

Does Investor Protection Affect Bank Liquidity Risk?

투자자 보호제도가 은행들의 유동성위험에 영향을 미치는가?

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투자자 보호제도가 은행들의 유동성위험에 영향을 미치는가?

Does Investor Protection Affect Bank Liquidity Risk?

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요약

2008년 글로벌 금융위기가 유동성위험에서 촉발되었으므로 금융위기 이후 유동성위험 관리방안에 대해 많은 연구들이 수행되었다. 그러나 투자자 보호 정도가 은행들의 유동성위험에 영향을 미치는지에 대해서는 전 세계적으로 아직 연구된 바가 없으므로 본 연구에서는 투자자 보호와 유동성위험과의 관계를 고찰하고 정책적 시사점을 도출하였다. 경제협력개발기구(OECD) 21개국 상업은행들을 대상으로 패널데이터를 구축하여 분석한 결과, 투자자에 대한 보호 수준이 높을수록 은행들의 유동성위험이 낮아짐을 발견하였다. 또한 투자자 보호의 이러한 긍정적 효과는 금융위기 기간 동안 더욱 강화되는 것으로 나타났다. 이는 금융위기 기간 동안 시행되는 강력한 경기부양책으로 인해 시장에 의한 규율이 약화된 상황에서 법적인 투자자 보호제도가 은행들의 건전성 제고에 기여할 수 있음을 시사한다.

■ 중심어 : | 금융기관 | 유동성위험 | 투자자 보호 | 금융위기 | 법과 금융 |

Abstract

There has been a large literature on bank liquidity risk since the 2008 global financial crisis because liquidity risk was at the heart of the crisis. However, there is no study that investigates whether the level of investor protection influences liquidity risk-taking behavior of banks. Therefore, this study aims to explore the relationship between investor protection and liquidity risk as well as to provide policy implications. Using a panel dataset of commercial banks in 21 OECD countries, we found that strong investor protection encourages banks to take lower liquidity risk. Furthermore, this positive role of shareholder protection is more prominent during a crisis, implying that legal protection of investors plays an essential role in bank stability while market discipline is largely ineffective due to extensive government guarantees in turbulent times.

■ keyword : | Financial Institutions | Liquidity Risk | Investor Protection | Financial Crisis | Law and Finance |

I. Introduction

There have been considerable academic and regulatory interests in managing and regulating bank liquidity risk since the global financial

crisis of 2008 because banks' excessive liquidity risk-taking was one of main causes of the crisis [1-3]. Bank risk is particularly important and should be carefully managed in that it has a significant impact on the stability of the

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banking system and economic growth. Ivashina and Scharfstein (2010) argued that banks with higher liquidity risk, relying more heavily on short-term debt, reduced their lending more during the crisis. The supply of credit is crucial for the growth of the economy. Ippolito et al. (2019) reported that banks with greater liquidity risk offer tougher conditions to borrowers who violate their covenant of credit lines, forcing them to change their source of finance. Kim (2018) and Jiang et al. (2019) showed that competition leads banks to reduce their liquidity risk, contributing to financial stability.

Despite a large body of literature on bank liquidity risk, most studies have focused mainly on from the perspective of credit supply and market structure. Not much attention has been paid to the relationship between investor protection and liquidity risk-taking behavior of banks. In fact, the last crisis also shed new light on investor expropriation by bank managers and controlling shareholders, such as enormous executive perquisites, personal loans to insiders, and excessive compensation, taking advantage of risk-shifting[8][9]. The limited research in this area is surprising given the severity of the crisis which stemmed from excessive liquidity risk. Therefore, this paper attempts to fill this gap by investigating whether minority shareholder protection leads banks to take on less liquidity risk, considering the impact of the 2008 financial crisis.

Why should we focus on shareholders when it comes to liquidity risk-taking behavior of banks? That is because the last financial crisis raised questions about the effectiveness of market discipline, which had long been recognized as a key mechanism to keep the banking system stable. Previous literature

argued that market participants—such as institutional investors and other short-term creditors—have an ability and incentives to punish banks for taking excessive risk because they have to bear losses from bank failures. In line with this argument, many studies showed that market discipline performs well in normal times, whereas it might not be effective due to substantial government guarantees during times of market stress[10–12]. The discipline in the marketplace, however, was largely absent around the last financial crisis. In such circumstances, shareholders could be a complementary source to impose discipline on bank management in that their investments are directly associated with bank performance. If the legal system can effectively support shareholders to exercise their rights, then they may perform well as a monitor of bank liquidity risk-taking.

Using a panel dataset for 11,640 bank-year observations of 21 Organization for Economic Cooperation and Development (OECD) countries from 2000 to 2014, we found that investor protection contributes to lower bank liquidity risk. Interestingly, this beneficial role of investor protection becomes more pronounced during a crisis, suggesting that better shareholder protection encourages banks to curb liquidity risk-shifting in times of market stress.

This paper contributes to the literature as follows. First, this paper is the first study to show that the legal protection for shareholders plays a vital role in managing liquidity risk. Given the significance of managing liquidity risk for bank stability, it is important to understand how legal and institutional systems affect liquidity risk-taking of banks. Second,

this paper provides important policy implications on the necessity of strong investor protection for the stability of the banking system. That is, the legal system for shareholders matters for liquidity risk-taking behavior of banks. Furthermore, this legal factor becomes more meaningful during a crisis in which market discipline by non-deposit creditors does not work well in turbulent times while dominant insiders' risk-shifting incentives significantly increase due to extensive government supports such as bank bailouts.

II. Literature Review and Hypothesis Development

Banks are inherently exposed to liquidity risk because they rely on short-term liabilities to invest in long-term assets[13]. Banks, however, engaged in excessive liquidity risk until the outbreak of the 2008 financial crisis[14][15]. Excessive risk-taking often aims to facilitate self-dealing that managers and controlling shareholders pursue to take private benefits[16]. Self-dealing includes looting, tunneling, or expropriation of investors which includes transferring profits out of corporations and committing funds to unprofitable investments that provide private benefits[17]. Furthermore, investor protection is crucial for banks because they are more opaque than firms in other industries[18]. In general, opacity leads dominant insiders to steal profits rather than to share them with minority shareholders.

Previous studies argued that non-deposit creditors have an incentive to discipline banks not to take excessive risk because they have to incur losses when banks go bankrupt. In

contrast, depositors do not have incentives to monitor banks in that their investments are safe due to deposit insurance. However, there was no effective market discipline by unsecured creditors before the last crisis[19][20].

Then, what makes banks operate prudently, preventing them from taking excessive risks? Shareholders may perform the disciplinary role for banks because they also have to suffer losses from the bankruptcy of banks. It is generally accepted that strong institutional and legal protections for shareholders reduce self-dealing by dominant insiders[9]. Therefore, better protection of minority shareholders is expected to help banks take less liquidity risk.

During a crisis, dominant insiders attempt to extract more from a company in order to maximize their current benefits[21]. This problem is more severe in the banking industry because bank insiders are subject to have greater risk-shifting incentives during a crisis, taking advantage of massive government safety nets. Furthermore, market discipline—which encourages banks to be sound and stable by punishing for taking excessive risks—is largely absent because uninsured creditors lose their incentives to monitor banks due to extensive government guarantees[10][22]. In such circumstances, legal protection of investors might be able to play a role in limiting banks to take greater liquidity risk during a crisis. Therefore, the following hypotheses are proposed.

H1: Stronger investor protection leads banks to take less liquidity risk.

H2: The beneficial role of investor protection in reducing liquidity risk is more

prominent during a financial crisis.

Although it is well known that legal or institutional systems are extremely stable over time, the level of investor protection may change slowly in response to banks' liquidity risk-taking behavior. That is, investor protection and liquidity risk may be jointly determined. To address this potential endogeneity, we employed legal origin—which does not vary over time—as a proxy for investor protection in that legal origin is highly correlated with the level of investor protection. La Porta et al. (1998) and Djankov et al. (2008) show that investor protection is the strongest in English common-law countries and the weakest in French civil-law countries, with German and Scandinavian civil-law countries offering moderate shareholder protection. Thus, the following hypotheses are formulated.

- H3: Banks in English common-law countries take lower liquidity risk than those in civil-law countries.
- H4: The tendency that banks in English common-law countries behave more prudently than those in civil-law countries is intensified during a crisis.

Besides, Bank credit risk is closely related to liquidity risk. According to Bryant (1980), Diamond and Dybvig (1983), and Gatev et al. (2009), credit risk is connected with liquidity risk through bank balance sheet structure. However, there was no direct research that examined the relationship between credit risk and liquidity risk. Recently, Imbierowicz and Rauch (2014) investigated this issue and found

that liquidity risk does not have a reliable relationship with credit risk although both risks jointly have a significant impact on bank stability.

Bank equity capital also matters for liquidity risk. Bhattacharya and Thakor (1993) suggested that more equity capital encourages banks to take greater liquidity risk because it provides a buffer, thereby enhancing risk-bearing capacity. On the other hand, Berger and Bouwman (2009) argued that the effect of capital on bank liquidity risk varies across large banks and small banks. For large banks, more capital results in higher liquidity risk through increasing risk-bearing capacity. For small banks, however, greater capital leads to lower bank liquidity risk, crowding out depositors.

Bank size plays a part in liquidity risk-taking of banks. Classic banking literature supports that too-big-to-fail (TBTF) banks are willing to take on more risk (e.g., [29]). More recently, in line with the existing body of literature, Afonso et al. (2015) argued that TBTF banks have an incentive to engage in risky activities, taking advantage of government support. This, in turn, leads smaller banks, which should compete with the TBTF banks, to take greater risk. Marques et al. (2018) found that guaranteed banks, which are more likely to be large, tend to increase their risk because government aids reduce market discipline while increasing charter value.

The relationship between competition and bank risk is well documented because market structure is one of crucial factors for bank stability [32–34]. For liquidity risk, Kim (2018) found that greater market power results in higher liquidity risk. Using US commercial bank data, Jiang et al. (2019) showed that

competition helps banks to reduce liquidity risk.

III. Data and Methodology

1. Data

We constructed a panel dataset comprising 1,728 commercial banks across 21 OECD countries with investor protection data between 2000 and 2014. Countries with fewer than five banks were dropped from the sample in order to include the market structure measure, which significantly affects banks' risk-taking(e.g., [32]). In addition, the United States (US) was excluded from the sample because we did not want our results to be driven by the US banking system which has numerous small banks. Therefore, our sample consisted of Austria, Belgium, Canada, Czech Republic, Denmark, France, Germany, Hungary, Israel, Italy, Japan, South Korea, Mexico, Netherlands, Norway, Poland, Portugal, Sweden, Switzerland, Spain, and the United Kingdom(UK).

Bank-level accounting information was collected from the Bankscope database. The investor protection index was obtained from the World Bank's Doing Business database, which is based on Djankov et al. (2008). Legal origins were collected from La Porta et al. (1998). Macroeconomic data were from the World Development Indicators.

2. Empirical methodology

To examine whether investor protection matters for banks' liquidity risk-taking, we employed the following estimation model:

$$\begin{aligned} Liquidityrisk_{ijt} = & \beta_0 + \beta_1 Investor\ protection_{jt} \\ & + \beta_2 Crisis_t \\ & + \beta_3 Investor\ protection_{jt} * Crisis_t \\ & + \beta_4 Non-performing\ loans_{ijt-1} \\ & + \beta_5 Equity_{ijt-1} \\ & + \beta_6 Assets_{ijt-1} \\ & + \beta_7 Market\ concentration_{jt} \\ & + \beta_8 GDP\ per\ capita_{jt} \\ & + \beta_9 GDP\ growth_{jt} \\ & + \mu_i + \tau_t + \epsilon_{ijt} \end{aligned} \quad (1)$$

where *Liquidity risk_{ijt}* indicates the liquidity risk of bank *i* in country *j* in year *t* and was calculated as the liquidity creation scaled by total assets. We employed the magnitude of liquidity creation to measure liquidity risk because banks are exposed to liquidity risk while they create liquidity by transforming illiquid assets into liquid deposits[13]. Following Berger and Bouwman (2009), we constructed the “cat fat” liquidity creation measure using a three-step procedure. In the first step, for each bank, we classified all bank assets, liabilities, equity, and off-balance sheet activities as liquid, semi-liquid, or illiquid because banks create liquidity using both asset and liability side activities. In the second step, we assigned weights to the classified balance sheet activities depending on the level of liquidity. In the third step, we constructed the liquidity creation measure by combining the classified and weighted balance sheet activities in the first and second steps.

Investor protection_{jt} is measured by the investor protection index (*Investor protection*) and legal origins. Investor protection is calculated as the simple average of three sub-components: transparency of related-party transactions (*Disclosure*), holding directors liable for self-dealing (*Director liability*), and the ease of shareholder suits for misconduct of dominant insiders (*Shareholder suits*). *Investor protection* represents the strength of minority

investor protections. That is, if shareholders are well protected, they can enjoy enhanced disclosure requirements for related-party transactions, extended access to information in shareholder actions, and increased director liability. The index ranges from 0 to 10 with higher values indicating better protection of minority shareholders against expropriation by dominant bank insiders such as managers and controlling shareholders. *Disclosure* means intermediate and periodic disclosure requirements to the public for interested party transactions. The index ranges between 0 and 10 with higher values representing greater disclosure of related party transactions. *Director liability* means minority shareholders' ability to sue and hold directors(CEO, members of the board of directors or members of the supervisory board) liable for the damages caused to the company from directors' fraud or negligence. The index ranges from 0 to 10, with higher values indicating stronger liability of directors. *Shareholder suits* represent the ease of the access to internal corporate documents and the extent of the evidence obtainable during trials. The index ranges between 0 and 10 with higher values representing greater power of shareholders to challenge transactions with interested parties. We estimated each regression model separately with the investor protection index and its three sub-components because the variables are highly correlated to each other.

Regarding legal origins, we divided countries into four groups: *English*, *French*, *German*, and *Scandinavian*, following La Porta et al. (1998). They are indicator variables that take the value of one if a country belongs to a certain legal origin. For instance, English has the value of

one if a bank is from the United Kingdom. The indicator variable for the financial crisis, *Crisis*, takes the value of one if the year is 2007 or 2008.

For the bank-level variables, *Non-performing loans*_{*ijt-1*} represents bank credit risk, which is calculated as the ratio of non-performing loans to total loans, *Equity*_{*ijt-1*} is the equity to assets ratio, and *Assets*_{*ijt-1*} indicates the logarithm of total assets. We used one-year lagged values of the bank-specific variables to mitigate potential endogeneity. For the country-level variables, *Market concentration*_{*it-1*} is measured as the logarithm of four-bank concentration ratio. *GDP per capita*_{*it-1*} is calculated as the logarithm of gross domestic product. The GDP per capita is employed to capture the level of economic development. GDP growth *rates*_{*it-1*}, which is the annual GDP growth, is introduced to control for the impact of business cycle. μ_i and τ_t represents bank fixed effects and year fixed effects, respectively. ε_{ijt} is an error term.

Our basic specification model is the fixed effects model which incorporates bank fixed effects in the estimations. However, we also conducted the random effects model for regressions with *Director liability* and *Legal origins* because those variables do not change during the sample period. All regressions employed robust standard errors clustered by country in order to control for both heteroskedasticity and serial correlation.

[Table 1] presents summary statistics on the variables used in the regressions. The sample consisted of 11,640 bank-year observations. The values of bank liquidity risk, which is the dependent variable, range from -0.2272 to 1.2349. According to Berger and Bouwman (2009), the liquidity creation measure can be

negative in that banks destroy liquidity when they provide illiquid liabilities by using liquid assets. Explanatory variables of interest are *Investor protection*, *Disclosure*, *Director liability*, *Shareholder suits*, of which the means are 5.3055, 5.4107, 4.8038, and 5.7169, respectively. 14.94% of banks in our sample are from English common-law countries; 26.51% of banks are from Scandinavian civil-law countries; 49.63% of banks are from German civil-law countries; 8.92% of banks are from French civil-law countries. Non-performing loans ratios and capital ratios of our sample banks are 0.0136 and 0.1205, respectively.

Table 1. Summary statistics

| Variable | N | Mean | Std. dev. | Min | Max |
|-----------------------------|--------|--------|-----------|---------|--------|
| <i>Bank liquidity risk</i> | 11,640 | 0.6068 | 0.3373 | -0.2272 | 1.2349 |
| <i>Investor protection</i> | 11,640 | 5.3055 | 1.5869 | 3 | 8.3 |
| <i>Disclosure</i> | 11,640 | 5.4107 | 3.387 | 1 | 10 |
| <i>Director liability</i> | 11,640 | 4.8038 | 1.9059 | 1 | 9 |
| <i>Shareholder suits</i> | 11,640 | 5.7169 | 1.4725 | 4 | 9 |
| <i>English</i> | 11,640 | 0.1494 | 0.3565 | 0 | 1 |
| <i>Scandinavian</i> | 11,640 | 0.2651 | 0.4414 | 0 | 1 |
| <i>German</i> | 11,640 | 0.4963 | 0.5 | 0 | 1 |
| <i>French</i> | 11,640 | 0.0892 | 0.2851 | 0 | 1 |
| <i>Non-performing loans</i> | 11,640 | 0.0136 | 0.0271 | 0.0003 | 0.1317 |
| <i>Equity</i> | 11,640 | 0.1205 | 0.1153 | 0.0294 | 0.7839 |
| <i>Assets</i> | 11,640 | 14.150 | 1.982 | 9.1022 | 17.998 |
| <i>Market concentration</i> | 11,640 | 4.2774 | 0.2219 | 3.5737 | 4.6047 |
| <i>GDP per capita</i> | 11,640 | 10.351 | 0.4883 | 8.3767 | 11.447 |
| <i>GDP growth</i> | 11,640 | 0.0168 | 0.0235 | -0.0669 | 0.0949 |

IV. Empirical Results

1. Investor protection and bank liquidity risk

[Table 2] shows results that test our hypotheses (H1, H2) for the impact of investor protection on bank liquidity risk. The dependent variable is bank liquidity risk. Key explanatory variables of interest are investor protection index and its sub-components: the extent of disclosure for related-party transactions, the extent of shareholders' ability to hold dominant insiders liable for self-dealing, and the ease of shareholder suits for expropriation by directors. We estimated each model separately in order to address the multicollinearity problem. Therefore, Models (1), (2), (3), and (4) are for *Disclosure*, *Director liability*, *Shareholder suits*, and *Investor protection*, respectively. Robust t-statistics are reported in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Consistent with our hypothesis H1, we found that stronger minority shareholder protection results in lower bank liquidity risk for all models. Specifically, the coefficient of *Disclosure* is negative (-0.0193) and statistically significant at the 1% level. This result implies that banks concealing information take on more liquidity risk while dominant insiders might enjoy private benefits. The coefficients of *Director liability* and *Shareholder suits* are also significantly negative, implying that banks with better shareholder ability to punish for expropriation—through holding dominant insiders liable or suing them for their misconduct—reduce their liquidity risk-taking. Likewise, *Investor protection* is negatively associated with bank liquidity risk. The coefficient of *Investor protection* is -0.0905 and statistically significant at the 1% level. This

result suggests that banks take on less liquidity risk as better investor protection can effectively curb bank insiders' incentives to pursue private benefits.

Turning to our control variables, coefficients of *Non-performing loans* in Models (1), (2), (3), and (4) are all insignificant. These results are consistent with Imbierowicz and Rauch (2014) which argued that there is no reliable relationship between liquidity risk and credit risk. In each model, *Equity* is negatively related to liquidity risk at the 1% significance level, implying that equity capital leads banks to reduce liquidity risk. Bank size does not matter for liquidity risk, as shown by insignificant coefficients of *Assets*. These results suggest that the impact of bank size on liquidity risk may vary across large (or TBTF) banks and small banks. *Market concentration* has a positive and significant coefficient in each model. The results are in line with Kim (2018) and Jiang et al. (2019) which showed that enhanced competition helps banks to behave prudently in terms of liquidity risk-taking. According to the coefficients of *GDP per capita* and *GDP growth*, macroeconomic conditions in terms of economic development and business cycles are not important determinants for liquidity risk-taking behavior of banks.

Table 2. Effects of investor protection on bank liquidity risk

| Dependent variable: Bank liquidity risk | | | | |
|---|-----------------------|----------------------|-----------------------|-----------------------|
| Explanatory variable | (1) | (2) | (3) | (4) |
| <i>Disclosure</i> | -0.0193*** (-3.58) | | | |
| <i>Director liability</i> | | -0.0328** (-2.09) | | |
| <i>Shareholder suits</i> | | | -0.1143*** (-4.62) | |
| <i>Investor protection</i> | | | | -0.0905*** (-3.95) |
| <i>Crisis</i> | 0.0082** (2.26) | 0.0058*** (2.93) | 0.0127*** (4.51) | 0.0116*** (3.78) |

| | | | | |
|-----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <i>Disclosure*Crisis</i> | -0.0091** (-2.08) | | | |
| <i>Director liability*Crisis</i> | | -0.0039 (-1.58) | | |
| <i>Shareholder suits*Crisis</i> | | | -0.0174*** (-3.32) | |
| <i>Investor protection*Crisis</i> | | | | -0.0159*** (-3.13) |
| <i>Non-performing loans</i> | 0.1254 (1.32) | 0.0226 (0.83) | 0.0810 (1.11) | 0.0947 (1.21) |
| <i>Equity</i> | -0.4316*** (-6.93) | -0.5210*** (-7.55) | -0.3485*** (-7.12) | -0.3445*** (-7.20) |
| <i>Assets</i> | 0.0008 (0.06) | -0.0215 (-1.32) | -0.0007 (-0.05) | -0.0002 (-0.01) |
| <i>Market concentration</i> | 0.0640** (2.30) | 0.0529* (1.85) | 0.0601** (2.26) | 0.0657** (2.39) |
| <i>GDP per capita</i> | -0.1234 (-1.64) | -0.0657** (-2.01) | -0.0709 (-1.09) | -0.1179 (-1.67) |
| <i>GDP growth</i> | -0.2164 (-0.69) | -0.1294 (-0.74) | 0.0142 (0.06) | -0.2145 (-0.73) |
| <i>Constant</i> | 1.5802** (2.44) | 1.3694*** (4.53) | 1.6911*** (3.05) | 1.8055** (2.79) |
| R-squared | 0.0457 | 0.0571 | 0.0502 | 0.0482 |
| Observations | 11,640 | 11,640 | 11,640 | 11,640 |

Notes: Robust t-statistics are reported in parentheses.
***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Furthermore, we interacted investor protection variables with the crisis dummy variable to test whether the effect of investor protection on liquidity risk-taking behavior changes during a crisis.

We found that the coefficients of *Disclosure*Crisis*, *Shareholder suits*Crisis*, and *Investor protection*Crisis* are all negative and statistically significant. The results support our hypothesis H2. Our results imply that legal protection of minority shareholders—through improving disclosure requirements and enhancing shareholders' ability to punish banks—helps banks to reduce liquidity risk-shifting from dominant insiders during a crisis.

2. Legal origins and bank liquidity risk

We examined the relationship between legal origins and bank liquidity risk in [Table 3] to check for the robustness of our findings. As mentioned above, we can deal with endogeneity

concerns for the relationship between investor protection and liquidity risk by employing legal origin as a proxy of investor protection. We estimated Models (1)-(4) for each legal origin indicator variable separately in order to study the effect of each legal origin on bank liquidity risk. In Model (5), we re-estimated the model incorporating all legal origin variables—except for *French*—to control for the effects of other legal origins. The dependent variable is bank liquidity risk. Key explanatory variables are legal origins: English common-law [Model(1)], Scandinavian civil-law [Model(2)], German civil-law [Model(3)], and French civil-law [Model(4)]. Robust t-statistics are reported in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3. Effects of legal origins on bank liquidity risk

| Dependent variable: Bank liquidity risk | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Explanatory variable | (1) | (2) | (3) | (4) | (5) |
| <i>English</i> | -0.0643** (-2.23) | | | | -0.0951*** (-3.02) |
| <i>Scandinavian</i> | | 0.0503 (0.96) | | | -0.0130 (-0.20) |
| <i>German</i> | | | -0.0917 (-0.74) | | -0.1018 (-1.05) |
| <i>French</i> | | | | 0.0574 (1.65) | |
| <i>Crisis</i> | 0.0063*** (2.50) | 0.0069*** (2.61) | 0.0040** (2.55) | 0.0039* (1.78) | 0.0057*** (3.59) |
| <i>English</i> <i>*Crisis</i> | -0.0272** (-2.18) | | | | -0.0389*** (-2.97) |
| <i>Scandinavian</i> <i>*Crisis</i> | | -0.0465 (-1.24) | | | -0.0305 (-1.63) |
| <i>German</i> <i>*Crisis</i> | | | 0.0362 (1.19) | | 0.0044 (0.22) |
| <i>French</i> <i>*Crisis</i> | | | | 0.0156 (0.95) | |
| <i>Non-performing loans</i> | 0.1306 (0.89) | 0.1244 (0.85) | 0.1228 (0.86) | 0.1333 (0.92) | 0.1027 (0.73) |
| <i>Equity</i> | -0.5291*** (-9.66) | -0.5315*** (-9.57) | -0.5317*** (-9.72) | -0.5267*** (-9.11) | -0.5321*** (-9.64) |
| <i>Assets</i> | -0.0211 (-0.26) | -0.0239 (-0.82) | -0.0244 (-0.95) | -0.0208 (-0.31) | -0.0246 (-0.89) |
| <i>Market concentration</i> | 0.0512 (1.50) | 0.0575* (1.89) | 0.0632** (1.99) | 0.0556* (1.71) | 0.0629** (2.18) |
| <i>GDP per capita</i> | -0.0825*** (-2.65) | -0.0705* (-1.94) | -0.0882*** (-2.73) | -0.0875*** (-2.68) | -0.0839** (-2.32) |
| <i>GDP growth</i> | -0.3437 | -0.2587 | -0.3965 | -0.3706 | -0.3893 |

| | (-1.05) | (-0.80) | (-1.23) | (-1.18) | (-1.21) |
|-----------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <i>Constant</i> | 1.5847*** (6.47) | 1.4393*** (4.50) | 1.6691*** (5.37) | 1.6044*** (6.09) | 1.5686*** (4.46) |
| R-squared | 0.0536 | 0.0525 | 0.0674 | 0.0745 | 0.0719 |
| Observations | 11,640 | 11,640 | 11,640 | 11,640 | 11,640 |

Notes: Robust t-statistics are reported in parentheses.

***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

We found results consistent with our hypotheses H3 and H4. English of Model (1) has significantly negative coefficient (-0.0643). The coefficient of *English***Crisis* is also negative (-0.0272) and significant at the 5% level. The results suggest that banks in countries with strong investor protection take on less liquidity risk, and this tendency is intensified during times of market stress. In contrast, *Scandinavian*, *German*, and *French* of Models (2)-(4) have insignificant coefficients. In Model (5), the coefficient of *English* is negative (-0.0951) and significant at the 1% level while those of *Scandinavian* and *German* are insignificant. *English***Crisis* is also negatively related to bank liquidity risk.

Taken together, the results imply that banks in English common-law countries take lower liquidity risk than those in French civil-law countries, and this tendency becomes more prominent during a crisis.

V. Conclusion

Market discipline has long been understood as a key element to promote the safety and soundness in the banking system. Prior research argued that market discipline is fairly effective in normal times because uninsured creditors have sufficient incentives to monitor banks. In contrast, market discipline does not work well during a crisis because even uninsured creditors

lose incentives to discipline banks due to extensive government guarantees to boost the economy. The financial crisis of 2008, however, showed that market participants did not provide appropriate disciplinary roles regardless of economic conditions, leaving banks to build up excessive liquidity risk.

In such circumstances, we definitely should figure out what went wrong with market discipline around the 2008 financial crisis as well as how to make it perform well as a main discipline mechanism. But we also could consider additional devices to complement discipline by market participants. Therefore, we focused on shareholders and examined the impact of shareholder protection on bank liquidity risk because better protection for investors could make ease their disciplining activities and contribute to improving financial stability of banks.

We found that better protection of minority shareholders prevents banks from taking greater liquidity risk. Interestingly, the role of investor protection in lowering liquidity risk becomes more prominent during a crisis in which dominant bank insiders' risk-shifting incentives dramatically increase. We also found that banks in English common-law countries take less liquidity risk than those in French civil-law countries. Taken together, our findings provide policy implications that minority shareholder protection matters for determining bank liquidity risk, and is particularly important for limiting banks' liquidity risk-shifting during times of crisis.

Although our study is meaningful as the first study to explore the impact of investor protection on liquidity risk, our investigation has limitations which provide suggestions for

future research. First, we employed the protecting minority shareholders indicators from the World Bank's Doing Business database as proxies for investor protection. This is because we intended to explore the effect of a country's legal environments on bank liquidity risk from the perspective of law and finance. However, it would be interesting if other firm-level governance variables such as the level of corporate disclosure and independent boards could be considered. Second, our results have low R-squared values. Although it is generally accepted that the low R-squared does not matter if empirical results have statistically significant coefficients in concrete models [35][36], our results should be carefully interpreted. We think that the main cause of our low R-squared values might be our large dataset over 10,000 observations. Finally, our sample period is from 2000 to 2014. Future research can extend the sample period in order to focus on the post-crisis effect of investor protection on liquidity risk.

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