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BANK INSOLVENCY RISK:  
INTERNATIONAL EVIDENCE**

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# **CORPORATE GOVERNANCE AND BANK INSOLVENCY RISK: INTERNATIONAL EVIDENCE**

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## ABSTRACT

### Corporate Governance and Bank Insolvency Risk: International Evidence

This paper finds that shareholder-friendly corporate governance is positively associated with bank insolvency risk, as proxied by the Z-score and the Merton's distance to default measure, for an international sample of banks over the 2004-2008 period. Banks are special in that 'good' corporate governance increases bank insolvency risk relatively more for banks that are large and located in countries with sound public finances, as banks aim to exploit the financial safety net. 'Good' corporate governance is specifically associated with higher asset volatility, more non-performing loans, and a lower tangible capital ratio. Furthermore, 'good' corporate governance is associated with more bank risk taking at times of rapid economic expansion. Consistent with increased risk-taking, 'good' corporate governance is associated with a higher valuation of the implicit insurance provided by the financial safety net, especially in the case of large banks. These results underline the importance of the financial safety net and too-big-to-fail policies in encouraging excessive risk-taking by banks.

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## 1. Introduction

Corporate managers may be more risk averse than shareholders, as corporate bankruptcy generally causes managers to lose their jobs, part of their personal wealth and their reputation.<sup>1</sup> ‘Good’ corporate governance - promoting the interests of shareholders – may serve to counteract managers’ bias against risk taking. In line with this, John, Litov, and Young (2008) find that ‘better’ corporate governance represented in the form of stronger investor protection brings about increased risk-taking and higher growth for an international sample of non-financial firms.

For financial institutions, the calculus regarding the optimal degree of risk taking is different than for non-financial firms, as banks tend to be supported by the financial safety net if they become distressed. Banks, in particular, benefit from deposit insurance and may receive generous public support to prevent their failure. The financial safety provides banks with an incentive to take on excessive risks in order to increase the value of these benefits. Hence, the financial safety net is expected to affect the association between risk taking and corporate governance (see for example, Laeven, 2013). Large banks may benefit relatively more from the financial safety net, as they may be deemed too big to fail by regulators (see Acharya, Anginer and Warburton 2014, , and Bertay, Demirguc-Kunt, and Huizinga, 2013). For this reason, shareholder-friendly corporate governance may increase risk taking more in the case of large banks. Similarly, a country’s financial safety net is more credible if it has sound public finances (Acharya, Drechsler, and Schnabl, 2013, and Demirguc-Kunt, and Huizinga, 2013). Therefore,

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<sup>1</sup> This paper’s findings, interpretations, and conclusions are entirely those of the authors and do not necessarily represent the views of the World Bank, its Executive Directors, or the countries they represent.

shareholder-friendly corporate governance is likely to increase bank risk taking especially in fiscally strong countries.

This paper empirically examines the relationships between bank risk taking and corporate governance for an international sample of banks from 22 countries over the 2004-2008 period. Following Aggarwal et al. (2009), we use an overall index of the shareholder-friendliness of corporate governance, and subindices dealing with board composition, compensation, auditing and takeover-related issues, based on data from Institutional Shareholder Services.

We find that a bank's insolvency risk, proxied by its Z-score or market-based distance to default, is positively associated with the overall index of the shareholder-friendliness of its corporate governance. The positive relationships between overall bank risk and different measures of corporate governance are robust to instrumental variables estimation, where, as instruments we use the annual country-mean values of the corporate governance variables over all banks after excluding the pertinent bank.

Furthermore, we find that bank insolvency risk is positively associated with the shareholder-friendliness of a bank's corporate governance especially for large banks and for banks located in fiscally sound countries. These results are consistent with the view that shareholder-friendly corporate governance increases bank risk more if the additional bank risk significantly increases a bank's contingent claim on the financial safety net.

Going beyond measures of insolvency risk, we also examine the 'channels' through which a bank takes on more risk, if it has more shareholder-friendly corporate governance. On the asset side, we find that asset volatility derived from Merton's option pricing model, and the share of non-performing loans in total loans, are positively related

to ‘good’ corporate governance. On the liability side, we find a negative relationship between a bank’s tangible equity ratio and the corporate governance index.

Our results also suggest that corporate governance affects the relationship between bank risk taking and the business cycle. Specifically, lending at banks with more shareholder-friendly corporate governance is more procyclical as such banks may care less about the riskiness of expanding credit at the height of the business cycle. In addition, we find that banks with ‘good’ corporate governance report less non-performing loans at times of high economic growth. This suggests that banks with ‘good’ corporate governance bias their reporting of non-performing loans downward during periods of rapid economic expansion so as to preserve capital to be able to continue to increase credit. Similarly, we see that banks with ‘good’ corporate governance have relatively low tangible capital ratios when the economy grows rapidly.

The higher bank risk associated with shareholder-friendly corporate governance should benefit banks to the extent that this increases the valuation of the implicit insurance provided by the financial safety net. As an extension, we examine the relationship between corporate governance and the estimated value of the implicit insurance provided by the financial safety net. We find that shareholder-friendly corporate governance is associated with a higher value of the implicit insurance, especially for large banks. This is consistent with the notion that large banks have an incentive to increase the value of the implicit insurance by increasing their risk, since their too-large-to-fail status increases their chances of collecting on this insurance.

Our study fits in an emerging literature that has addressed the impact of corporate governance on bank risk taking.<sup>2</sup> Pathan (2009) finds that small boards and boards that are not controlled by the CEO lead to additional bank risk as reflected in market measures of risk and the Z-score for a sample of US bank holding companies over the 1997-2004 period. Chen, Steiner, and Whyte (2006), in turn, find a positive impact of option-based executive compensation and wealth on market measures of risk for a sample of US commercial banks during the period 1992-2000. DeYoung, Peng, and Yan (2013) further find that CEO risk-taking incentives lead to riskier business policy decisions (regarding loans to businesses, non-interest based banking activities, and investment in mortgage-backed securities) at US commercial banks over the 1994-2006 period, especially in the second half of the sample period after deregulation and for the largest banks. Calomiris and Carlson (2014) examine bank ownership and risk-taking at US banks in the 1890s, finding that higher managerial ownership is associated with lower bank default risk.

Several papers have also examined how banks with different corporate governance regimes fared during the crisis, with mixed results. Berger, Bjorn, and Rauch (2012) find that high shareholdings of outside directors and chief officers imply a substantially lower probability of bank failure for US commercial banks over the 2007-2010 period. Fahlenbrach and Stulz (2011) find some evidence that US banks with CEOs whose incentives were better aligned with the interests of shareholders in 2006 had worse share price performance during the subsequent crisis. Ellul and Yerramilli (2013) report that US bank holding companies that had a strong and independent risk management

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<sup>2</sup> Recent surveys are offered by Becht, Bolton, and Roell (2011) and Mehran, Morrison and Shapiro (2012).

function in place before the onset of the financial crisis fared better in terms of operating and stock performance during the crisis.

However, multi-country studies of bank corporate governance and risk taking are relatively scarce. Laeven and Levine (2009) examine the relationship between bank ownership and bank risk taking for an international sample of banks. They find that greater cash flow rights of large owners are associated with greater bank risk, consistent with the hypothesis that bank shareholders favor risk-taking relative to managers and creditors. These authors also consider the interaction between bank regulation and ownership, finding that deposit insurance is associated with an increase in risk only when the bank has a large equity holder. More recently, using international data, Erkens, Hung, and Matos (2012) find that financial institutions with more independent boards and higher institutional ownership experienced worse stock returns during the global financial crisis.

Our contribution to this literature is three-fold. First, we use international bank-level data for 22 countries to study the association between bank risk and corporate governance, adding to a literature which has mostly relied on US data. Second, using multi-country data allows us to exploit differences across country safety-nets to study how the relationship between bank risk-taking and corporate governance varies with the generosity and credibility of the safety net and banks' ability to engage in risk-shifting. Third, we are able to study how banks increase their risk-taking with more share-holder friendly corporate governance, identifying increased asset risk, reduced capitalization, and the pursuit of more pro-cyclical lending policies as potential channels.

Overall, our findings on the interaction of bank-level corporate governance variables and the financial safety net has important implications for corporate governance reforms in the banking sector, as policy makers question the extent to which governance failures have contributed to excessive risk taking and financial instability. In particular, our results suggest that one has to be cautious to call for ‘better’ corporate governance at banks as long as generous financial safety nets and too-big-to-fail policies are in place, as this may actually induce banks to take on more risk with potentially negative repercussions for the stability of the financial system.

In the remainder, section 2 discusses the data, and section 3 presents the empirical results. Section 3 starts with an analysis of the relationships between corporate governance and overall bank insolvency risk and bank returns. Then it considers the ‘channels’ on the assets and liabilities sides of the bank’s balance sheet through which corporate governance affects overall bank risk. Finally, it considers the relationship between corporate governance and bank risk taking over the business cycle. Section 4 concludes with policy implications.

## **2. The data**

In this study, we relate measures of bank risk to summary indicators of corporate governance for an international sample of banks over the 2004-2008 period. Accounting and market data necessary to construct our bank risk measures are taken from Bankscope of Bureau Van Dijk, CRSP and Compustat Global. Data on bank corporate governance are from the Corporate Governance Quotient data base assembled by Institutional Shareholder Services (ISS).

We examine two main measures of bank insolvency risk. First, the Z-score represents the number of standard deviations that a bank's rate of return on assets has to fall for the bank to become insolvent. The Z-score is constructed as the sum of the rate of return on assets and the equity to assets ratio divided by the standard deviation of the return on assets. Table A1 in the Appendix describes variable definitions and data sources. A higher Z-score signals that a bank has lower insolvency risk. We calculate a Z-score for a bank, if at least three annual observations of its rate of return on assets are available. Second, the distance to default measures the difference between the asset value of the bank and the face value its debt, scaled by the standard deviation of the bank's asset value (see Campbell, Hilscher and Szilagyi, 2008, p. 2899). The distance to default variable is computed as an annual average of weekly values (see the Appendix for details on how the distance to default is estimated).

Next, we collect several variables to capture different aspects of a bank's overall risk strategy. These variables reflect a bank's asset allocation and income mix strategies, its capitalization and funding strategies, and its overall asset growth strategy.

To start, asset volatility is the annualized standard deviation of the asset returns computed from the Merton's option pricing model. The asset volatility variable has mean of 0.048. Asset risk weight is an indicator of the average riskiness of a bank's assets, and is computed as the ratio of risk-weighted assets to total assets, using the risk weights as defined in the Basle capital adequacy framework. Lower values of asset risk weight indicate less risky assets. The asset risk weight variable has a mean of 0.70.

Bank loans are generally riskier than other investments, such as holdings of government securities. We use the loans variable, computed as the ratio of loans to total assets, as a proxy for asset risk. The loans variable has a mean of 70.3%.

The non-performing loans variable, computed as the ratio of non-performing loans to total loans, is an index of loan quality. On average, 1.2% of loans are non-performing.

A bank's asset allocation affects the composition of its income which generally can include interest income, fees, commissions and trading income. The fee income variable, constructed as the ratio of net interest income to total operating income, is an index of the riskiness of a bank's income. It has a mean of 0.30.

Turning to bank capitalization, we can divide a bank's common equity into tangible common equity and non-tangible common equity. The latter category includes tax deferred assets and mortgage servicing rights, which are capital categories with only limited loss absorption capacity. Excluding these, we construct the tangible capital ratio as the ratio of tangible equity divided by tangible assets (i.e., total assets minus non-tangible assets). The tangible equity ratio has a mean of 7.8%.

A bank's short-term funding comprises customer and other deposits and non-deposits such as short-term borrowing in the interbank market. The non-deposit funding variable, computed as the share of non-deposit, short-term funding in total short-term funding, is an index of the riskiness of a bank's short-term funding. It has a mean of 0.17.

High bank asset growth may signal higher bank risk, as a bank may only be able to grow fast by investing in riskier assets, for instance by lending to riskier loan customers. Our asset growth variable is the growth rate of total assets, with a mean value of 7.5%.

In addition, banks with highly procyclical lending may be more risky, as such banks may be overly optimistic about their customers' creditworthiness at the peak of the business cycle. We construct the lending procyclicality variable as the correlation between a bank's loan growth rate and the GDP growth rate. The mean lending procyclicality variable is 0.10.

Bank risk is beneficial to the banks to the extent that it increases the value of their contingent claim on the financial safety net. As an indicator of this, we consider the fair value of the implicit insurance of a bank's liabilities provided by the financial safety net. Following Hovakimian, Kane and Laeven (2003) and Bushman and Williams (2012), we construct the IPP variable as the estimated fair-value insurance premium of a dollar of bank liabilities expressed in cents (see the Appendix for details).

Our corporate governance variables are indices that summarize extensive information on detailed governance attributes that are indicative of increased power of minority shareholders. We use the indices as formulated by Aggarwal, Erel, Stulz, and Williamson (2009) based on individual governance attributes assembled by Institutional Shareholder Services. The individual attributes are dummy variables that take on a value of 1 if the characteristic is relatively shareholder-friendly, and a value of zero otherwise. An overall index, called corporate governance, summarizes information on 44 attributes. In addition, there are four sub-indices, called board, compensation and ownership, auditing and takeover that summarize information on 25, 10, 3 and 6 attributes related to these various aspects of corporate governance, respectively. The takeover sub-index, for instance, has a higher score, if there are fewer corporate governance-related barriers to takeovers. A listing of the individual attributes that are represented by the overall index, and the four

sub-indices, is provided in Table A2 in the Appendix. This detailed information on corporate governance is available for banks located in 22 countries. For the country coverage, see Table A3 in the Appendix.

Table 2 displays information on the correlations among the overall corporate governance index and the four sub-indices. Not surprisingly, the overall index is positive and significantly correlated to the four sub-indices. The correlation between the overall index and the board index is high at 0.91, which no doubt reflects 25 attributes in the overall index (out of 44) are board attributes. Correlations among the four sub-indices are positive and significant, with the exception that the takeover index is negatively correlated with the other three sub-indices (and significantly in the case of the compensation and ownership, and auditing indices). Apparently, corporate governance regimes at banks that are relatively shareholder friendly in terms of posing few takeover barriers are less shareholder-friendly in other respects.

Overall corporate governance has become more shareholder-friendly over the 2003-2007 period. As seen in Figure 1, Part A, the overall index increased from 23.31 in 2003 to 26.45 in 2007 for US banks in part due to the passage of the Sarbanes-Oxley Act of 2002. It increased from 24.36 to 24.75 for non-US banks. These differential trends in corporate governance for US and non-US banks (and, therefore, also for individual banks) allows us to estimate relationships between bank risk variables and corporate governance in specifications that include bank fixed effects. Figure 1, Parts B-E provide time trends for the four sub-indices related to board, compensation and ownership, auditing, and takeover attributes, respectively. Part A shows that board characteristics became materially more shareholder-friendly for US banks, but only slightly so for non-US banks.

In Part B, we see that the sub-index related to compensation and ownership increased about equally for US and non-US banks. The auditing subindex, in turn, went up for US banks, and declined for non-US banks, as seen in Part C. Finally, the takeover sub-index increased about the same for US banks and non-US banks, as evident in Part C of the figure.

In the analysis, we use several bank-level control variables. The assets variable, constructed as the log of a bank's total assets, proxies for the bank's absolute size. As an alternative index of absolute size, the Big bank variable is a dummy variable that signals a bank with total assets exceeding 50 billion dollars. In addition, the assets to GDP variable, or total bank assets divided by GDP, represents the bank's size relative to the national economy. Larger banks may pursue riskier banking strategies, if they are considered to be too big to fail. The overhead variable is constructed as overhead expenses divided by total assets. Inefficient banks with large overhead expenses may choose relatively risky bank strategies to maintain a certain expected return on assets. Finally, the collateral variable is the ratio of assets that can be easily used as collateral divided by total assets. Banks with assets that can be used as collateral may find it easier to pursue risky banking strategies, as their financial costs may be less sensitive to overall bank risk.

Finally, we include several macroeconomic and country-level institutional control variables. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Fiscal balance represents the government budget balance as a percentage of GDP. The variable restrict is a composite index of regulatory restrictions on bank activities from

Barth et al. (2004). Specifically, it is an indicator of the degree to which banks face regulatory restrictions on their activities in securities markets, insurance, real estate, and owning shares in non-financial firms. It ranges from 0 to 4 with higher values indicating greater restrictions. Capital stringency is an index of regulatory oversight of bank capital, summarizing information about the nature and the magnitude of bank capital requirements, with higher values indicating greater diversification. Official is an index of the power of the commercial bank supervisory agency to undertake specific actions to prevent and correct problems at a bank, with higher values indicating greater power. Diversification is an index of loan diversification guidelines imposed on banks. Finally, financial freedom is an index of financial market freedoms from the Heritage Foundation.

### **3. Empirical results**

#### **A. Bank insolvency risk and corporate governance**

Table 3 considers the relationships between corporate governance indices on the one hand and the Z-score and the distance to default as proxies for bank insolvency risk on the other.<sup>3</sup> The regressions include bank and year fixed effects, and errors are clustered at the bank level. All independent variables are lagged one year to reduce endogeneity concerns.

In regression (1), where Z-score is the dependent variable, the overall corporate governance index has a negative coefficient -0.027 that is significant at the 5% level, suggesting that more shareholder-friendly corporate governance increases bank

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<sup>3</sup> We also considered the relationships between a bank's return on assets and its return on equity with corporate governance. The relationship between a bank's return on assets and the overall corporate governance index is estimated to be negative and significant at 10 percent (unreported). This negative relationship possibly reflects that the 2004-2008 sample period includes a major financial crisis.

insolvency risk. Among the controls, we find that the Z-score is negatively and significantly related to the assets and assets to GDP variables, indicating that larger absolute and relative bank size are associated with higher bank insolvency risk. This suggests that larger banks take on more risk as they benefit from a too-big-to-fail status. The Z-score is also negatively and significantly related to GDP per capita. This result may reflect the fact that banks in wealthier countries benefit from a more credible financial safety net, which allows them to take on more risk. Furthermore, the Z-score is negatively and significantly related to the diversification variable, suggesting that guidelines promoting diversification contribute to bank safety.

In regression 2, we replace the overall corporate governance index by the four subindices. In this regression, the board subindex has a negative coefficient that is significant at 5%, while the compensation and ownership, auditing and takeover indices have insignificant coefficients. Thus, a more shareholder-friendly board is found to be associated with higher bank insolvency risk.

In regressions 3 and 4, the dependent variable is the distance to default measure.

Otherwise, these regressions are analogous to regressions 1 and 2. In regression 3, the overall corporate governance index is estimated with a negative coefficient that is significant at 5%. In regression 4 the board index has a negative coefficient that is also significant at 5%. This is further evidence that a bank's insolvency risk is positively associated with shareholder-friendly corporate governance.

Bigger banks may be riskier, because they expect to receive a more generous treatment by bank regulators in case of insolvency on account of their too-big-to-fail

status. Hence the positive relationship between bank risk and good corporate governance may be driven by the larger banks in the sample. To see whether the relationship between bank insolvency risk and corporate governance depends on bank size, we include interaction terms between the corporate governance variables and the assets variable in the regressions of Table 3. The results are reported in Panel A of Table 4. The results are particularly stark for distance to default regressions in 3 and 4. While the overall corporate governance index and its components have positive and significant coefficients in the regressions, indicating that “good” corporate governance is associated with a reduction in risk-taking, the interaction terms of the overall index and board and compensation and ownership variables with bank size have negative and significant coefficients. In Panel B of Table 4, we replace the assets variable as an index of absolute bank size by the big bank dummy. The results are similar to those using absolute size. We find negative coefficients for the interactions of the big bank variable with the overall corporate governance variable and the board and compensation and ownership subindices in regressions 3 and 4. Overall, these results suggest that the adverse effects of good corporate governance on bank risk-taking are more important for larger banks that are able to shift their risk onto the safety net.

To further investigate risk-shifting by larger banks, we also examine how the impact of corporate governance on bank risk varies with the credibility of the safety net. Countries with strong finances are more likely to be able to bail out distressed banks that are deemed too big to fail. Thus banks with shareholder-friendly corporate governance may have higher insolvency risk if they are located in countries with a high fiscal balance

relative to GDP.<sup>4</sup> To examine this, we estimate regressions interacting the fiscal balance-to-GDP ratio with corporate governance indices. The results are reported in in Panel A of Table 5. In the distance to default regression 3, the overall corporate governance index and its interaction with the fiscal balance both have negative and significant coefficients. Similarly, the distance to default is negatively and significantly related to the compensation and ownership variables and their interaction with the fiscal balance in regression 4. These results provide evidence that shareholder-friendly corporate governance increases bank insolvency risk more in countries with strong public finances.

Taken together, the results of Table 4 and Panels A of Table 5 suggest that ‘good’ corporate governance will increase risk taking especially at banks that are both large and located in countries with sound public finances. To test this, the regressions in Panel B of Table 5 include interactions of corporate governance variables with the assets variable, interactions of corporate governance variables with the fiscal balance variable, and triple interactions of corporate governance, assets and fiscal balance variables. In the Z-score regression 1, the triple interaction involving the overall corporate governance index has a negative and significant coefficient. In the distance to default regression 3, this triple interaction variable also has a negative coefficient that is significant. In the regressions of Panel C of Table 5, we replace the assets variable by the big bank variable, again yielding negative and significant coefficients for the triple interaction variables in regressions 1 and 3. Overall, these results indicate that shareholder-friendly corporate governance increases risk taking at large banks located in countries with sound public finances that are in a position to engage in risk-shifting towards the financial safety net.

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<sup>4</sup> Previously Demirguc-Kunt and Huizinga (2013) have found that a bank’s market-to-book value is negatively related to the size of its liabilities-to-GDP ratio, especially in countries running large public deficits.

## **B. Endogeneity**

We recognize that corporate governance may to some extent be endogenously determined. For instance, a strong preference for risk on the part of a bank's shareholders may jointly give rise to both considerable bank risk taking and shareholder-friendly corporate governance. To alleviate concerns about endogeneity, we include bank fixed effects in all regressions in the paper, thereby controlling for any time-invariant unobservable bank characteristics that affect both bank corporate governance and bank risk. Going beyond this, we analyze the relationship between corporate governance and bank insolvency risk using an instrumental variables approach. In particular, we instrument for a bank's corporate governance variables by using the country and year averages of these variables for all banks in the country excluding the bank itself. Country-year averages are good instruments to use, because a shock to the risk of one bank is unlikely to affect the corporate governance of other banks. This IV approach was previously used by John, Litov, and Yeung, 2008, Aggarwal et al., 2009 and Laeven and Levine, 2009. The IV results, reported in Table 6, are very similar to those reported in Table 3. Specifically, the Z-score and the distance to default are negatively related to the overall corporate governance index in regressions 1 and 3. The IV regressions thus provide additional evidence that shareholder-friendly corporate governance increased bank insolvency risk over the sample period covering the years 2004-2008.

## **C. Bank risk strategies**

A bank's Z-score and its distance to default are summary measures that reflect a range of bank risk-related strategies associated with its asset allocation, income mix, and

capitalization and funding strategy. Next, we consider the impact of corporate governance on a range of indicators that reflect a bank's broader risk strategy. To start, Table 7 reports results on the associations between a bank's asset and income strategies and indices of corporate governance. In regression 1, the asset volatility variable is positively and significantly related to the overall corporate governance index, while in regression 2 it is positively and significantly related to the board variable. This indicates that more shareholder-friendly corporate governance is associated with more asset risk. In regression 4, the assets risk weight variable is positively and significantly related to the board and takeover variables, but it is negatively and significantly related to the auditing index. The latter result could mean that shareholder-friendly auditing regimes lead banks to take on less asset risk, or alternatively that they cause the bank to manipulate downward the reported asset risk weight.

Regressions 5 and 6 relate the loans variable to corporate governance indices. This variable is positively and significantly related to the takeover variable in regression 6, providing some evidence that banks with shareholder-friendly corporate governance regimes allocate a larger share of their assets to loans which are expected to be relatively risky.

Next, we find that the loan loss provisioning variable is positively and significantly related to the overall corporate governance index in regression 7, while it is positively and significantly related to the board and auditing subindices in regression 8, suggesting that banks with shareholder-friendly corporate governance provider riskier loans.

Finally, we see in regressions 9 and 10 that the fee income variable is not significantly related to the corporate governance indices.

Overall, we find some evidence that asset risk, and in particular loan performance risk, is positively associated with shareholder-friendly corporate governance.

Next, we consider whether corporate governance is associated with risky capitalization, funding and growth strategies. In regression 1 of Table 8, the tangible capital ratio is negatively and significantly related to the overall corporate governance index, and in regression 2 it is negatively and significantly related to the board index. This provides some evidence that bank capitalization is negatively related to shareholder-friendly corporate governance.<sup>5</sup> We do not find that the non-deposit funding variable is significantly related to corporate governance variables in regressions 3 and 4, while also the assets growth variable is not significantly related to corporate governance in regressions 5 and 6. The finding that a bank's intangible equity is negatively associated with shareholder-friendly corporate governance is in line with our earlier finding that bank insolvency risk is positively related to shareholder-friendly corporate governance.

#### **D. Banking procyclicality**

Next, we consider how corporate governance affects the cyclicity of bank lending and other proxies of bank-risk taking. Banks with shareholder-friendly corporate governance may take on additional risk by expanding credit during economic booms. To test this, we relate the lending procyclicality variable, which is the correlation between bank loan growth and GDP growth, to the overall corporate governance index in regression 1 of Table 9. The estimated coefficient is positive and significant at 10%,

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<sup>5</sup> Anginer, Demirguc-Kunt, Huizinga and Ma (2013) consider in detail how board-related and takeover-related corporate governance features and executive compensation affect capitalization strategies for an international sample of banks over the 2003-2011 period.

providing some evidence that lending is more procyclical at banks with greater shareholder-friendly corporate governance. However, none of the individual corporate governance subindices obtain significant coefficients.

Similar to the analyses described above, we also calculate correlation coefficients between non-performing loans and GDP growth and tangible capital ratio and GDP growth, and estimate similar procyclicality regressions as reported in columns 1 and 2. We obtain significant results for regressions of non-performing loans procyclicality and tangible equity procyclicality reported in Table 9. Specifically, in regression 3 the non-performing loans procyclicality variable is negatively and significantly related to the overall corporate governance variable. In regression 4 it is negatively and significantly related to the board subindex. Banks with greater shareholder-friendly corporate governance report less non-performing loans during economic booms. This may reflect the fact that these banks manipulate the reporting of non-performing loans downward in order to preserve capital and continue to be able to expand credit. In regression 5 and 6, we see that the tangible equity procyclicality variable is negatively and significantly related to the overall corporate governance index and the board index. That is, banks with shareholder-friendly corporate governance reduce their tangible capital ratio more during economic upswings, probably due to large credit expansion during these periods. Overall, we find that banks with shareholder-friendly corporate governance expand credit more during economic booms, and that they tend to reduce the reporting of non-performing loans and to reduce tangible equity.

#### **E. The valuation of the implicit insurance offered by the financial safety net**

Higher bank insolvency risk is beneficial to bank shareholders to the extent that this increases the valuation of the implicit insurance provided by the financial safety net. The IPP variable is an estimate of the value of this insurance, measured as cents per dollar of total bank liabilities over a one-year horizon. In Table 10, we report regressions of IPP on corporate governance indices, the assets variable and their interactions, analogously to the bank insolvency risk regressions of Table 4. In regression 1, IPP is positively and significantly related to the overall corporate governance variable, which suggests that banks with shareholder-friendly corporate governance engage in more risk-shifting towards the financial safety net. In regression 2, we interact corporate governance with assets. The interaction term is positive and significant. This is consistent with large banks with shareholder-friendly corporate governance engaging in greater risk-shifting. Similarly, the board, auditing and takeover indices are estimated with negative and significant coefficients in regression 3, and the interaction of the board and assets variables is estimated with a positive and significant coefficient in regression 4. The results of Tables 4 and 7 together suggest that large banks with ‘good’ corporate governance are able to shift risk on the financial safety by increasing their insolvency risk .

#### **4. Conclusion**

This paper provides evidence that more shareholder-friendly corporate governance is associated with increased bank insolvency risk, as proxied by the bank Z-score and the market based distance to default variables. This empirical relationship is robust to including bank fixed effects and instrumental variable estimation, alleviating endogeneity

concerns. We further find that ‘good’ corporate governance is associated with increased asset volatility, more non-performing loans, and a lower tangible equity ratio.

Our findings that ‘good’ corporate governance is associated with increased risk taking at financial firms are consistent with earlier research showing that better investor protection reduces excessive risk-avoidance at non-financial firms explained by the fact that managers earn private benefits from reducing risk. Banks, however, are special in that they benefit from the financial safety net. The financial safety net provides banks with an incentive to take on too much risk, as banks receive financial support from the financial safety if they become distressed.

This suggests that risk taking at banks is determined by the interaction of corporate governance regimes and the financial safety net. We find empirical support for this hypothesis by showing that ‘good’ corporate governance increases bank risk taking especially for banks that are large and located in countries with strong public finances. For these banks, more risk can be expected to increase their contingent claim on the financial safety net. ‘Good’ corporate governance thus reinforces the tendency for banks to exploit the financial safety net, if they are in a position to do so.

Consistent with our results on bank risk taking, we find that ‘good’ corporate governance is associated with a higher valuation of the implicit insurance offered by the financial safety net especially in the case of large banks. This reflects that large banks have a relatively strong incentive to increase the value of the implicit insurance, as they stand a much better chance to collect on the insurance given their too-big-to-fail status.

The interaction of corporate governance and the financial safety net in determining bank insolvency risk has important implications for public policy towards

corporate governance at large banks. In particular, the case for more shareholder-friendly corporate governance at banks is much weaker than in the case of non-financial firms. In the case of banks, particularly large ones, 'better' corporate governance may only exacerbate the excessive risk taking resulting from the banks' incentives to exploit the financial safety net. In the second-best world where mispriced financial safety nets and too-big-to-fail policies exist, 'better' corporate governance thus may actually produce worse outcomes. To prevent this, a first priority should be regulatory and safety net reform to address too-big-to-fail issues and reduce moral hazard leading to excess risk taking of banks. Only after these reforms, the case for 'better' corporate governance at banks would become much stronger.

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## Appendix

### A1. The distance to default and IPP

We follow Hillegeist, Keating, Cram, and Lundstedt (2004) and Campbell, Hilscher and Szilagyi (2008) in calculating Merton's (1974) distance to default. The market equity value of a company is modeled as a call option on the company's assets:

$$V_E = V_A e^{-dT} N(d_1) - X e^{-rT} N(d_2) + (1 - e^{-dT}) V_A$$
$$d_1 = \frac{\log\left(\frac{V_A}{X}\right) + \left(r - d + \frac{s_A^2}{2}\right) T}{s_A \sqrt{T}}; d_2 = d_1 - s_A \sqrt{T} \quad (\text{A1})$$

where  $V_E$  is the market value of a bank,  $V_A$  is the value of the bank's assets,  $X$  is the face value of debt maturing at time  $T$ ,  $r$  is the risk free rate,  $d$  is the dividend rate expressed in terms of  $V_A$ , and where  $N(x_i)$  is the probability that  $x \leq x_i$  given that  $x$  is distributed with zero mean and unit variance.  $s_A$  is the volatility of the value of assets, which is related to equity volatility through the following equation:

$$s_E = \frac{V_A e^{-dT} N(d_1) s_A}{V_E} \quad (\text{A2})$$

We simultaneously solve equations (A1) and (A2) to find the values of  $V_A$  and  $s_A$ . We use the market value of equity for  $V_E$  and total liabilities to proxy for the face value of debt,  $X$ . Since the accounting information is on an annual basis, we linearly interpolate the values for all dates over the period, using end of year values for accounting items. The interpolation method has the advantage of producing a smooth implied asset value process and avoids jumps in the implied default probabilities at year end.  $s_E$  is the standard deviation of daily equity returns over the past 12 months. In calculating standard

deviations, we require the company to have at least 90 non-zero and non-missing returns over the previous 12 months.  $T$  equals one year, and  $r$  is the one-year Treasury bill rate, which we take to be the risk-free rate. The dividend rate,  $d$ , is the sum of the prior year's common and preferred dividends divided by the market value of assets. We use the Newton method to simultaneously solve the two equations above. For starting values of the unknown variables, we use  $V_A = V_E + X$  and  $s_A = s_E V_E / (V_E + X)$ . After we determine asset values  $V_A$ , we follow Campbell, Hilscher and Szilagyi (2008) and assign asset return  $m$  to be equal to the equity premium given by 6%.<sup>6</sup> Merton's (1974) distance to default is finally computed as:

$$\text{Distance to default} = \frac{\log\left(\frac{V_A}{X}\right) + \left(m - d - \frac{s_A^2}{2}\right)T}{s_A \sqrt{T}} \quad (\text{A3})$$

Following Hovakimian, Kane and Laeven (2000) and Bushman and Williams (2012), we estimate IPP as the value of a put option on bank liabilities as follows:

$$IPP = N\left(\frac{\log\left(\frac{X}{V_A}\right) + \frac{s_A^2}{2}T}{s_A \sqrt{T}}\right) - \left(\frac{V_A}{X}\right) N\left(\frac{\log\left(\frac{X}{V_A}\right) - \frac{s_A^2}{2}T}{s_A \sqrt{T}}\right) \quad (\text{A4})$$

In the empirical work, IPP is expressed as the value of the put option per dollar of bank liabilities in cents.

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<sup>6</sup> We obtain similar distance to default values if we compute the asset return as  $\max\left(\frac{V_{A,t}}{V_{A,t-1}} - 1, r\right)$  following Hillegeist, Keating, Cram, and Lundstedt (2004).

## A2. Variable definitions, data sources, governance attributes, and country coverage

**Table A1. Variable definitions and data sources**

| Variable name                                    | Definition                                                                                                                                                                                                 | Data source                     |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <i>Risk and return variables</i>                 |                                                                                                                                                                                                            |                                 |
| Z-score                                          | Index of bank solvency constructed as the logarithm of $(E(ROA) + CAR)/SROA$ where ROA is return on assets, CAR represents capital assets ratio and SROA stands for standard deviation of return on assets | BankScope                       |
| Distance to default                              | Annual average of distance-to-default based on stock based on stock price variability                                                                                                                      | Authors' calculation            |
| Asset volatility                                 | Annualized standard deviation of the asset return implicit in Merton's option pricing model                                                                                                                | Authors' calculation            |
| Asset risk weight                                | Risk weighted assets divided by total asset                                                                                                                                                                | BankScope                       |
| Loans                                            | Loans divided by total assets                                                                                                                                                                              | BankScope                       |
| Non-performing loans                             | Non-performing loans divided by gross loans outstanding                                                                                                                                                    | BankScope                       |
| Fee income                                       | Share of non-interest income in total operating income                                                                                                                                                     | BankScope                       |
| Tangible capital                                 | Ratio of tangible capital to tangible assets                                                                                                                                                               | BankScope                       |
| Non-deposit funding                              | Share of non-deposit short-term funding in total deposits and short-term funding                                                                                                                           | BankScope                       |
| Asset growth                                     | Growth rate of total assets                                                                                                                                                                                | BankScope                       |
| Lending procyclicality                           | Correlation coefficient between loan growth rate and GDP growth rate                                                                                                                                       | BankScope                       |
| IPP                                              | Fair value of the insurance put option per dollar of liabilities in cents                                                                                                                                  | Authors' calculation            |
| <i>Governance variables</i>                      |                                                                                                                                                                                                            |                                 |
| Corporate governance                             | Overall corporate governance index                                                                                                                                                                         | ISS                             |
| Board                                            | Corporate governance index based on board characteristics                                                                                                                                                  | ISS                             |
| Compensation and ownership                       | Corporate governance index based on compensation and ownership characteristics                                                                                                                             | ISS                             |
| Auditing                                         | Corporate governance index based on auditing characteristics                                                                                                                                               | ISS                             |
| Takeover                                         | Corporate governance index based on takeover characteristics                                                                                                                                               | ISS                             |
| <i>Bank control variables</i>                    |                                                                                                                                                                                                            |                                 |
| Assets                                           | Logarithm of total assets                                                                                                                                                                                  | BankScope                       |
| Big bank                                         | Dummy variable equal to 1 if a bank's assets exceed 50 billion dollars, and zero otherwise.                                                                                                                | BankScope                       |
| Assets to GDP                                    | Total assets divided by GDP                                                                                                                                                                                | BankScope                       |
| Overhead                                         | Overhead divided by total assets                                                                                                                                                                           | BankScope                       |
| Collateral                                       | Assets that can be used as collateral (securities, cash and due from other banks, and fixed assets) divided by total assets                                                                                | BankScope                       |
| <i>Macro and institutional control variables</i> |                                                                                                                                                                                                            |                                 |
| Inflation                                        | Consumer price inflation rate                                                                                                                                                                              | World Development Indicators    |
| GDP growth                                       | Rate of real GDP growth                                                                                                                                                                                    | World Development Indicators    |
| GDP per capita                                   | GDP per capita in thousands of constant 2005 U.S. dollars                                                                                                                                                  | World Development Indicators    |
| Fiscal balance                                   | Government budget balance as a percentage of GDP                                                                                                                                                           | World Development Indicators    |
| Restrict                                         | Index of regulatory restrictions on bank activities                                                                                                                                                        | Barth, Caprio and Levine (2004) |
| Capital stringency                               | Index of regulatory oversight of bank, ranging from 3 to 10 with higher values indicate greater stringency                                                                                                 | Barth, Caprio and Levine (2004) |
| Official                                         | Index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater | Barth, Caprio and Levine (2004) |

|                   |                                                                                                                               |                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
|                   | power.                                                                                                                        |                                 |
| Diversification   | Index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. | Barth, Caprio and Levine (2004) |
| Financial freedom | Index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom.                               | Heritage Foundation             |

## Table A2. Corporate governance attributes

| <b>Board attributes</b>                                                                                  |
|----------------------------------------------------------------------------------------------------------|
| 1. All directors attended 75% of board meetings or had a valid excuse                                    |
| 2. CEO serves on the boards of two or fewer public companies                                             |
| 3. Board is controlled by more than 50% independent outside directors                                    |
| 4. Board size is greater than 5 but less than 16                                                         |
| 5. CEO is not listed as having a related-party transaction                                               |
| 6. No former CEO on the board                                                                            |
| 7. Compensation committee composed solely of independent outsiders                                       |
| 8. Chairman and CEO are separated or there is a lead director                                            |
| 9. Nominating committee composed solely of independent outsiders                                         |
| 10. Governance committee exists and met in the past year                                                 |
| 11. Shareholders vote on directors selected to fill vacancies                                            |
| 12. Governance guidelines are publicly disclosed                                                         |
| 13. Annually elected board (no staggered board)                                                          |
| 14. Policy exists on outside directorships (four or fewer boards is the limit)                           |
| 15. Shareholders have cumulative voting rights                                                           |
| 16. Shareholder approval is required to increase/decrease board size                                     |
| 17. Majority vote requirement to amend charter/bylaws                                                    |
| 18. Board has the express authority to hire its own advisors                                             |
| 19. Performance of the board is reviewed regularly                                                       |
| 20. Board-approved succession plan in place for the CEO                                                  |
| 21. Outside directors meet without CEO and disclose number of times met                                  |
| 22. Directors are required to submit resignation upon a change in job                                    |
| 23. Board cannot amend bylaws without shareholder approval or can do so only under limited circumstances |
| 24. Does not ignore shareholder proposal                                                                 |
| 25. Qualifies for proxy contest defenses combination points                                              |
| <b>Compensation and ownership attributes</b>                                                             |
| 26. Directors are subject to stock ownership requirements                                                |
| 27. Executives are subject to stock ownership guidelines                                                 |
| 28. No interlocks among compensation committee members                                                   |
| 29. Directors receive all or a portion of their fees in stock                                            |
| 30. All stock-incentive plans adopted with shareholder approval                                          |
| 31. Options grants align with company performance and reasonable burn rate                               |
| 32. Company expenses stock options                                                                       |
| 33. All directors with more than one year of service own stock                                           |
| 34. Officers' and directors' stock ownership is at least 1% but not over 30% of total shares outstanding |
| 35. Repricing is prohibited                                                                              |
| <b>Auditing attributes</b>                                                                               |
| 36. Board independence: Audit committee                                                                  |
| 37. Consulting fees paid to auditors are less than audit fees paid to auditors                           |
| 38. Auditors ratified at most recent annual meeting                                                      |
| <b>Antitakeover attributes</b>                                                                           |
| 39. Single class, common                                                                                 |
| 40. Majority vote requirement to approve mergers (not supermajority)                                     |
| 41. Shareholders may call special meetings                                                               |
| 42. Shareholder may act by written consent                                                               |
| 43. Company either has no poison pill or a pill that was shareholder approved                            |
| 44. Company is not authorized to issue blank check preferred                                             |

Source: Aggarwal, Erel, Stulz, and Williamson (2009)

**Table A3. Country coverage**

| Country name      | Frequency | Percent |
|-------------------|-----------|---------|
| Australia         | 35        | 1.14    |
| Austria           | 8         | 0.26    |
| Belgium           | 18        | 0.59    |
| Canada            | 44        | 1.44    |
| Denmark           | 8         | 0.26    |
| France            | 14        | 0.46    |
| Germany           | 38        | 1.24    |
| Greece            | 26        | 0.85    |
| Hong Kong         | 44        | 1.44    |
| Ireland           | 15        | 0.49    |
| Italy             | 41        | 1.34    |
| Japan             | 264       | 8.61    |
| Korea Republic of | 2         | 0.07    |
| Netherlands       | 15        | 0.49    |
| Norway            | 2         | 0.07    |
| Portugal          | 15        | 0.49    |
| Singapore         | 19        | 0.62    |
| Spain             | 18        | 0.59    |
| Sweden            | 20        | 0.65    |
| Switzerland       | 20        | 0.65    |
| United Kingdom    | 65        | 2.12    |
| United States     | 2,334     | 76.15   |

## Table 1. Summary statistics

Z-score is an index of bank solvency constructed as the logarithm of  $(E(ROA) + CAR)/SROA$  where ROA is return on assets, CAR represents capital assets ratio and SRO. Distance to default is the annual average of distance to default based on stock price variability. Asset volatility is the annualized standard deviation of the asset return implicit in Merton's option pricing model. Asset risk is risk weighted assets divided by total assets. Loans is total loans divided by total assets. Non-performing loans is non-performing loans divided by gross loans outstanding. Fee income is the share of non-interest income in total operating income. Tangible capital is the ratio of tangible capital to tangible assets. Non-deposit funding is the share of non-deposit short-term funding in total deposits and short-term funding. Asset growth is the growth rate of total assets. Lending procyclicality is the correlation coefficient between loan growth rate and GDP growth rate. IPP is the fair value of the insurance put option per dollar of liabilities in cents. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership is a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. Assets is the logarithm of total assets. Big bank is a dummy variable equal to 1 if a bank's assets exceed 50 billion dollars, and zero otherwise. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Fiscal balance is the government budget balance as a percentage of GDP. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom.

| Variable                   | Obs. | Mean      | Std. Dev. | Min        | Max       |
|----------------------------|------|-----------|-----------|------------|-----------|
| Z-score                    | 3209 | 4.184962  | 1.093369  | -0.9347929 | 8.550281  |
| Distance to default        | 3244 | 6.285612  | 1.954979  | 1.249333   | 12        |
| Asset volatility           | 2858 | 0.048106  | 0.035787  | 0.003987   | 0.402628  |
| Asset risk weight          | 2307 | 0.6973368 | 0.1499069 | 0.0840349  | 0.9988244 |
| Loans                      | 3149 | 0.703366  | 0.201349  | 0          | 1         |
| Non-performing loans       | 3072 | 0.0116643 | 0.0174703 | 0          | 0.1       |
| Fee income                 | 3371 | 0.3023819 | 0.2061754 | 0          | 1         |
| Tangible capital           | 3372 | 0.0776388 | 0.0422173 | 0          | 0.3997    |
| Non-deposit funding        | 3418 | 0.1670455 | 0.2600481 | 0          | 1.004587  |
| Asset growth               | 3387 | 0.0746193 | 0.1331773 | -0.6931472 | 0.6931472 |
| Lending procyclicality     | 3381 | 0.0969869 | 0.417961  | -1         | 1         |
| IPP                        | 2858 | 0.0428959 | 0.1250289 | 0          | 1.458718  |
| Corporate governance       | 3627 | 25.03364  | 3.598887  | 15         | 39        |
| Board                      | 3627 | 12.87869  | 2.673573  | 6          | 21        |
| Compensation and ownership | 3627 | 6.25834   | 1.15688   | 3          | 10        |
| Auditing                   | 3627 | 2.241798  | 0.7190849 | 0          | 3         |
| Takeover                   | 3627 | 3.654811  | 1.124837  | 0          | 6         |
| Assets                     | 3412 | 8.332414  | 2.270508  | 1.386294   | 14.85713  |
| Big bank                   | 3412 | 0.1769499 | 0.3816819 | 0          | 1         |
| Assets to GDP              | 3412 | 0.0615769 | 0.2448429 | 3.39E-07   | 2.790281  |
| Overhead                   | 3399 | 0.033921  | 0.0522931 | 0.0007951  | 0.8771428 |
| Collateral                 | 3411 | 0.268855  | 0.1520512 | 0.0051394  | 0.9978418 |
| Inflation                  | 3614 | 0.0253839 | 0.0093389 | -0.025     | 0.0487992 |
| GDP growth                 | 3627 | 0.0275575 | 0.0096054 | -0.0091112 | 0.091591  |
| GDP per capita             | 3627 | 40.79125  | 4.983224  | 17.95289   | 81.3538   |
| Fiscal balance             | 3564 | -2.689619 | 1.823869  | -7.350887  | 18.37307  |
| Restrict                   | 3614 | 7.65689   | 1.120296  | 3          | 9         |
| Capital stringency         | 3614 | 4.957665  | 0.6045594 | 2          | 8         |
| Official                   | 3614 | 12.40786  | 1.538042  | 5          | 14        |
| Diversification            | 3614 | 1.429441  | 0.505028  | 0          | 2         |
| Financial freedom          | 3614 | 82.49032  | 14.69674  | 30         | 90        |

## Table 2. Correlations among corporate governance variables

This table presents pair-wise correlations between corporate governance variables. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

|                            | Corporate governance | Board    | Compensation and ownership | Auditing  | Takeover |
|----------------------------|----------------------|----------|----------------------------|-----------|----------|
| Corporate governance       | 1                    |          |                            |           |          |
| Board                      | 0.908***             | 1        |                            |           |          |
| Compensation and ownership | 0.570***             | 0.378*** | 1                          |           |          |
| Auditing                   | 0.388***             | 0.252*** | 0.144***                   | 1         |          |
| Takeover                   | 0.207***             | -0.0178  | -0.198***                  | -0.147*** | 1        |

### Table 3. Bank insolvency risk and corporate governance

The dependent variable in columns 1 and 2 is the z-score, and the dependent variable in column 3 and 4 is the distance to default. Z-score is an index of bank solvency constructed as the logarithm of (E(ROA) + CAR)/SROA where ROA is return on assets, CAR represents capital assets ratio and SRO. Distance to default is the annual average of distance to default based on stock price variability. Assets is the logarithm of total assets. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Regressions include bank and year fixed effects. Standard errors are adjusted for clustering at the bank level, and provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

|                            | Z-score<br>(1)       | Z-score<br>(2)       | Distance to default<br>(3) | Distance to default<br>(4) |
|----------------------------|----------------------|----------------------|----------------------------|----------------------------|
| Assets                     | -0.493***<br>(0.185) | -0.486***<br>(0.184) | -0.039<br>(0.199)          | -0.046<br>(0.200)          |
| Assets to GDP              | -1.224*<br>(0.680)   | -1.146*<br>(0.660)   | -0.736<br>(0.805)          | -0.703<br>(0.804)          |
| Overhead                   | -1.088<br>(1.984)    | -0.872<br>(1.974)    | -0.968<br>(2.112)          | -0.860<br>(2.116)          |
| Collateral                 | -0.560<br>(0.459)    | -0.566<br>(0.457)    | -0.486<br>(0.563)          | -0.516<br>(0.561)          |
| Inflation                  | 16.776***<br>(4.905) | 16.538***<br>(4.901) | 24.233***<br>(8.878)       | 23.809***<br>(8.897)       |
| GDP growth                 | 2.058<br>(8.242)     | 2.005<br>(8.210)     | -3.673<br>(12.470)         | -3.893<br>(12.519)         |
| GDP per capita             | -0.216**<br>(0.091)  | -0.214**<br>(0.091)  | -0.176<br>(0.137)          | -0.182<br>(0.136)          |
| Restrict                   | 0.002<br>(0.141)     | 0.014<br>(0.141)     | -0.399**<br>(0.171)        | -0.393**<br>(0.171)        |
| Capital stringency         | -0.006<br>(0.089)    | -0.009<br>(0.088)    | 0.131<br>(0.100)           | 0.130<br>(0.100)           |
| Official                   | 0.002<br>(0.043)     | -0.005<br>(0.042)    | -0.031<br>(0.051)          | -0.028<br>(0.052)          |
| Diversification            | 0.543***<br>(0.110)  | 0.513***<br>(0.108)  | -0.767***<br>(0.122)       | -0.736***<br>(0.125)       |
| Financial freedom          | 0.012**<br>(0.005)   | 0.011**<br>(0.005)   | 0.020***<br>(0.007)        | 0.020***<br>(0.007)        |
| Corporate governance       | -0.027**<br>(0.012)  |                      | -0.029**<br>(0.014)        |                            |
| Board                      |                      | -0.040**<br>(0.017)  |                            | -0.052***<br>(0.020)       |
| Compensation and ownership |                      | 0.020<br>(0.029)     |                            | 0.001<br>(0.037)           |
| Auditing                   |                      | -0.070<br>(0.047)    |                            | 0.029<br>(0.054)           |
| Takeover                   |                      | 0.038<br>(0.054)     |                            | 0.017<br>(0.061)           |
| N                          | 3085                 | 3085                 | 2934                       | 2934                       |
| adj. R-sq                  | 0.209                | 0.210                | 0.563                      | 0.563                      |

**Table 4. Bank insolvency risk, bank size and corporate governance**

The dependent variable in columns 1 and 2 is the z-score which is an index of bank solvency constructed as the logarithm of  $(E(ROA) + CAR)/SROA$  where ROA is return on assets, CAR represents capital assets ratio and SRO. The dependent variable in columns 3 and 4 is the distance to default which is the distance to default based on stock price variability. Assets is the logarithm of total assets. Big bank is a dummy variable equal to 1 if a bank's assets exceed 50 billion dollars, and zero otherwise. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Panel A includes the interaction between corporate governance indices and bank assets. Whereas panel B constitutes a robustness check where we replace assets by the big bank dummy. All explanatory variables are lagged one year. Regressions include bank and year fixed effects. Standard errors are adjusted for clustering at the bank level, and provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

| Panel A                     | Z-score<br>(1)       | Z-score<br>(2)       | Distance to default<br>(3) | Distance to default<br>(4) |
|-----------------------------|----------------------|----------------------|----------------------------|----------------------------|
| Assets                      | -0.364<br>(0.227)    | -0.278<br>(0.233)    | 0.837***<br>(0.251)        | 0.807***<br>(0.258)        |
| Assets to GDP               | -1.122<br>(0.691)    | -1.155*<br>(0.664)   | -0.139<br>(0.846)          | -0.042<br>(0.879)          |
| Overhead                    | -1.021<br>(1.982)    | -0.936<br>(1.994)    | -0.602<br>(2.055)          | -0.365<br>(2.066)          |
| Collateral                  | -0.534<br>(0.460)    | -0.548<br>(0.454)    | -0.348<br>(0.560)          | -0.377<br>(0.562)          |
| Inflation                   | 16.990***<br>(4.902) | 16.734***<br>(4.932) | 24.655***<br>(9.022)       | 23.893***<br>(8.990)       |
| GDP growth                  | 2.077<br>(8.206)     | 3.868<br>(8.235)     | -1.761<br>(12.636)         | -2.579<br>(12.626)         |
| GDP per capita              | -0.218**<br>(0.092)  | -0.200**<br>(0.092)  | -0.195<br>(0.137)          | -0.210<br>(0.138)          |
| Restrict                    | -0.007<br>(0.142)    | 0.014<br>(0.144)     | -0.439**<br>(0.174)        | -0.428**<br>(0.174)        |
| Capital stringency          | 0.002<br>(0.090)     | 0.014<br>(0.090)     | 0.182*<br>(0.099)          | 0.172*<br>(0.100)          |
| Official                    | -0.002<br>(0.043)    | -0.012<br>(0.043)    | -0.062<br>(0.051)          | -0.063<br>(0.052)          |
| Diversification             | 0.549***<br>(0.110)  | 0.458***<br>(0.104)  | -0.738***<br>(0.125)       | -0.688***<br>(0.129)       |
| Financial freedom           | 0.013**<br>(0.005)   | 0.009*<br>(0.005)    | 0.023***<br>(0.007)        | 0.023***<br>(0.007)        |
| Corporate governance        | 0.016<br>(0.047)     |                      | 0.258***<br>(0.052)        |                            |
| Corporate governance*Assets | -0.005<br>(0.005)    |                      | -0.033***<br>(0.006)       |                            |
| Board                       |                      | 0.000<br>(0.063)     |                            | 0.183**<br>(0.082)         |

|                                       |                    |                     |                      |                      |
|---------------------------------------|--------------------|---------------------|----------------------|----------------------|
| Compensation and ownership            |                    | -0.104<br>(0.117)   |                      | 0.482***<br>(0.134)  |
| Auditing                              |                    | 0.323*<br>(0.189)   |                      | 0.345*<br>(0.205)    |
| Takeover                              |                    | 0.287<br>(0.176)    |                      | 0.149<br>(0.214)     |
| Board * Assets                        |                    | -0.005<br>(0.007)   |                      | -0.028***<br>(0.010) |
| Compensation and ownership * Assets   |                    | 0.014<br>(0.012)    |                      | -0.053***<br>(0.015) |
| Auditing * Assets                     |                    | -0.045**<br>(0.021) |                      | -0.036<br>(0.023)    |
| Takeover * Assets                     |                    | -0.030<br>(0.020)   |                      | -0.015<br>(0.026)    |
| N                                     | 3085               | 3085                | 2934                 | 2934                 |
| adj. R-sq                             | 0.209              | 0.212               | 0.571                | 0.572                |
| <hr/>                                 |                    |                     |                      |                      |
| Panel B                               |                    |                     |                      |                      |
| Big bank                              | 0.018<br>(0.691)   | 0.213<br>(0.776)    | 1.553**<br>(0.755)   | 2.139**<br>(0.952)   |
| Corporate governance                  | -0.026*<br>(0.014) |                     | -0.015<br>(0.015)    |                      |
| Corporate governance * Big bank       | -0.004<br>(0.026)  |                     | -0.082***<br>(0.028) |                      |
| Board                                 |                    | -0.041**<br>(0.019) |                      | -0.042**<br>(0.021)  |
| Compensation and ownership            |                    | 0.003<br>(0.034)    |                      | 0.054<br>(0.041)     |
| Auditing                              |                    | -0.022<br>(0.051)   |                      | 0.001<br>(0.060)     |
| Takeover                              |                    | 0.051<br>(0.060)    |                      | 0.048<br>(0.063)     |
| Board * Big bank                      |                    | -0.005<br>(0.038)   |                      | -0.078*<br>(0.045)   |
| Compensation and ownership * Big bank |                    | 0.075<br>(0.061)    |                      | -0.193***<br>(0.073) |
| Auditing * Big bank                   |                    | -0.222**<br>(0.113) |                      | 0.119<br>(0.119)     |
| Takeover * Big bank                   |                    | -0.081<br>(0.115)   |                      | -0.176<br>(0.149)    |
| N                                     | 3085               | 3085                | 2934                 | 2934                 |
| adj. R-sq                             | 0.209              | 0.211               | 0.566                | 0.567                |

**Table 5. Bank insolvency risk, the fiscal balance and corporate governance**

The dependent variable in columns 1 and 2 is the z-score which is an index of bank solvency constructed as the logarithm of (E(ROA) + CAR)/SROA where ROA is return on assets, CAR represents capital assets ratio and SRO. The dependent variable in columns 3 and 4 is the distance to default which is the distance to default based on stock price variability. The dependent variable in columns 5 and 6 is the return on assets which is pre-tax profits divided by assets. Assets is the logarithm of total assets. Big bank is a dummy variable equal to 1 if a bank's assets exceed 50 billion dollars, and zero otherwise. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Fiscal balance is the government budget balance as a percentage of GDP. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Panel A includes interaction of corporate governance indices and the fiscal balance of the country where the bank is incorporated. Panel B and C include triple interactions of corporate governance indices, the fiscal balance, and bank size measured by the assets and big bank variables, respectively. All explanatory variables are lagged one year. Regressions include bank and year fixed effects. Standard errors are adjusted for clustering at the bank level, and provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

| Panel A            | Z-score<br>(1)       | Z-score<br>(2)       | Distance to<br>default<br>(3) | Distance to<br>default<br>(4) |
|--------------------|----------------------|----------------------|-------------------------------|-------------------------------|
| Assets             | -0.337*<br>(0.181)   | -0.330*<br>(0.180)   | -0.004<br>(0.201)             | -0.033<br>(0.200)             |
| Assets to GDP      | -0.442<br>(0.665)    | -0.409<br>(0.659)    | -0.172<br>(0.889)             | -0.109<br>(0.908)             |
| Overhead           | -0.424<br>(1.882)    | -0.297<br>(1.882)    | -0.645<br>(1.983)             | -0.662<br>(2.016)             |
| Collateral         | -0.822*<br>(0.464)   | -0.835*<br>(0.460)   | -0.634<br>(0.571)             | -0.673<br>(0.571)             |
| Inflation          | 19.801***<br>(4.874) | 19.592***<br>(4.976) | 16.287*<br>(9.178)            | 15.796*<br>(9.020)            |
| GDP growth         | 4.944<br>(8.725)     | 4.099<br>(8.810)     | -20.199*<br>(11.962)          | -17.734<br>(12.076)           |
| GDP per capita     | -0.111<br>(0.103)    | -0.101<br>(0.105)    | -0.195<br>(0.160)             | -0.218<br>(0.162)             |
| Restrict           | 0.091<br>(0.122)     | 0.092<br>(0.124)     | -0.384**<br>(0.166)           | -0.342**<br>(0.166)           |
| Capital stringency | -0.062<br>(0.085)    | -0.076<br>(0.087)    | 0.115<br>(0.100)              | 0.130<br>(0.101)              |
| Official           | -0.054<br>(0.039)    | -0.051<br>(0.040)    | -0.051<br>(0.055)             | -0.046<br>(0.056)             |
| Diversification    | 0.136<br>(0.097)     | 0.168<br>(0.104)     | -0.865***<br>(0.144)          | -0.877***<br>(0.147)          |
| Financial freedom  | 0.012**<br>(0.006)   | 0.013**<br>(0.006)   | 0.043***<br>(0.008)           | 0.041***<br>(0.009)           |
| Fiscal balance     | 0.085<br>(0.143)     | 0.120<br>(0.164)     | 0.776***<br>(0.191)           | 0.726***<br>(0.200)           |

|                                                |           |          |           |           |
|------------------------------------------------|-----------|----------|-----------|-----------|
| Corporate governance                           | -0.027    |          | -0.089*** |           |
|                                                | (0.019)   |          | (0.024)   |           |
| Corporate governance * Fiscal balance          | -0.005    |          | -0.027*** |           |
|                                                | (0.006)   |          | (0.007)   |           |
| Board                                          |           | -0.060** |           | -0.076**  |
|                                                |           | (0.025)  |           | (0.035)   |
| Compensation and ownership                     |           | 0.018    |           | -0.124**  |
|                                                |           | (0.036)  |           | (0.059)   |
| Auditing                                       |           | 0.043    |           | -0.085    |
|                                                |           | (0.067)  |           | (0.107)   |
| Takeover                                       |           | 0.016    |           | -0.004    |
|                                                |           | (0.081)  |           | (0.091)   |
| Board * Fiscal balance                         |           | -0.010   |           | -0.014    |
|                                                |           | (0.007)  |           | (0.011)   |
| Compensation and ownership * Fiscal balance    |           | 0.001    |           | -0.056*** |
|                                                |           | (0.010)  |           | (0.018)   |
| Auditing * Fiscal balance                      |           | 0.013    |           | -0.049    |
|                                                |           | (0.019)  |           | (0.031)   |
| Takeover * Fiscal balance                      |           | -0.013   |           | -0.009    |
|                                                |           | (0.021)  |           | (0.024)   |
| N                                              | 3001      | 3001     | 2855      | 2855      |
| adj. R-sq                                      | 0.218     | 0.218    | 0.577     | 0.579     |
| <b>Panel B</b>                                 |           |          |           |           |
| Assets                                         | 0.378     | 0.257    | -0.399*   | -0.340    |
|                                                | (0.268)   | (0.269)  | (0.233)   | (0.241)   |
| Fiscal balance                                 | 0.413**   | 0.633*** | 0.041     | -0.030    |
|                                                | (0.208)   | (0.242)  | (0.153)   | (0.181)   |
| Corporate governance                           | 0.217***  |          | -0.001    |           |
|                                                | (0.067)   |          | (0.057)   |           |
| Corporate governance * Fiscal balance          | 0.042***  |          | 0.013     |           |
|                                                | (0.011)   |          | (0.010)   |           |
| Corporate governance * Assets                  | -0.025*** |          | -0.001    |           |
|                                                | (0.006)   |          | (0.005)   |           |
| Corporate governance * Fiscal balance * Assets | -0.005*** |          | -0.001**  |           |
|                                                | (0.001)   |          | (0.001)   |           |
| Board                                          |           | 0.229    |           | 0.088     |
|                                                |           | (0.153)  |           | (0.112)   |
| Compensation and ownership                     |           | 0.401    |           | -0.028    |
|                                                |           | (0.304)  |           | (0.222)   |
| Auditing                                       |           | -0.458   |           | 0.289     |
|                                                |           | (0.559)  |           | (0.443)   |
| Takeover                                       |           | 0.093    |           | -0.218    |
|                                                |           | (0.305)  |           | (0.258)   |
| Board * Fiscal balance                         |           | 0.035    |           | 0.047     |
|                                                |           | (0.041)  |           | (0.031)   |
| Compensation and ownership * Fiscal balance    |           | 0.106    |           | 0.036     |
|                                                |           | (0.085)  |           | (0.059)   |
| Auditing * Fiscal balance                      |           | -0.171   |           | 0.091     |
|                                                |           | (0.157)  |           | (0.120)   |
| Takeover * Fiscal balance                      |           | 0.081    |           | -0.151**  |
|                                                |           | (0.076)  |           | (0.061)   |
| Board * Assets                                 |           | -0.025   |           | -0.012    |
|                                                |           | (0.015)  |           | (0.010)   |
| Compensation and ownership * Assets            |           | -0.040   |           | 0.009     |
|                                                |           | (0.027)  |           | (0.020)   |
| Auditing * Assets                              |           | 0.035    |           | -0.023    |
|                                                |           | (0.050)  |           | (0.040)   |
| Takeover * Assets                              |           | -0.017   |           | 0.021     |
|                                                |           | (0.031)  |           | (0.026)   |
| Board * Fiscal balance * Assets                |           | -0.002   |           | -0.005*   |
|                                                |           | (0.004)  |           | (0.003)   |
| Compensation and ownership * Fiscal balance *  |           | -0.013*  |           | -0.003    |

|                                                        |           |          |          |          |
|--------------------------------------------------------|-----------|----------|----------|----------|
| Assets                                                 |           |          |          |          |
| Auditing * Fiscal balance * Assets                     |           | (0.007)  |          | (0.005)  |
|                                                        |           | 0.012    |          | -0.008   |
|                                                        |           | (0.014)  |          | (0.011)  |
| Takeover * Fiscal balance * Assets                     |           | -0.014*  |          | 0.015**  |
|                                                        |           | (0.008)  |          | (0.006)  |
| N                                                      | 2855      | 2855     | 3001     | 3001     |
| adj. R-sq                                              | 0.595     | 0.598    | 0.220    | 0.223    |
| <hr/>                                                  |           |          |          |          |
| Panel C                                                |           |          |          |          |
| Big Bank                                               | -0.695    | -0.658   | -1.372** | -1.313*  |
|                                                        | (0.983)   | (1.143)  | (0.644)  | (0.786)  |
| Fiscal balance                                         | 0.716***  | 0.665*** | 0.122    | 0.050    |
|                                                        | (0.200)   | (0.238)  | (0.149)  | (0.183)  |
| Corporate governance                                   | -0.057**  |          | -0.030   |          |
|                                                        | (0.026)   |          | (0.022)  |          |
| Corporate governance * Fiscal balance                  | -0.016**  |          | -0.004   |          |
|                                                        | (0.007)   |          | (0.006)  |          |
| Corporate governance * Big bank                        | -0.028    |          | 0.033    |          |
|                                                        | (0.032)   |          | (0.025)  |          |
| Corporate governance * Fiscal balance * Big bank       | -0.010*** |          | -0.004** |          |
|                                                        | (0.003)   |          | (0.002)  |          |
| Board                                                  |           | -0.026   |          | -0.051   |
|                                                        |           | (0.050)  |          | (0.035)  |
| Compensation and ownership                             |           | -0.011   |          | 0.022    |
|                                                        |           | (0.118)  |          | (0.069)  |
| Auditing                                               |           | -0.314   |          | 0.184    |
|                                                        |           | (0.196)  |          | (0.115)  |
| Takeover                                               |           | -0.016   |          | -0.011   |
|                                                        |           | (0.106)  |          | (0.090)  |
| Board * Fiscal balance                                 |           | 0.000    |          | -0.006   |
|                                                        |           | (0.015)  |          | (0.010)  |
| Compensation and ownership * Fiscal balance            |           | -0.018   |          | 0.009    |
|                                                        |           | (0.036)  |          | (0.019)  |
| Auditing * Fiscal balance                              |           | -0.102*  |          | 0.057*   |
|                                                        |           | (0.055)  |          | (0.031)  |
| Takeover * Fiscal balance                              |           | -0.015   |          | -0.022   |
|                                                        |           | (0.027)  |          | (0.021)  |
| Board * Big bank                                       |           | -0.069   |          | 0.020    |
|                                                        |           | (0.065)  |          | (0.042)  |
| Compensation and ownership * Big bank                  |           | -0.094   |          | 0.055    |
|                                                        |           | (0.130)  |          | (0.079)  |
| Auditing * Big bank                                    |           | 0.335    |          | -0.218   |
|                                                        |           | (0.215)  |          | (0.134)  |
| Takeover * Big bank                                    |           | -0.020   |          | 0.114    |
|                                                        |           | (0.161)  |          | (0.128)  |
| Board * Fiscal balance * Big bank                      |           | -0.014   |          | -0.010   |
|                                                        |           | (0.018)  |          | (0.010)  |
| Compensation and ownership * Fiscal balance * Big bank |           | -0.039   |          | -0.002   |
|                                                        |           | (0.036)  |          | (0.019)  |
| Auditing * Fiscal balance * Big bank                   |           | 0.041    |          | -0.091** |
|                                                        |           | (0.064)  |          | (0.038)  |
| Takeover * Fiscal balance * Big bank                   |           | 0.016    |          | 0.053**  |
|                                                        |           | (0.034)  |          | (0.024)  |
| N                                                      | 2855      | 2855     | 3001     | 3001     |
| adj. R-sq                                              | 0.583     | 0.585    | 0.220    | 0.221    |

**Table 6. Bank insolvency risk and corporate governance: IV estimation**

The dependent variable in columns 1 and 2 is the z-score which is index of bank solvency constructed as the logarithm of  $(E(ROA) + CAR)/SROA$  where ROA is return on assets, CAR represents capital assets ratio and SRO. Assets is the logarithm of total assets. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Corporate governance variables are instrumented by country and year averages of the same variables excluding the pertinent bank. The estimation is carried out with two-stage least square. Both 1<sup>st</sup> and 2<sup>nd</sup> stage regressions include bank and year fixed effects. Standard errors are adjusted for clustering at the bank level, and provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

|                            | Z-score<br>(1)       | Z-score<br>(2)       | Distance to<br>default<br>(3) | Distance to<br>default<br>(4) |
|----------------------------|----------------------|----------------------|-------------------------------|-------------------------------|
| Assets                     | -0.489**<br>(0.195)  | -0.429*<br>(0.238)   | -0.003<br>(0.232)             | -0.108<br>(0.261)             |
| Assets to GDP              | -0.897<br>(0.740)    | -1.446*<br>(0.785)   | -0.803<br>(1.044)             | -0.762<br>(1.115)             |
| Overhead                   | -1.150<br>(2.335)    | 0.852<br>(2.732)     | -0.727<br>(2.561)             | -0.314<br>(3.058)             |
| Collateral                 | -0.697<br>(0.527)    | -0.498<br>(0.667)    | -0.857<br>(0.674)             | -1.211<br>(0.755)             |
| Inflation                  | 13.609***<br>(5.017) | 14.156**<br>(5.588)  | 17.046<br>(10.588)            | 11.769<br>(12.245)            |
| GDP growth rate            | 8.794<br>(8.898)     | 14.663<br>(11.109)   | 17.134<br>(14.954)            | 19.077<br>(17.579)            |
| GDP per capita             | -0.184*<br>(0.097)   | -0.059<br>(0.130)    | -0.185<br>(0.152)             | -0.215<br>(0.165)             |
| Restrict                   | -0.078<br>(0.161)    | -0.035<br>(0.212)    | -0.597***<br>(0.186)          | -0.611***<br>(0.205)          |
| Capital stringency         | 0.089<br>(0.110)     | 0.235<br>(0.152)     | 0.360***<br>(0.120)           | 0.428**<br>(0.170)            |
| Official                   | -0.006<br>(0.047)    | 0.012<br>(0.062)     | -0.057<br>(0.061)             | 0.008<br>(0.080)              |
| Diversification            | 0.484***<br>(0.103)  | 0.024<br>(0.207)     | -0.960***<br>(0.153)          | -0.596**<br>(0.282)           |
| Financial freedom          | 0.015***<br>(0.005)  | -0.021*<br>(0.012)   | 0.026***<br>(0.008)           | 0.021<br>(0.021)              |
| Corporate governance       | -0.177***<br>(0.051) |                      | -0.316***<br>(0.085)          |                               |
| Board                      |                      | -0.269***<br>(0.102) |                               | -0.581***<br>(0.151)          |
| Compensation and ownership |                      | -0.801***<br>(0.245) |                               | 0.323<br>(0.344)              |
| Auditing                   |                      | 0.726**<br>(0.295)   |                               | -0.082<br>(0.488)             |
| Takeover                   |                      | -0.861**<br>(0.353)  |                               | -0.307<br>(0.542)             |
| N                          | 3008                 | 3008                 | 2849                          | 2849                          |
| adj. R-sq                  | -0.131               | -0.653               | 0.280                         | 0.137                         |

**Table 7. Channels through which corporate governance can affect bank risk: asset and income choices**

The dependent variable in columns 1 and 2 is asset volatility which is the annualized standard deviation of the asset return implied by Merton's option pricing model. Morton's option pricing model. The dependent variable in columns 3 and 4 is asset risk weight which is risk weighted assets divided by total assets. The dependent variable in column 5 and 6 is loans which is loans divided by total assets. The dependent variable in columns 7 and 8 is non-performing loans which is non-performing loans divided by gross loans outstanding. The dependent variable in columns 9 and 10 is fee income which is the share of non-interest income in total operating income. Assets is the logarithm of total assets. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. All explanatory variables are lagged one year. Regressions include bank and year fixed effects. Standard errors are adjusted for clustering at the bank level, and provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

|                | Asset<br>volatility<br>(1) | Asset<br>volatility<br>(2) | Asset risk<br>weight<br>(3) | Asset risk<br>weight<br>(4) | Loans<br>(5)         | Loans<br>(6)         | Non-<br>performing<br>loans<br>(7) | Non-<br>performing<br>loans<br>(8) | Fee income<br>(9)   | Fee income<br>(10)  |
|----------------|----------------------------|----------------------------|-----------------------------|-----------------------------|----------------------|----------------------|------------------------------------|------------------------------------|---------------------|---------------------|
| Assets         | -0.021***<br>(0.005)       | -0.022***<br>(0.005)       | -0.048***<br>(0.010)        | -0.046***<br>(0.010)        | -0.004<br>(0.011)    | -0.003<br>(0.011)    | 0.013***<br>(0.003)                | 0.013***<br>(0.003)                | -0.026**<br>(0.013) | -0.027**<br>(0.013) |
| Assets to GDP  | 0.004<br>(0.014)           | 0.004<br>(0.014)           | 0.004<br>(0.045)            | 0.004<br>(0.045)            | 0.065<br>(0.050)     | 0.070<br>(0.050)     | -0.001<br>(0.009)                  | -0.002<br>(0.009)                  | -0.037<br>(0.056)   | -0.040<br>(0.056)   |
| Overhead       | 0.095<br>(0.099)           | 0.093<br>(0.098)           | 0.374*<br>(0.227)           | 0.390*<br>(0.226)           | 0.272<br>(0.281)     | 0.280<br>(0.279)     | 0.085<br>(0.075)                   | 0.081<br>(0.073)                   | 0.560**<br>(0.272)  | 0.555**<br>(0.270)  |
| Collateral     | 0.008<br>(0.014)           | 0.007<br>(0.014)           | -0.277***<br>(0.027)        | -0.277***<br>(0.026)        | -0.352***<br>(0.059) | -0.353***<br>(0.059) | 0.005<br>(0.011)                   | 0.005<br>(0.011)                   | -0.001<br>(0.034)   | -0.001<br>(0.034)   |
| Inflation      | -0.480***<br>(0.132)       | -0.483***<br>(0.131)       | 0.430<br>(0.336)            | 0.445<br>(0.329)            | 0.444<br>(0.500)     | 0.423<br>(0.501)     | 0.049<br>(0.136)                   | 0.042<br>(0.133)                   | -0.940<br>(0.622)   | -0.921<br>(0.635)   |
| GDP growth     | -0.024<br>(0.273)          | -0.027<br>(0.273)          | 0.058<br>(0.325)            | 0.066<br>(0.321)            | -0.148<br>(0.327)    | -0.158<br>(0.326)    | -0.472***<br>(0.063)               | -0.467***<br>(0.064)               | -0.686*<br>(0.361)  | -0.678*<br>(0.361)  |
| GDP per capita | 0.003<br>(0.002)           | 0.003<br>(0.002)           | 0.005<br>(0.005)            | 0.005<br>(0.005)            | 0.006<br>(0.006)     | 0.006<br>(0.006)     | -0.004**<br>(0.002)                | -0.004**<br>(0.002)                | 0.002<br>(0.007)    | 0.002<br>(0.007)    |
| Restrict       | -0.001                     | -0.001                     | 0.027***                    | 0.028***                    | 0.010                | 0.011                | 0.000                              | 0.000                              | -0.014*             | -0.014*             |

|                            |                             |                             |                              |                              |                              |                              |                             |                             |                             |                             |
|----------------------------|-----------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Capital stringency         | (0.003)<br>0.000<br>(0.002) | (0.003)<br>0.000<br>(0.002) | (0.008)<br>-0.004<br>(0.006) | (0.008)<br>-0.005<br>(0.006) | (0.008)<br>-0.002<br>(0.006) | (0.008)<br>-0.002<br>(0.006) | (0.002)<br>0.000<br>(0.001) | (0.002)<br>0.000<br>(0.001) | (0.007)<br>0.008<br>(0.007) | (0.007)<br>0.008<br>(0.007) |
| Official                   | 0.003**<br>(0.001)          | 0.003**<br>(0.001)          | -0.001<br>(0.003)            | -0.002<br>(0.003)            | 0.004<br>(0.004)             | 0.004<br>(0.004)             | -0.000<br>(0.001)           | -0.000<br>(0.001)           | 0.000<br>(0.003)            | 0.000<br>(0.003)            |
| Diversification            | 0.007*<br>(0.004)           | 0.008**<br>(0.004)          | -0.028***<br>(0.006)         | -0.031***<br>(0.007)         | -0.012*<br>(0.006)           | -0.013*<br>(0.007)           | -0.009***<br>(0.002)        | -0.009***<br>(0.002)        | 0.011<br>(0.009)            | 0.011<br>(0.009)            |
| Financial freedom          | -0.001***<br>(0.000)        | -0.001***<br>(0.000)        | -0.001***<br>(0.000)         | -0.001***<br>(0.000)         | 0.000<br>(0.000)             | 0.000<br>(0.000)             | -0.000***<br>(0.000)        | -0.000***<br>(0.000)        | 0.000<br>(0.000)            | 0.000<br>(0.000)            |
| Corporate governance       | 0.001**<br>(0.000)          |                             | 0.000<br>(0.001)             |                              | 0.001<br>(0.001)             |                              | 0.001***<br>(0.000)         |                             | -0.000<br>(0.001)           |                             |
| Board                      |                             | 0.001**<br>(0.000)          |                              | 0.001*<br>(0.001)            |                              | 0.001<br>(0.001)             |                             | 0.001***<br>(0.000)         |                             | -0.000<br>(0.001)           |
| Compensation and ownership |                             | -0.000<br>(0.001)           |                              | -0.001<br>(0.002)            |                              | 0.001<br>(0.002)             |                             | -0.000<br>(0.000)           |                             | -0.001<br>(0.002)           |
| Auditing                   |                             | 0.002<br>(0.001)            |                              | -0.005*<br>(0.003)           |                              | -0.001<br>(0.002)            |                             | 0.001**<br>(0.001)          |                             | 0.000<br>(0.003)            |
| Takeover                   |                             | 0.001<br>(0.001)            |                              | 0.005*<br>(0.002)            |                              | 0.007**<br>(0.003)           |                             | 0.000<br>(0.001)            |                             | -0.004<br>(0.004)           |
| N                          | 3147                        | 3147                        | 2277                         | 2277                         | 3149                         | 3149                         | 2847                        | 2847                        | 3031                        | 3031                        |
| adj. R-sq                  | 0.180                       | 0.181                       | 0.256                        | 0.259                        | 0.242                        | 0.244                        | 0.315                       | 0.316                       | 0.061                       | 0.060                       |

**Table 8. Channels through which corporate governance can affect bank risk: liability and growth choices**

The dependent variable in columns 1 and 2 is tangible capital which is the ratio of tangible capital to tangible assets. The dependent variable in columns 5 and 6 is non-deposit funding which is the share of non-deposit short-term funding in total deposits and short-term funding. The dependent variable in columns 7 and 8 is asset growth which is the growth rate of total assets. Assets is the logarithm of total assets. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. All explanatory variables are lagged one year. Regressions include bank and year fixed effects. Standard errors are adjusted for clustering at the bank level, and provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

|                    | Tangible capital<br>(1) | Tangible capital<br>(2) | Non-deposit funding<br>(3) | Non-deposit funding<br>(4) | Asset growth<br>(5)  | Asset growth<br>(6)  |
|--------------------|-------------------------|-------------------------|----------------------------|----------------------------|----------------------|----------------------|
| Assets             | -0.006*<br>(0.003)      | -0.006*<br>(0.003)      | 0.016<br>(0.015)           | 0.015<br>(0.015)           | -0.372***<br>(0.024) | -0.373***<br>(0.024) |
| Assets to GDP      | 0.013<br>(0.009)        | 0.014*<br>(0.008)       | -0.034<br>(0.054)          | -0.039<br>(0.053)          | 0.169<br>(0.117)     | 0.171<br>(0.117)     |
| Overhead           | 0.095<br>(0.081)        | 0.098<br>(0.081)        | 0.515*<br>(0.289)          | 0.502*<br>(0.287)          | 0.440<br>(0.345)     | 0.438<br>(0.346)     |
| Collateral         | -0.018*<br>(0.011)      | -0.018*<br>(0.011)      | 0.034<br>(0.034)           | 0.034<br>(0.034)           | 0.139*<br>(0.073)    | 0.137*<br>(0.073)    |
| Inflation          | 0.062<br>(0.074)        | 0.054<br>(0.075)        | -0.618<br>(0.785)          | -0.614<br>(0.783)          | -1.416<br>(1.161)    | -1.464<br>(1.159)    |
| GDP growth rate    | 0.064<br>(0.073)        | 0.059<br>(0.074)        | 0.006<br>(0.511)           | 0.014<br>(0.510)           | 0.319<br>(0.687)     | 0.279<br>(0.692)     |
| GDP per capita     | -0.001<br>(0.001)       | -0.001<br>(0.001)       | 0.008<br>(0.010)           | 0.007<br>(0.010)           | -0.018<br>(0.012)    | -0.018<br>(0.012)    |
| Restrict           | 0.001<br>(0.002)        | 0.001<br>(0.002)        | -0.023**<br>(0.011)        | -0.024**<br>(0.011)        | 0.007<br>(0.013)     | 0.007<br>(0.014)     |
| Capital stringency | 0.001<br>(0.001)        | 0.001<br>(0.001)        | 0.015*<br>(0.009)          | 0.015*<br>(0.008)          | -0.031**<br>(0.012)  | -0.032***<br>(0.012) |

|                            |                     |                     |                   |                   |                      |                      |
|----------------------------|---------------------|---------------------|-------------------|-------------------|----------------------|----------------------|
| Official                   | -0.001**<br>(0.001) | -0.002**<br>(0.001) | 0.001<br>(0.004)  | 0.001<br>(0.004)  | -0.013*<br>(0.006)   | -0.012*<br>(0.007)   |
| Diversification            | 0.001<br>(0.001)    | 0.001<br>(0.001)    | -0.005<br>(0.006) | -0.003<br>(0.006) | 0.003<br>(0.015)     | 0.007<br>(0.015)     |
| Financial freedom          | 0.000<br>(0.000)    | 0.000<br>(0.000)    | -0.000<br>(0.000) | 0.000<br>(0.000)  | -0.003***<br>(0.001) | -0.003***<br>(0.001) |
| Corporate governance       | -0.000**<br>(0.000) |                     | 0.000<br>(0.001)  |                   | -0.000<br>(0.002)    |                      |
| Board                      |                     | -0.001**<br>(0.000) |                   | 0.001<br>(0.001)  |                      | -0.002<br>(0.002)    |
| Compensation and ownership |                     | -0.000<br>(0.000)   |                   | -0.002<br>(0.002) |                      | 0.000<br>(0.004)     |
| Auditing                   |                     | -0.001<br>(0.001)   |                   | 0.003<br>(0.003)  |                      | 0.006<br>(0.006)     |
| Takeover                   |                     | 0.001<br>(0.001)    |                   | -0.003<br>(0.004) |                      | 0.005<br>(0.006)     |
| N                          | 3091                | 3091                | 3131              | 3131              | 3156                 | 3156                 |
| adj. R-sq                  | 0.128               | 0.129               | 0.046             | 0.047             | 0.266                | 0.267                |

**Table 9. Banking procyclicality and corporate governance**

The dependent variable in columns 1 and 2 is lending procyclicality which is the correlation coefficient between GDP growth and a bank's loan growth. The dependent variable in columns 3 and 4 is NPL procyclicality which is the correlation between GDP growth and non-performing loans as a fraction of total loan outstanding. The dependent variable in columns 5 and 6 is tangible capital procyclicality which is the correlation between GDP growth and tangible capital ratio. Assets is the logarithm of total assets. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. All explanatory variables are mean values per bank. Regressions include country fixed effects. Standard errors are adjusted for heteroskedasticity and provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

|                    | Lending<br>procyclicality<br>(1) | Lending<br>procyclicality<br>(2) | NPL<br>procyclicality<br>(3) | NPL<br>procyclicality<br>(4) | Tangible capital<br>procyclicality<br>(5) | Tangible capital<br>procyclicality<br>(6) |
|--------------------|----------------------------------|----------------------------------|------------------------------|------------------------------|-------------------------------------------|-------------------------------------------|
| Assets             | -0.008<br>(0.011)                | -0.007<br>(0.012)                | -0.014*<br>(0.008)           | -0.017**<br>(0.009)          | -0.002<br>(0.009)                         | -0.002<br>(0.010)                         |
| Assets to GDP      | 0.103<br>(0.076)                 | 0.094<br>(0.077)                 | -0.095*<br>(0.053)           | -0.069<br>(0.057)            | -0.011<br>(0.061)                         | -0.004<br>(0.064)                         |
| Overhead           | -0.317<br>(0.739)                | -0.307<br>(0.749)                | 0.503<br>(0.656)             | 0.474<br>(0.689)             | -0.459*<br>(0.238)                        | -0.439*<br>(0.242)                        |
| Collateral         | -0.296**<br>(0.145)              | -0.300**<br>(0.145)              | 0.426***<br>(0.124)          | 0.425***<br>(0.124)          | -0.133<br>(0.111)                         | -0.134<br>(0.112)                         |
| Inflation          | -5.142**<br>(2.592)              | -5.681**<br>(2.724)              | 3.538*<br>(1.947)            | 3.772*<br>(1.998)            | -8.221***<br>(2.862)                      | -7.928***<br>(2.945)                      |
| GDP growth         | 15.388***<br>(4.198)             | 15.635***<br>(4.363)             | -19.751***<br>(4.254)        | -21.788***<br>(4.309)        | 9.975**<br>(4.929)                        | 9.425*<br>(5.169)                         |
| GDP per capita     | 0.000<br>(0.005)                 | -0.000<br>(0.006)                | -0.003<br>(0.006)            | -0.005<br>(0.006)            | 0.008<br>(0.006)                          | 0.007<br>(0.006)                          |
| Restrict           | -0.079***<br>(0.028)             | -0.077***<br>(0.028)             | 0.025<br>(0.030)             | 0.028<br>(0.030)             | -0.093***<br>(0.028)                      | -0.090***<br>(0.028)                      |
| Capital stringency | -0.055**                         | -0.055**                         | -0.038                       | -0.035                       | -0.089***                                 | -0.088**                                  |

|                            |                               |                               |                                |                                |                                |                                |
|----------------------------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Official                   | (0.026)<br>0.041**<br>(0.017) | (0.027)<br>0.040**<br>(0.017) | (0.025)<br>-0.040**<br>(0.017) | (0.025)<br>-0.041**<br>(0.017) | (0.034)<br>0.058***<br>(0.017) | (0.034)<br>0.057***<br>(0.017) |
| Diversification            | -0.017<br>(0.078)             | 0.001<br>(0.082)              | 0.149*<br>(0.086)              | 0.124<br>(0.089)               | -0.089<br>(0.098)              | -0.096<br>(0.101)              |
| Financial freedom          | -0.002<br>(0.003)             | -0.002<br>(0.003)             | 0.000<br>(0.003)               | 0.001<br>(0.003)               | -0.005<br>(0.003)              | -0.005<br>(0.003)              |
| Corporate governance       | 0.009*<br>(0.005)             |                               | -0.012***<br>(0.004)           |                                | -0.009*<br>(0.005)             |                                |
| Board                      |                               | 0.010<br>(0.008)              |                                | -0.015**<br>(0.006)            |                                | -0.013*<br>(0.008)             |
| Compensation and ownership |                               | -0.004<br>(0.019)             |                                | 0.007<br>(0.016)               |                                | 0.001<br>(0.018)               |
| Auditing                   |                               | 0.037<br>(0.028)              |                                | -0.009<br>(0.023)              |                                | -0.001<br>(0.029)              |
| Takeover                   |                               | 0.008<br>(0.015)              |                                | -0.018<br>(0.012)              |                                | -0.006<br>(0.016)              |
| N                          | 702                           | 702                           | 633                            | 633                            | 702                            | 702                            |
| adj. R-sq                  | 0.080                         | 0.078                         | 0.291                          | 0.290                          | 0.026                          | 0.023                          |

**Table 10. Implicit liability insurance, bank size and corporate governance**

The dependent variable is IPP, which is the fair value of the insurance put option per dollar of liabilities in cents. Assets is the logarithm of total assets. Assets to GDP is total assets divided by GDP. Overhead is overhead divided by total assets. Collateral is assets that can easily be used as collateral divided by total assets. Inflation is the consumer price inflation rate. GDP growth is the rate of real GDP growth. GDP per capita is GDP per capita in thousands of constant U.S. dollars. Restrict is an index of regulatory restrictions on bank activities. Capital stringency is an index of regulatory oversight of bank capital, ranging from 3 to 10 with higher values indicate greater stringency. Official is an index of power of commercial bank supervisory agency. It measures the power of the supervisory authorities to take specific actions to prevent and correct problems, with higher values indicating greater power. Diversification is an index of diversification guidelines imposed on banks, ranging from 0 to 2 with higher values indicating more diversification. Financial freedom is an index of financial freedom, scaled from 0 to 100 with higher values indicating greater freedom. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board characteristics. Compensation and ownership a corporate governance index based on compensation and ownership characteristics. Auditing is a corporate governance index based on auditing characteristics. Takeover is a corporate governance index based on takeover characteristics. All explanatory variables are lagged one year. Regressions include bank and year fixed effects. Standard errors are adjusted for clustering at the bank level, and provided in parentheses. \*, \*\*, and \*\*\* denote significance at 10%, 5%, and 1%, respectively.

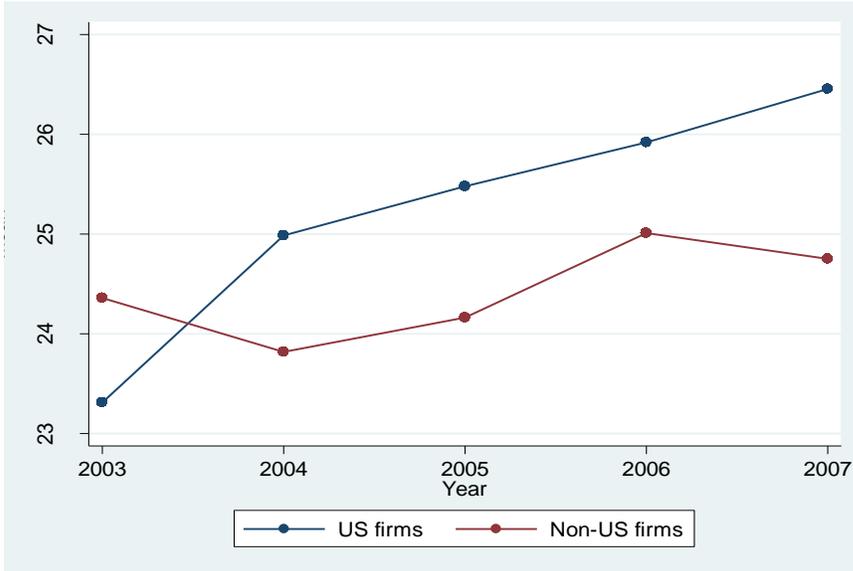
|                               | IPP<br>(1)           | IPP<br>(2)           | IPP<br>(3)           | IPP<br>(4)           |
|-------------------------------|----------------------|----------------------|----------------------|----------------------|
| Assets                        | 0.034*<br>(0.020)    | 0.000<br>(0.022)     | 0.033*<br>(0.020)    | -0.002<br>(0.024)    |
| Assets to GDP                 | -0.164***<br>(0.060) | -0.190***<br>(0.062) | -0.161***<br>(0.060) | -0.189***<br>(0.061) |
| Overhead                      | 0.987<br>(0.917)     | 0.974<br>(0.913)     | 0.979<br>(0.915)     | 0.963<br>(0.912)     |
| Collateral                    | -0.014<br>(0.066)    | -0.019<br>(0.066)    | -0.015<br>(0.066)    | -0.021<br>(0.065)    |
| GDP growth                    | -2.732***<br>(0.495) | -2.749***<br>(0.496) | -2.775***<br>(0.494) | -2.799***<br>(0.494) |
| Inflation                     | -0.453<br>(0.694)    | -0.559<br>(0.699)    | -0.504<br>(0.680)    | -0.613<br>(0.686)    |
| GDP per capita                | -0.013<br>(0.008)    | -0.013<br>(0.008)    | -0.014<br>(0.008)    | -0.013<br>(0.008)    |
| Restrict                      | -0.015*<br>(0.008)   | -0.013<br>(0.009)    | -0.016*<br>(0.008)   | -0.014<br>(0.009)    |
| Capital stringency            | 0.013*<br>(0.007)    | 0.010<br>(0.008)     | 0.013*<br>(0.007)    | 0.010<br>(0.008)     |
| Official                      | 0.009*<br>(0.005)    | 0.009*<br>(0.005)    | 0.009*<br>(0.005)    | 0.009*<br>(0.005)    |
| Diversification               | -0.011<br>(0.007)    | -0.012*<br>(0.007)   | -0.009<br>(0.007)    | -0.010<br>(0.008)    |
| Financial freedom             | -0.003***<br>(0.001) | -0.003***<br>(0.001) | -0.003***<br>(0.001) | -0.003***<br>(0.001) |
| Corporate governance          | 0.004***<br>(0.001)  | -0.007*<br>(0.004)   |                      |                      |
| Corporate governance * Assets |                      | 0.001***<br>(0.000)  |                      |                      |
| Board                         |                      |                      | 0.004***<br>(0.001)  | -0.008<br>(0.005)    |
| Compensation and ownership    |                      |                      | 0.001<br>(0.003)     | -0.010<br>(0.010)    |
| Auditing                      |                      |                      | 0.008*<br>(0.004)    | -0.003<br>(0.017)    |
| Takeover                      |                      |                      | 0.009*<br>(0.005)    | -0.003<br>(0.019)    |

|                                     |       |       |       |          |
|-------------------------------------|-------|-------|-------|----------|
| Board * Assets                      |       |       |       | 0.001*** |
|                                     |       |       |       | (0.001)  |
| Compensation and ownership * Assets |       |       |       | 0.001    |
|                                     |       |       |       | (0.001)  |
| Auditing * Assets                   |       |       |       | 0.001    |
|                                     |       |       |       | (0.002)  |
| Takeover * Assets                   |       |       |       | 0.001    |
|                                     |       |       |       | (0.002)  |
| N                                   | 2858  | 2858  | 2858  | 2858     |
| adj. R-sq                           | 0.523 | 0.525 | 0.523 | 0.524    |

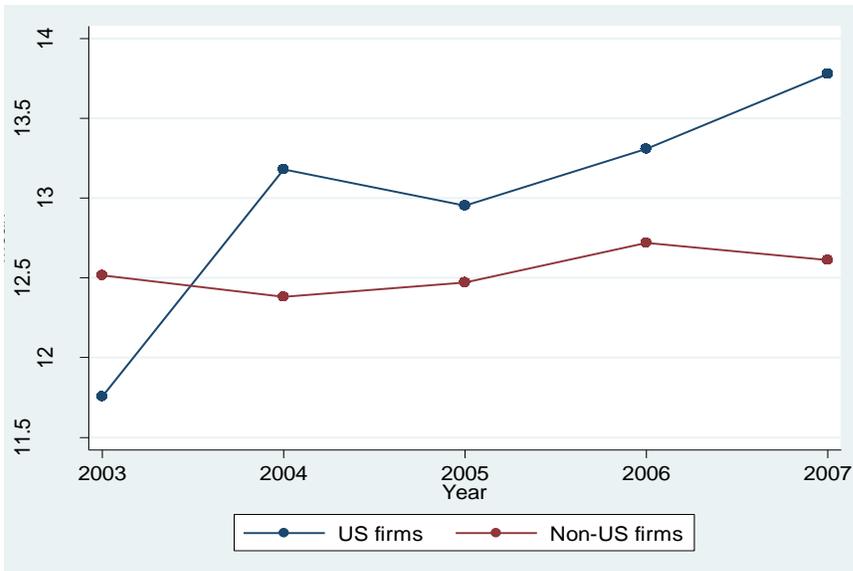
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**Figure 1. The evolution of governance finance variables**

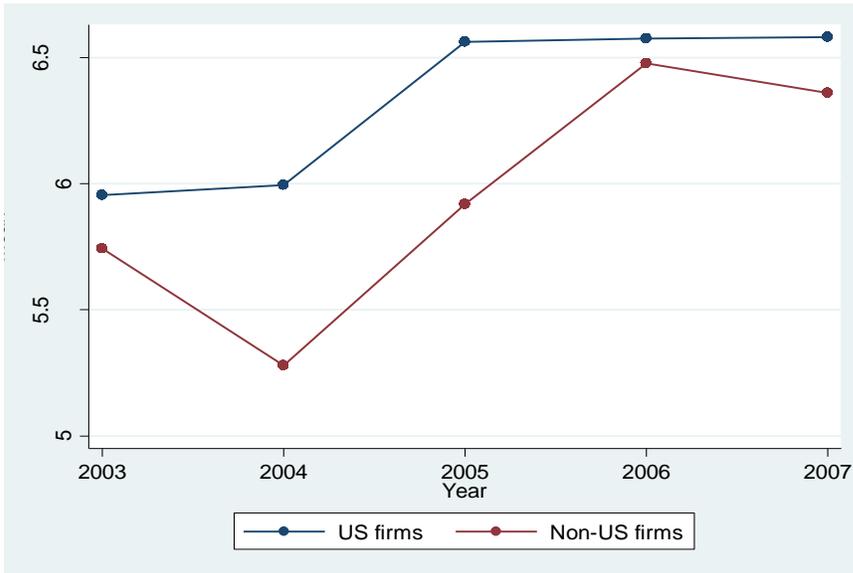
Part A. Overall corporate governance index



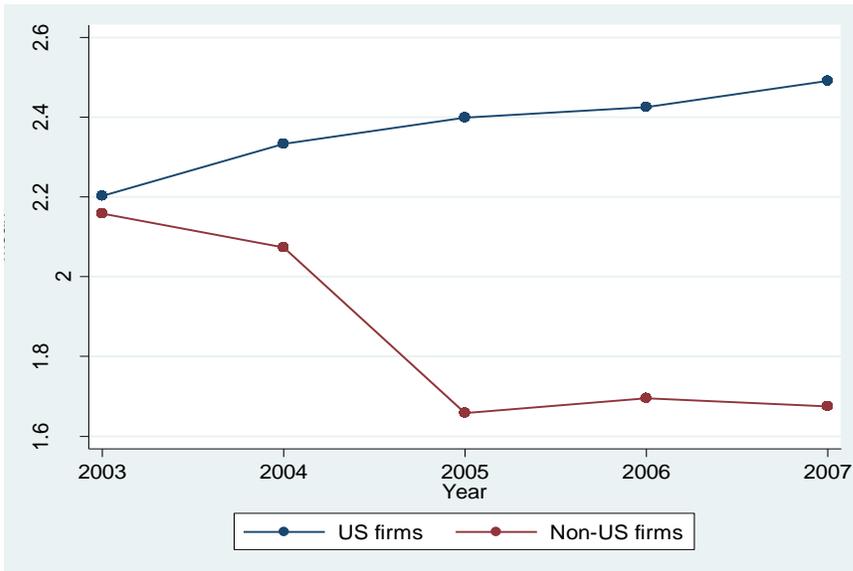
Part B. Board index



Part C. Compensation and ownership index



Part D. Auditing index



Part E. Takeover index

