.
Li, B., Sun, Q. and Wang, C., (2014) Liquidity, liqudity risk and stock returns: Evidence from Japan, *European Financial Management*, 20(1), 126-151
Lie, E., (2005) Operating performance following open market share repurchase announcements, *Journal of Accounting and Economics*, 39, 411-436
Lin, J.-C., Singh, A. K. and Yu, W. (2009) Stock splits, trading continuity, and the cost of equity capital. *Journal of Financial Economics* 93 (3), 474-489.
Lin, J.J. and Lee, C.F., 2021. Does managerial reluctance of dividend cuts signal future earnings?. *Review of Quantitative Finance and Accounting*, *56*(2), pp.453-478.
Liu, C. and Chen, A.-S. (2015) Do firms use dividend changes to signal future profitability? A simultaneous equation analysis. *International Review of Financial Analysis* 37, 194-207
Liu, W. (2006) A liquidity-augmented capital asset pricing model. *Journal of Financial Economics* 82 (3), 631-671
Michaely, R. and Moin, A., 2022. Disappearing and reappearing dividends. *Journal of Financial Economics*, *143*(1), pp.207-226
Michaely, R. and Qian, M., 2022. Does stock market liquidity affect dividends?. *Pacific-Basin Finance Journal*, p.101788.
Miller, M. and Modigliani, F. (1961) Dividend policy, growth, and the valuation of shares. *The Journal of Business* 34 (4), 411-433.
Miller, M. and Rock, K. (1985) Dividend policy under asymmetric information. *The Journal of Finance* 40 (4), 1031-1051
Mitra, D. and Rashid, M. (1997) The information content of dividend initiations and firm size: an analysis using bid‐ask spreads. *Financial Review* 32 (2), 309-329
Moin, A., Guney, Y. and EI Kalak, I., 2020. The effects of ownership structure, sub-optimal cash holdings and investment inefficiency on dividend policy: evidence from Indonesia. *Review of Quantitative Finance and Accounting*, *55*(3), pp.857-900.

Ng, J. (2011) The effect of information quality on liquidity risk. *Journal of Accounting and Economics* 52 (2), 126-143.
Officer, M.S., (2011) Overinvestment, corporate governance, and dividend initiations, *Journal of Corporate Finance*, 17, 710-724
Pastor, L. and Stambaugh, R. F. (2003) Liquidity risk and expected stock returns. *Journal of Political Economy* 111 (3), 642-685.
Redding, L. S. (1997) Firm size and dividend payouts. *Journal of Financial Intermediation* 6 (3), 224-248
Sharma, V., (2011) Independent directors and the propensity to pay dividends, *Journal of Corporate Finance,* 17, 1001-1015
Shipman, E. J., Swanquist, Q. and Whited, R.L. (2017) Propensity score mathcing in accounting research, *Accounting Review*, 92 (1), 213-244
Sloan, R.G., (1996) Do stock prices fully reflect information in accruals and cash flows about future earnings?*Accounting review*, pp.289-315.
Wang, Z., Yin, Q.E. and Yu, L., (2021) Real effects of share repurchases legalization on corporate behaviors. *Journal of Financial Economics*, *140*(1), 197-219.
Weisbach, M., (1988), Outside directors and CEO turnover, *Journal of Financial Economics*, 20, 431-460
Yu, F.F. (2008) Analyst coverage and earnings management, *Journal of Financial Economics*, 88 (2), 245-271

Table 1 Summary statistics

This table reports summary statistics of our main variables over our sample period from 1996 to 2018. The liquidity beta is the coefficient on the liquidity factor in LCAPM (Liu, 2006). The liquidity factor is constructed on the return differential between illiquidity-minus-liquidity portfolios. Liquidity is based on LM12, which is the standardised sum of the number of non-trading days and stock turnover over a 12-month period. We use daily stock returns to estimate the liquidity beta over a 12-month period. TO is the turnover ratio, which is daily turnover (trading volume over the number of stocks outstanding) accumulated over a 12-month period. Profitability is the ratio of earnings before interest and taxes to total assets. IO is a firm's institutional holdings over its market capitalization at the fiscal year end. Analyst is the number of analysts following a firm. MTB is the ratio of market capitalization over book value of equity. Past return is the accumulative returns in the past 12-month. Volatility is the standard deviation of daily stock returns over a 12-month period. FTSE100 is equal to one if a firm is included in the FTSE100 index, and zero otherwise. R&D is the ratio of the expenditure of research and development over market capitalization. Age is the years since a firm is first recorded in the Datastream. Size is the market capitalization in logarithm form. DIV is equal to one if a firm pays dividends to common shareholders, and zero otherwise. DVP is dividend yield defined as dividend per share scaled by price at the end of fiscal year.

	Obs	Mean	SD	Median	10th	90th
Liquidity beta	11,501	-0.032	0.987	-0.017	-1.056	1.361
LM12	11,501	4.141	15.169	0.000	0.000	7.937
TO	11,501	0.976	2.428	0.576	0.000	1.873
Profitability	11,501	0.019	0.169	0.049	-0.108	0.138
IO	11,501	0.495	0.308	0.540	0	0.869
Analyst	11,501	3.302	6.607	0	0	14
MTB	11,501	3.144	6.346	2.031	0.590	11.171
Past return	11,501	0.111	0.505	0.114	-0.446	0.645
Volatility	11,501	0.023	0.011	0.020	0.011	0.039
FTSE100	11,501	0.210	0.407	0	0	1
R&D	11,501	0.025	0.343	0	0	0.092
Age	11,501	20.14	14.798	16	3	42
Leverage	11,501	0.549	0.245	0.543	0.248	0.825
Size	11,501	12.579	1.924	12.386	10.343	15.108
DIV	11,501	0.747	0.434	1	0	1
DVP	11,501	0.029	0.073	0.021	0	0.061

Table 2 Univariate analysis

This table presents the univariate analysis of the systematic liquidity risk for dividend payers and non-dividend payers as well as high- and low-dividend paying firms. Dividend and non-dividend payers are defined as firms that have paid dividends and no dividend to common shareholders, respectively. High- and low-dividend payers are defined as firms with DVP (i.e. dividend yield) above and below the median in each year, respectively. We use the t-test for differences in mean and the Wilcoxon-Mann-Whitney test for differences in median. The sample period is from 1997 to 2018. Using daily stock returns, a liquidity beta is the slope coefficient on LIQ (i.e. the liquidity factor) in LCAPM of Liu (2006). ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Dividend payers vs. Non-dividend payers				
Liquidity Risk	Dividend Payers	Non-dividend payers	Mean test	Median test
Mean	-0.090	0.142	-0.232***	
Median	-0.045	0.100		-0.145***
Observations	8,371	3,130		
Panel B: High dividend payers vs. low-dividend payers				
Liquidity Risk	High-dividend Payers	Low-dividend payers	Mean test	Median test
Mean	-0.124	0.069	-0.193***	
Median	-0.067	0.041		-0.108***
Observations	5,633	5,418		

Table 3 Regression analysis

This table reports the multivariate regression results of the relationship between dividend payout and systematic liquidity risk. The sample period is from 1997 to 2018. The dependent variable is systematic liquidity risk, which is estimated from daily stock returns by LCAPM (Liu, 2006). *DIV* is a dummy variable that takes the value of one for dividend-payers, and zero otherwise. *DVP* is dividend yield which is defined as dividend per share over price at fiscal year end. *Size* is the market capitalization in logarithm form. *Age* is the years since a firm is first recorded in the Datastream. *IO* is the percentage of institutional holdings over market capitalization. *Analyst* is the number of analysts following a firm. *Past returns* are the accumulative returns in the past 12-month. *Volatility* is the standard deviation of daily stock returns over a 12-month period. *Profitability* is the ratio of earnings before interest and taxes over total assets. *MTB* is the ratio of market capitalization over book value of equity. *R&D* is the ratio of the expenditure of research and development over market capitalization. *Leverage* is the ratio of the sum of current liabilities and long-term debt over total assets. *LM12* measures stock liquidity which is the standardized turnover-adjusted number of days with zero trading volume over the prior 12 months. *FTSE100* is equal to one if a firm is included in the FTSE100 index, and zero otherwise. *t*-statistics are reported in parentheses. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	(1)	(2)	(3)	(4)
DIV	-0.245***	-0.112***		
	(-6.61)	(-4.17)		
DVP			-2.678***	-1.417***
			(-4.69)	(-3.31)
Size		-0.156***		-0.159***
		(-17.84)		(-18.01)
Age		0.002***		0.001**
		(2.63)		(2.59)
IO		-0.367***		-0.369***
		(-10.27)		(-10.28)
Analyst		-0.001		-0.002
		(-1.13)		(-1.18)
Past returns		0.028		0.021
		(0.97)		(0.72)
Volatility		-10.237***		-9.601***
		(-7.13)		(-6.61)
Profitability		0.061		0.051
		(0.49)		(0.41)
MTB		-0.000		-0.001
		(-0.31)		(-0.59)
R&D		-0.001		-0.000
		(-0.57)		(-0.52)
Leverage		0.177***		0.179***
		(3.49)		(3.52)
LM12		0.006***		0.006***
		(9.07)		(9.15)
FTSE100		-0.065**		-0.067**
		(-2.42)		(-2.49)
Cons	0.446	2.212***	0.321	2.184***
	(1.51)	(8.91)	(1.20)	(9.07)
Year effect	Y	Y	Y	Y
Industry effect	Y	Y	Y	Y
Observations	11,501	11,051	11,501	11,501
Adjusted R^2	0.10	0.21	0.09	0.21

Table 4 The effect of dividend policy on the cost of equity via the channels of market risk and liquidity risk

This table reports the differences in the cost of equity capital (CEC) between dividend payers and non-dividend payers in Panel A, and between high- and low-dividend payers in Panel B. Dividend and non-dividend payer are defined as whether or not a firm pays dividends. High- and low-dividend payers are defined as to whether a firm's dividend yield (i.e. dividend per share over price) is above or below the median in a given year. Based on LCAPM (i.e., $E(r_i) - r_f = \beta_{m,i}\left[E(r_m) - r_f\right] + \beta_{l,i}E(LIQ)$) (Liu, 2006), the effect of systematic liquidity risk on CEC can be measured by a firm's liquidity beta multiplied by the liquidity risk premium, while the effect of the market risk on CEC can be measured by the firm's market beta multiplied by the market premium. Following Lin et al. (2009) and Ng (2011), we use historical betas, which are estimated from Eq(2), and the realized market and liquidity risk premiums on a yearly basis as proxies for $\left(E(r_m) - r_f\right)$ and $E(LIQ)$, respectively, to estimate the annual CEC effects. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	(1) Systematic liquidity risk (β_l)	(2) Systematic market risk (β_m)	(3) The annual effect of dividend policy on CEC via the channel of systematic liquidity risk measured by ($\beta_l \times$ LIQ)	(4) The annual effect of dividend policy on CEC via the channel of systematic market risk measured by ($\beta_m \times (R_m - R_f)$)	(5) Observations
		Panel A: Dividend payers vs. Non-dividend payers			
Dividend Payers	-0.091	0.481	0.39%	10.46%	8,371
Non-dividend payers	0.142	0.621	1.12%	12.61%	3,130
Difference	-0.233***	-0.140***	-0.73%*	-2.15%**	
	(-10.29)	(-12.20)	(-1.90)	(-2.59)	
		Panel B: High dividend payers vs. low-dividend payers			
High-dividend Payers	-0.124	0.473	0.20%	9.87%	5,633
Low-dividend Payers	0.069	0.596	1.33%	13.44%	5,418
Difference	-0.194***	-0.123***	-1.13%**	-3.56%***	
	(-9.80)	(-9.09)	(-2.12)	(-4.70)	

Table 5 Propensity score matching

This table reports the propensity score matching estimation results. Panel A reports the parameter estimates from the probit model used to estimate the propensity scores. The dependent variable is an indicator variable DIV, which is equal to one if a firm pays dividends, and zero otherwise. Covariates include Size, Age, IO, Analyst, Past returns, Volatility, Profitability, R&D, Leverage, LM12, and FTSE100. The definitions of these covariates are the same as those specified in Table 3 (also see Appendix 1 for variable definitions). Columns (1) and (2) in Panel A report the pre-match propensity score regression and the post-match diagnostic regression, respectively. Panel B reports the univariate comparisons of firm-specific characteristics between the treated (dividend payers) and control (non-dividend payers) groups. Panel C report the regression results based on the matched sample. *t*-statistics are reported in parentheses. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A Pre- and Post-matching regressions		
	(1)	(2)
	Pre-matching	Post-matching
Dependent variable	DIV	
Size	0.176***	0.004
	(13.45)	(0.25)
Age	0.013***	0.002
	(11.36)	(1.20)
IO	0.359***	-0.046
	(5.89)	(-0.56)
Analyst	0.008**	-0.000
	(2.40)	(-0.00)
Past returns	-0.118***	-0.035
	(-4.15)	(-0.94)
Volatility	-37.167***	3.327
	(-22.31)	(1.48)
Profitability	1.375***	0.298
	(12.47)	(1.04)
MTB	0.002	-0.001
	(0.91)	(-0.16)
R&D	-0.001***	-0.000
	(-2.90)	(-0.93)
Leverage	0.084	0.149
	(1.25)	(1.50)
LM12	-0.003**	-0.001
	(-2.29)	(-0.68)
FTSE100	-0.030	0.077
	(-0.41)	(0.69)
Cons	-0.884	-0.187
	(-1.44)	(-0.79)
Year effect	Y	Y
Industry effect	Y	Y
Observations	11,501	3,434
Pseudo R^2	0.33	0.01

Panel B Balance tests

	(1) Treated group	(2) Control group	(3) Difference
Observations	N=1,717	N=1,717	
Size	12.228	12.160	0.068 (1.14)
Age	16.811	16.361	0.450 (0.96)
IO	0.510	0.511	-0.001 (-0.06)
Analyst	3.000	2.862	0.138 (0.70)
Past returns	0.115	0.113	0.002 (1.26)
Volatility	0.028	0.028	0.000 (0.86)
Profitability	0.006	0.003	0.003 (0.98)
MTB	2.826	2.842	-0.016 (-0.08)
R&D	0.022	0.024	-0.002 (-1.07)
Leverage	0.541	0.531	0.010 (1.14)
LM12	4.394	4.658	-0.264 (-0.47)
FTSE100	0.061	0.051	0.010 (1.26)
P_score	0.632	0.632	-0.000 (-0.08)
Liquidity beta	-0.055	0.049	**-0.104**(-2.78)

Panel C Regression based on the matched sample

	(1)
Dependent variable	Liquidity beta
DIV	**-0.096*****
	(-2.68)
Controls/cons	Y
Year effect	Y
Industry effect	Y
Observations	3,434
Adjusted R^2	0.19

Table 6 The effect of dividend initiations on liquidity risk

This table reports the results of the difference-in-difference approach (DID) to dividend initiations. We define a dividend initiator (i.e. the treated firm) as a firm that pays dividends in year *t* but has not paid any dividend between year *t-5* and year *t-1*. The control group for dividend initiations includes firms that pay no dividends between year *t-5* and year *t*. We match each treated firm with control firm using propensity score matching in year *t*. we require a control firm to have the closest score within a distance of 0.005 from the treated firm's propensity score. This procedure yields a total of 72 pairs of matched firms. Panel A examines the differences in observable characteristics between firms with dividend initiation and their matched controls in the pre-treatment year. Panel B reports the DID estimates where the dependent variable is the liquidity beta estimated by LCAPM (Liu, 2006). Treat is a dummy variable which is equal to one if a firm belongs to the treatment group, and zero otherwise. Post is a time dummy variable which is equal to one if the year is after dividend initiation. The same set of control variables as in our baseline model is included. For the sake of brevity, we report the coefficients on the main variables of interest. *t*-statistics are reported in parentheses. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	Panel A: Post-match differences			
	(1) Treated group (N=72)	(2) Control group (N=72)	(3) Diff	(4) t-stat
Size	12.582	12.577	0.005	0.02
Age	18.097	17.306	0.791	0.37
IO	0.574	0.567	0.007	0.15
Analyst	5.458	3.958	1.500	1.28
Past returns	0.153	0.115	0.035	0.44
Volatility	0.027	0.025	0.002	1.54
Profitability	0.026	0.017	0.009	0.36
MTB	2.396	1.814	0.582	1.13
R&D	0.031	0.044	-0.013	-0.81
Leverage	0.451	0.481	-0.030	-0.72
LM12	0.539	0.581	-0.042	-0.13
FTSE100	0.083	0.083	0.00	0.00
pscore	0.156	0.158	0.02	0.02
	Panel B: DID estimator			
Dep. variable		Liquidity beta		
Treat		0.047		
		(0.40)		
Post*Treat		-0.378**		
		(-1.99)		
Controls/cons		Y		
Year effects		Y		
Industry effects		Y		
N		288		
Adjusted R^2		0.38		

Table 7 The effect of dividend omission on liquidity risk

This table reports the results of the difference-in-differences approach (DID) to dividend omission. We define a dividend omitter (i.e., the treated firm) as a firm that has continuously paid dividends over the period from year *t-5* to year *t-1*, but does not pay any dividend in year t. The control group for dividend omissions consists of firms that pay dividend between year t-5 and year t. We match each treated and with a control firm in year *t* by using propensity score matching. Similar to the case of dividend initiations, a control firm must have the closest score within a distance of 0.005 from the treated firm's propensity score. This approach results in 150 pairs of matched firms. The liquidity beta is estimated over two periods, namely the pre-treatment period from year *t-1* to *t*, and the post-treatment period from year *t* to year *t+1*. Panel A examines the differences in observable characteristics between firm-years with dividend omission and their matched controls in the pre-treatment year. Panel B reports the DiD estimates where the dependent variable is the liquidity beta estimated by LCAPM (Liu, 2006). Treat is a dummy variable which is equal to one if a firm belongs to the treatment group, and zero otherwise. Post is a time dummy variable which is equal to one if the year is after dividend omission. The same set of control variables as in our baseline model is included. For the sake of brevity, we report the coefficients on the main variables of interest. *t*-statistics are reported in parentheses. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	Panel A: Pre-match differences			
	(1) Treated group (N=150)	(2) Control group (N=150)	(3) Diff	(4) t-stat
Size	12.618	12.534	0.084	0.39
Age	25.737	25.151	0.586	0.37
IO	0.610	0.578	0.032	1.09
Analyst	3.625	3.493	0.132	0.18
Past returns	0.181	0.163	0.018	0.21
Volatility	0.031	0.033	-0.002	-1.16
Profitability	-0.023	-0.027	-0.004	0.22
MTB	2.157	2.346	-0.189	-0.31
R&D	0.002	0.002	0.001	0.07
Leverage	0.639	0.624	0.015	0.53
LM12	0.725	0.852	-0.127	-0.42
FTSE100	0.723	0.592	0.131	0.46
pscore	0.159	0.159	0.001	0.03
	Panel B: DID estimator			
Dep. variable		Liquidity beta		
Treat		0.044		
		(0.50)		
Post*Treat		0.203*		
		(1.87)		
Controls/cons		Y		
Year effects		Y		
Industry effects		Y		
N		600		
Adjusted R^2		0.34		

Table 8 Heterogeneity in the relationship between dividend payout and liquidity risk

This table reports the results of economic channels through which dividend payout policy affects liquidity risk. In Panel A, we use three proxies for information uncertainty. The first proxy is analyst coverage (i.e., Analyst) which is measured by the number of analysts following a firm in the last fiscal quarter. The second proxy is the dispersion of earnings forecasts, which is defined as the standard deviation of earnings forecasts for the next fiscal year scaled by the mean value of the earnings forecasts made during the same year. The third proxy is the return volatility measured by the standard deviation of daily returns over the past year. The high and low uncertainty groups are defined as the observations with each measure above and below the median in each year, respectively. In Panel B, we use three measures for the quality of governance. The first measure is corporate governance score (i.e., Gov_score) supplied by Thomson Reuters, which is a weighted average of management score, shareholder score, and social responsibility score. The second measure is the percentage of independent directors on the board. The third measure is CEO duality, i.e., whether a CEO is also the chairman of the board. We separate the whole sample into two sub-samples by the median of each of the six measures. In Panel C, we separate the sample firms according to the competitiveness in an industry. To measure competitiveness, we use the Herfindahl–Hirschman Index (HHI), which is computed as the sum of squared market shares (i.e., sales) in a given industry. High and low competitive industries are defined as industries with the HHIs below (above) the median, respectively. We also separate the sample firms into high and low accrual groups by the median of accruals. Following Sloan (1996), we define accruals as follows. Accruals=((ΔCA−ΔCash)−(ΔCL−ΔSD−ΔTP)−DP), where ΔCA is the change in current assets, ΔCash is the change in cash and equivalents, ΔCL is the change in current liabilities, ΔSD is the change in short-term debt included in the current liabilities, ΔTP is the change in income tax payable, and *DP* denotes depreciation and amortization expenses. All of the numbers are scaled by lagged total assets. In Panel D, the dummy variable of crisis is equal to one if firm-year observations are between 2007 and 2009, and zero otherwise. The dependent variable of the regressions is liquidity beta estimated by LCAPM (Liu, 2006). For the sake of brevity, we report the coefficients on the main variables of interest. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	Panel A: uncertainty channel											
	Analyst coverage				The dispersion of earnings forecast				Volatility of returns			
	Low		high		low		High		low		high	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DIV	-0.142***		0.009		-0.044		-0.106**		-0.031		-0.103**	
	(-3.44)		(0.22)		(-080)		(-2.01)		(-0.84)		(-2.33)	
DVP		-2.229**		0.091		-0.146		-1.124*		-0.206		-2.311***
		(-2.47)		(0.08)		(-0.17)		(-1.83)		(-0.37)		(-3.37)
Controls/cons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.21	0.21	0.21	0.21	0.23	0.27	0.27	0.27	0.25	0.25	0.24	0.24
Observations	7,761	7,761	3,290	3,290	1,466	1,466	1,466	1,466	5,525	5,525	5,526	5,526
	Panel B: governance channel											
	Governance score				The percentage of independent directors				CEO-Chairman			
	Low		High		Low		High		No		Yes	
DIV	-0.208***		-0.021		-0.155***		-0.021		-0.105		-0.140**	
	(-3.20)		(-0.40)		(-2.70)		(-0.40)		(-1.60)		(-2.19)	
DVP		-3.096**		-1.634		-3.726***		-1.392		-1.368		-2.401**
		(-2.39)		(-1.20)		(-3.16)		(-0.98)		(-1.07)		(-2.17)
Controls /cons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.20	0.20	0.30	0.30	0.23	0.16	0.30	0.24	0.21	0.16	0.37	0.38
Observations	1,759	1,759	1,762	1,762	1,653	1,653	1,762	1,442	3,093	3,093	442	442

Panel C: The relative strength between uncertainty and governance channels

	Whole sample		Industry competitiveness				Accruals			
			Low		High		Low		High	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DIV*Analyst	0.039***		0.020*		0.046***		0.020		0.048***	
	(2.93)		(1.69)		(2.79)		(1.49)		(2.79)	
DIV*Gov_score	0.008**		0.011***		0.004		0.013***		0.007	
	(2.55)		(2.63)		(1.19)		(2.78)		(1.32)	
DVP*Analyst		0.220**		0.139		0.252**		0.158		0.242**
		(2.30)		(1.39)		(2.10)		(1.59)		(2.00)
DVP*Gov_score		0.096**		0.143**		0.062		0.135**		0.071
		(2.22)		(1.98)		(1.32)		(2.12)		(1.42)
Controls /cons	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.07	0.06	0.07	0.06	0.19	0.16	0.12	0.11	0.09	0.08
Observations	3,535	3,535	1.898	1,898	1,637	1,637	1,767	1,768	1,767	1,768

Panel D: The relationship between dividend and systematic liquidity risk during the financial crisis

Dep. Variable	Liquidity beta			
	(1)	(2)	(3)	(4)
DIV	-0.085**		-0.026	
	(-2.23)		(-0.68)	
DIV*Crisis	-0.101**		-0.152**	
	(-1.98)		(-1.96)	
DVP		-1.065*		1.106**
		(-1.91)		(2.02)
DVP*Crisis		-1.798**		-1.410**
		(-2.07)		(-2.29)
Crisis	0.340	0.303	-0.301	-0.307
	(1.34)	(1.30)	(-0.97)	(-0.95)
Crisis*controls	N	N	Y	Y
Controls/cons	Y	Y	Y	Y
Year effects	N	N	N	N
Industry effects	Y	Y	Y	Y
Observations	11,501	11,501	11,501	11,501
Adjusted R^2	0.20	0.21	0.21	0.21

Table 9 Alternative measure of liquidity risk

This table presents the results of an alternative measure of liquidity risk, namely Amihud's (2019) liquidity beta. This liquidity risk has a focus on the price impact of trades. Specifically, the illiquidity factor (ILM) is constructed upon the differential return on illiquid-minus-liquid stock portfolio (see Amihud (2019) for details). Liquidity is measured by price impact (i.e. the absolute value of daily return divided by dollar trading volume). Following Amihud (2019), we run the five-factor model including the ILM, market, size, momentum and value factors and the coefficient on the ILM (i.e., Amihud_liquidity beta) can be interpreted as liquidity risk. In Panels A and B, we conduct the univariate analysis of liquidity risk for dividend payers and non-dividend payers as well as high-dividend and low-dividend paying firms. Dividend and non-dividend payers are defined as firms that have paid dividends and no dividends to common shareholders, respectively. High- and low-dividend payers are defined as firms with DVP (i.e. dividend yield) above and below the median in each year, respectively. We use the t-test for differences in mean and Wilcoxon-Mann-Whitney test for differences in median. The sample period is from 1997 to 2017. Panel C reports the results of the regression analysis. For the sake of brevity, we report the coefficients on the main variables of interest. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Dividend payers vs. Non-dividend payers				
Amihud_liquidity beta	Dividend Payers	Non-dividend payers	Mean test	Median test
Mean	0.137	0.503	-0.366***	
Median	0.108	0.406		-0.298***
Observations	7,725	3,029		
Panel B: High dividend payers vs. low-dividend payers				
Amihud_liquidity beta	High-dividend Payers	Low-dividend payers	Mean test	Median test
Mean	0.116	0.353	-0.237***	
Median	0.089	0.276		-0.187***
Observations	5,377	5,377		
Panel C: Regression analysis				
	(1)	(2)		
Dep. Variable	Amihud_liquidity beta	Amihud_liquidity beta		
DIV	-0.074***			
	(-2.62)			
DVP		-0.930***		
		(-2.63)		
Controls/cons	Y	Y		
Year effect	Y	Y		
Industry effect	Y	Y		
Observations	10,754	10,754		
Adj R^2	0.22	0.20		

Table 10 The effect of stock repurchases on systematic liquidity risk

This table reports the results of the effect of stock repurchases on systematic liquidity risk. Accordingly, we set up two variables to measure repurchases. The first one is a dummy variable (Rep) which is equal to one if net repurchase is non-zero, and zero otherwise. The second one is a continuous variable (Repv) which is the ratio of the amount of net repurchases over total assets (Almeida et al., 2016). In Panel A, we regress liquidity beta on the two repurchase variables and firm-level controls. In Panel B, we examine the difference in the liquidity risk based on the matched sample. We use the probit model to estimate the propensity scores. Covariates include Size, Age, IO, Analyst, Past return, Volatility, Profitability, R&D, Leverage, LM12, and FTSE100. The definitions of these covariates are the same as those specified in Table 3 (also see Appendix 1 for variable definitions). A repurchasing firm is matched to a non-repurchasing payer that has the closest score within a distance of 0.005 from the repurchasing firm's propensity score. Panel C reports the regression results based on the matched sample. Panel D reports the difference in CEC between repurchasing and non-repurchasing firms. The estimation of CEC is described in Table 4. Standard errors are clustered at the firm level. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	Panel A: Regression analysis			
	(1)	(2)	(3)	(4)
Rep	-0.070***		-0.064***	-0.069
	(-3.30)		(-3.04)	(-0.87)
Repv		-0.364**		
		(-2.41)		
DIV			-0.108***	-0.109***
			(-4.03)	(-2.80)
Rep*DIV				0.007
				(0.08)
Controls/cons	Y	Y	Y	Y
Year effect	Y	Y	Y	Y
Industry effect	Y	Y	Y	Y
Observations	11,501	11,501	11,501	11,501
Adjusted R^2	0.21	0.21	0.21	0.22

	Panel B: Propensity score matching			
	(1)	(2)	(3)	(4)
	Treated group (N=2,138)	Control group (N=2,138)	Diff	*t*-stat
Size	13.301	13.335	-0.024	-0.59
Age	24.535	24.538	-0.003	-0.01
IO	0.579	0.571	0.008	0.98
Analyst	5.316	5.472	-0.156	-0.61
Past returns	0.110	0.110	0.000	0.02
Volatility	0.022	0.022	-0.000	-0.65
Profitability	0.058	0.053	0.005	1.00
MTB	3.159	2.978	0.181	0.95
R&D	0.016	0.016	-0.000	-0.36
Leverage	0.572	0.571	0.001	0.25
LM12	3.006	3.136	-0.130	-0.31
FTSE100	0.188	0.191	-0.003	-0.31
pscore	0.268	0.268	0.000	0.21
Liquidity beta	-0.211	-0.141	**-0.068****	**-2.53**

	Panel C: Regressions based on the matched sample
Dependent variable	Liquidity beta
	(1)
Rep	-0.073***
	(-2.83)
Controls/cons	Y
Year effects	Y
Industry effects	Y
Observations	4,276
Adjusted R^2	0.20

	Panel D: The effect of dividend payouts on CEC

	(1)	(2)	(3)
	The annual effect of dividend policy on CEC via the channel of systematic liquidity risk measured by ($\beta_l \times LIQ$)	The annual effect of dividend policy on CEC via the channel of systematic market risk measured by ($\beta_m \times (R_m - R_f)$)	Firm-year observations
Firms with share repurchases	0.03%	10.66%	2,362
Firms without share repurchases	1.93%	12.48%	9,139
Difference	-1.90%**	-1.82%**	
t-statistic	(-2.54)	(-1.98)	

Table 11 Robustness tests

This table reports the results of alternative measures of systematic liquidity risk and dividend payout, and alternative model specifications. FF_liquidity beta is the coefficient on the illiquidity factor in the model where the LCAPM (Liu, 2006) is augmented by the size, value and momentum factors. The sample period is from 1997 to 2017. DIV/total asset, DIV/sales, DIV/net income and DIV/cash flows are defined as the amount of dividend payout divided by total assets, sales, net income and operational cash flows, respectively. For DIV/sales and DIV/net income, we only include firms that have positive sales and net income. The dependent variable in Panels B and C is liquidity beta estimated by LCAPM (Liu, 2006). In Panel C, we use alternative model specifications by incorporating firm fixed and industry-year fixed effects. Industry-year fixed effects are measured by the interactions between industry dummies and year dummies. *DIV* is equal to one if a firm pay dividends, and zero otherwise. *DVP* is dividend yield defined as dividend per share divided by price at fiscal year end. For the sake of brevity, we report the coefficients on the main variables of interest. Standard errors are clustered at the firm level. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	Panel A : Alternative measures of systematic liquidity risk	
	(1)	(2)
Dep. variable	FF_liquidity beta	FF_liqudiity beta
DIV	-0.106***	
	(-2.93)	
DVP		-0.942**
		(-2.00)
Controls/cons	Y	Y
Year effect	Y	Y
Industry effect	Y	Y
Observations	10,754	10,754
Adjusted R^2	0.18	0.18

	Panel B: Alternative measures of dividend payout			
	(1)	(2)	(3)	(4)
Dep. Variable		Liquidity beta		
DIV/total asset	-1.878***			
	(-3.83)			
DIV/sales		-0.162***		
		(-4.15)		
DIV/net income			-0.126**	
			(-2.57)	
DIV/Cash flows				-0.180***
				(-2.95)
Controls/cons	Y	Y	Y	Y
Year effect	Y	Y	Y	Y
Industry effect	Y	Y	Y	Y
Observations	11,051	10,935	9,053	11,051
Adjusted R^2	0.21	0.20	0.21	0.21

	Panel C: Alternative model specifications			
	(1)	(2)	(3)	(4)
Dep. Variable		Liquidity beta		
DIV	-0.079**	-0.084**		
	(-1.98)	(-2.01)		
DVP			-1.387**	-1.370**
			(-2.31)	(-2.23)
Controls/cons	Y	Y	Y	Y
Year effect	Y	N	Y	N
Year*Industry	N	Y	N	Y
Firm fixed effect	Y	Y	Y	Y
Observations	11,051	11,051	11,051	11,501
Adjusted R^2	0.16	0.21	0.17	0.21

Appendix 1: Variable definitions

Variable name	Definition	Source
Panel A: Liquidity risk		
Liquidity beta	The coefficient on the liquidity factor of LCAPM (Liu, 2006) estimated by a stock's daily returns over prior 12 months.	Datastream
FF_liquidity beta	The coefficient on the illiquidity factor in the model where the LCAPM (Liu, 2006) is augmented by the size, value and momentum factors	Datastream and Xfi Centre for Finance and Accounting, University of Exeter*
Amihud_liquidity beta	The coefficient on the illiquidity factor (ILM) constructed by Amihud (2019) in the model which includes ILM, the Fama-French three factors and the momentum factor.	Datastream and Xfi Centre for Finance and Accounting, University of Exeter*
Panel B: Dividend measures		
DIV	A dummy variable which is equal to one if dividend per share is positive, and zero otherwise.	Datastream
DVP	Dividend yield which is defined as dividend per share over a stock' price at fiscal year end.	Datastream
DIV/total asset	The ratio of dividend payout over total assets	Datastream
DIV/sales	The ratio of dividend payout over total sales	Datastream
DIV/net income	The ratio of dividend payout over net incomes	Datastream
DIV/Cash flows	The ratio of dividend payout over operating cash flows	Datastream
Rep	A dummy variable which is equal to one if net repurchases are non-zero, and zero otherwise. Net repurchase are defined as the increase in common treasury stock if treasury stock is not recorded as zero or missing. If treasury stock is recorded as zero in the current and prior year, we measure repurchase as the difference between stock purchases and stock issuances from the statement of cash flows. If either of these amounts is negative, repurchases are set to zero.	Datastream
Repv	The ratio of the amount of net repurchases over total assets	Datastream
Panel C: Firm characteristics		
LM12	The standardized turnover-adjusted number of days with zero trading volume over prior 12 months	Datastream
TO	The accumulated daily turnover over prior 12 months. The turnover is calculated as a firm's shares outstanding over the trading volume.	Datastream
Profitability	Profitability is the ratio of earnings before interest and taxes to total assets.	Datastream
IO	The percentage of institutional holdings over share outstanding.	Thomson Reuters' Eikon
Analyst	The number of analysts following a firm.	Thomson Reuters' Eikon
MTB	The book value of total shareholder equity divided by the market value of equity.	Datastream
Past return	A stock's accumulated monthly returns over prior 12 months	Datastream
Volatility	The standard deviation of a stock's daily returns in the past 12 months.	Datastream
FTSE100	A dummy variable which is equal to one if a firm is included in the FTSE100 index, and zero otherwise.	Datastream
R&D	The expenditure of research and development over market capitalization.	Datastream
Age	The years since a firm is first recorded in the Datastream.	Datastream
Leverage	The sum of current liabilities and long-term debt over total book assets.	Datastream
Size	Market capitalization in logarithm	Datastream

Dispersion of earnings forecast	The standard deviation of earnings forecasts for the next fiscal year scaled by the mean value of the earnings forecasts made during the same year	Thomson Reuters' Eikon
Gov_ score	A weighted average of management, shareholder, and social responsibility scores	Thomson Reuters' Eikon
The percentage of independent director	The percentage of independent directors on the board	Thomson Reuters' Eikon
CEO-Chairman	A CEO is also the chairman of the board	Thomson Reuters' Eikon

* See http://business-school.exeter.ac.uk/research/centres/xfi/famafrench/files/