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The credit crisis around the globe: Why did some banks perform better? ☆

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ABSTRACT

Though overall bank performance from July 2007 to December 2008 was the worst since the Great Depression, there is significant variation in the cross-section of stock returns of large banks across the world during that period. We use this variation to evaluate the importance of factors that have been put forth as having contributed to the poor performance of banks during the credit crisis. The evidence is supportive of theories that emphasize the fragility of banks financed with short-term capital market funding. The better-performing banks had less leverage and lower returns immediately before the crisis. Differences in banking regulations across countries are generally uncorrelated with the performance of banks during the crisis, except that large banks from countries with more restrictions on bank activities performed better and decreased loans less. Our evidence poses a substantial challenge to those who argue that poor bank governance was a major cause of the crisis because we find that banks with more shareholder-friendly boards performed significantly worse during the crisis than other banks, were not less risky before the crisis, and reduced loans more during the crisis.

1. Introduction

Throughout the world, by the end of 2008, many banks had seen most of their equity destroyed by the crisis that started in the US subprime sector in 2007. Yet, not all banks across the world performed equally poorly. In this paper, we investigate how banks that performed better during the crisis, measuring performance by stock returns, differed from other banks before the crisis. Academics, journalists, and policy-makers have argued that lax regulation, insufficient capital, excessive reliance on short-term financing, and poor governance all contributed to making the crisis as serious as it was. If these factors did contribute to making the crisis worse, we would expect that banks that were more exposed to these factors performed more poorly during the crisis. We investigate the relation between these factors and the stock return

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performance of large banks during the crisis, where large banks are defined as banks with assets in excess of $50 billion in 2006. With our definition of large banks, 32 countries had at least one large bank and our sample includes 164 large banks from these countries.

Many analyses of the crisis emphasize the run on the funding of banks that relied on short-term finance in the capital markets for a substantial fraction of their financing (see, for instance, Adrian and Shin, 2008, Brunnermeier, 2009, Gorton, 2010, and Diamond and Rajan, 2009). We would expect banks that rely on short-term finance before the crisis to perform worse during the crisis. We find that this is the case with two different approaches. First, we find strong evidence that banks that relied more on deposits for their financing in 2006 fared better during the crisis. Second, following Demirgüç-Kunt and Huizinga (2010), we use a measure of short-term funding provided by sources other than customer deposits. We show that performance is strongly negatively related to that measure both for the sample of large banks and the sample extended to include large financial institutions that are not depository banks, such as investment banks. These analyses also emphasize how losses force banks to reduce their leverage, perhaps through fire sales of securities, and how this effect is greater for banks with more leverage. We find that large banks with less leverage in 2006 performed better during the crisis.

An Organization for Economic Co-operation and Development (OECD) report argues that "the financial crisis can be to an important extent attributed to failures and weaknesses in corporate governance arrangements" (Kirkpatrick, 2008). More recently, the National Commission on the Causes of the Financial and Economic Crisis in the United States concluded that "dramatic failures of corporate governance … at many systematically important financial institutions were a key cause of this crisis." (The Financial Crisis Inquiry Report, 2011, pp. xvii). Some academic studies also emphasize that flaws in bank governance played a key role in the performance of banks (Diamond and Rajan, 2009, and Bebchuk and Spamann, 2010). The idea is generally that banks with poor governance engaged in excessive risk taking, causing them to make larger losses during the crisis because they were riskier.

We use two proxies for governance. The first one is the ownership of the controlling shareholder in 2006. The second one is whether the bank had a shareholder-friendly board. To the extent that governance played a role, we would expect banks with better governance to have performed better. It is generally believed that greater ownership by insiders aligns their incentives more closely with the interests of shareholders. However, a powerful controlling shareholder could use control of a bank to benefit other related entities, so that it is not necessarily the case that greater ownership by the controlling shareholder means better alignment of interests of management with shareholders. Some limited evidence shows that banks with higher ownership by the controlling shareholder performed better. In contrast, a strong and unambiguous relation exists between the extent to which a board was shareholder friendly in 2006 and a bank's performance during the crisis. Banks with a shareholder-friendly board performed worse during the crisis. The hypothesis that the crisis resulted from excessive risk taking made possible by poor governance would imply the opposite result, so that our evidence poses a considerable challenge to the proponents of that hypothesis. We also investigate whether banks with better governance were less risky in 2006 and find no evidence supportive of that hypothesis either. Banks with more shareholder-friendly boards had a lower distance to default in 2006 but did not have higher idiosyncratic risk or higher leverage than other banks. Like Laeven and Levine (2009), we find that banks with higher controlling shareholder ownership are riskier, as these banks had greater idiosyncratic risk and a lower distance to default before the crisis.

Governance and board characteristics are endogenously determined (see, e.g., Hermalin and Weisbach, 1998). In the context of our study, an important form of endogeneity stressed in the literature seems to have little relevance. Though taking into account the possibility that good governance could be caused by expectations about future outcomes generally is important, the banks with more shareholder-friendly boards are highly unlikely to have had such boards because they anticipated the crisis and expected to require better governance during it.

At the same time, the concern that governance is significantly related to performance because it is associated with unobserved bank characteristics is important in the context of our study. In fact, the existence of such a relation is the only way to explain the results we find. Surely, it cannot be the case that a shareholder-friendly board wanted to position a bank so that its performance during a crisis would be poor. Instead, the most likely explanation is that shareholder-friendly boards positioned banks in ways that they believed maximized shareholder wealth, perhaps by taking advantage of implicit or explicit governmental guarantees, but left them more exposed to risks that manifested themselves during the crisis and had an adverse impact on banks. In other words, shareholder-friendly boards created more value for shareholders through their decisions before the crisis, but during the crisis these decisions were associated with poor outcomes that could not be forecasted. For this explanation to work, these risks must not have been captured by traditional measures because accounting for these measures does not eliminate the relation between governance and performance we document. An example that could explain what we find is that banks with more shareholder-friendly boards invested more aggressively in highly-rated tranches of subprime securitizations. Such investments did not appear risky in 2006 by traditional risk measures, but they did work out poorly for the banks that made them. An alternative explanation for our results is that certain banks optimally chose more shareholder-friendly governance before the crisis because they were exposed to risks that required more independent board monitoring. With this view, the risks were not chosen by the board but instead led to the choice of a shareholder-friendly board. These risks had adverse

realizations during the crisis, but because the banks had a shareholder-friendly board, they performed better than they would have had otherwise. With this explanation, banks with good governance had poor returns because of the risks they had, but they would have had even lower returns had they had worse governance. Governance is negatively related to performance in this case because it is correlated with risks that had adverse realizations, but it led to better performance nevertheless. Though we find some support for the latter explanation, neither explanation is consistent with the view that poor bank governance was a first-order cause of the crisis.

We use the 2008 World Bank survey on bank regulation to examine the hypothesis that lax regulation led banks to take excessive risks that caused large losses during the crisis (see, e.g., Dooley, Folkerts-Landau, and Garber (2009), Stiglitz (2010)). We use indices for the power of the regulators, oversight of bank capital, restrictions on bank activities, and private monitoring of banks. There is no convincing evidence that tighter regulation in general was associated with better bank performance during the crisis or with less risky banks before the crisis. In all our regressions, only the index on restrictions of bank activities is positively related to the performance of banks during the crisis. Barth, Caprio, and Levine (1999) show that the banking system is more fragile in countries where banking activities are more restricted. However, some observers, perhaps most visibly the former chairman of the Federal Reserve System Paul Volcker, have blamed the difficulties of banks during the crisis on their activities not related to making loans and taking deposits. Though we find that large banks in countries where bank activities were more restricted suffered less from the crisis, no evidence exists that such restrictions made banks less risky before the crisis using common measures of risk. Most likely, therefore, to the extent that restrictions on bank activities are associated with better performance of banks during the crisis, it is because traditional bank activities were less exposed to the risks that turned out poorly during the crisis than were newer or less traditional bank activities. In addition, we find that stronger regulations for bank capital were associated with less risk before the crisis. Given the attention paid to the moral hazard resulting from deposit insurance, we investigate whether banks in countries with a deposit insurance scheme performed worse and find no evidence supportive of this hypothesis. However, banks in countries with formal deposit insurance schemes had higher idiosyncratic risk before the crisis.

If banks are impeded from making loans because of poor financial health, economic growth is weaker. It is therefore important to understand whether the variables that help predict returns during the crisis also help explain loan growth. In a related paper, Cornett, McNutt, Strahan, and Tehranian (2011) find that US banks with more exposure to liquidity risk experienced less loan growth during the crisis. We have a much smaller sample than they have, so that our tests do not have as much power as theirs and are less definitive. Nevertheless, we find evidence that is supportive of their results on an international sample composed of much larger banks than the typical bank in their study. Banks with more shareholder friendly boards have lower loan growth during the crisis. Finally, a strong positive relation exists between loan growth and restrictions on bank activities.

We also estimate regressions excluding US banks. With these regressions, we can evaluate whether the worse performers were banks from countries where the banking system was more exposed to the US according to the Bank for International Settlements (BIS) statistics. These regressions allow us to assess whether holding US exposures was a contagion channel [see, e.g., Eichengreen, Mody, Nedeljkovic, and Sarno (2009) for the view that assets were a contagion channel]. We find that banks from countries where the banking system was more exposed to the US performed worse.

Our main results hold up in a variety of robustness tests. Our study is limited by the data available. Ideally, we would like to have data on the nature of holdings of securities by banks. However, such data are generally not available. Another limitation of our study is that, in the fall of 2008, countries stepped in with capital injections and other forms of support of banks. Such intervention might have distorted returns. Yet, our results generally hold for returns measured from mid-2007 to just before the Lehman Brothers bankruptcy in September 2008. Moreover, Panetta, Faeh, Grande, Ho, King, Levy, Sigboretti, Taboga, and Zaghini (2009) show that the announcement of rescue packages did not have a positive impact on bank stock prices across countries. We estimate our regression that includes the indicator variable for whether the board is shareholder-friendly for a sample that includes investment banks and other financial institutions not subject to the Basle Accords (i.e., financial institutions that do not report Tier 1 capital and are not subject to the regulations forming the basis for our regulatory variables). We find that our results hold for that sample.

The paper proceeds as follows. In Section 2, we introduce the data that we use. In Section 3, we examine how the performance of banks during the crisis relates to governance, regulation, balance sheet composition, and country characteristics other than regulation. We also show how these attributes are related to bank risk before the crisis. We conclude in Section 4.

2. Data

To select the sample, we start from the financial institutions in Bankscope with assets in excess of $10 billion at the end of 2006. Bankscope has 1,648 financial institutions that satisfy this criterion. We exclude financial institutions that are not publicly traded, that disappear before the middle of 2007, and a few institutions for which the data appear inaccurate. The resulting sample has 503 institutions.

For the main sample of our analysis, we require that a financial institution is a deposit-taking and loan-making bank. The regulation indices we use apply to such institutions, but they do not apply to institutions that are not subject to the Basle Accords. For a financial institution to be in the sample as a deposit-taking bank, we require a deposit to assets ratio above 20% and a loan to assets ratio above 10%.

Table 1
Country characteristics.

The large bank sample includes public banks with assets larger than $50 billion as of December 2006. The overall sample includes banks in the same countries with assets larger than $10 billion. Banks are included in the sample if they have a loan-to-asset ratio larger than 10% and a deposit-to-asset ratio larger than 20%. Country characteristics are computed using data from 2006. *Log GDP* is the log of real gross domestic product (GDP) per capita in dollars for 2006, *current account* is the ratio between the current account deficit and GDP for 2006, and *concentration* is the ratio between the assets of the three largest banks in each country and total assets of the national banking system in 2006. ADRI is the anti-director index of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) as revised in Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008). *Institution* is the simple average of six indicators reported by Kaufmann, Kraay, and Mastruzzi (2008) called voice, political stability, government effectiveness, regulatory quality, rule of law, and corruption. The regulation variables come from Caprio, Laeven, and Levine (2007) using data in the 2007 database (revised in June 2008) downloaded from the World Bank. *Official* is an index of the power of the commercial bank supervisory agency, *capital* is an index of regulatory oversight of bank capital, *restrict* is an index of regulatory restrictions on the activities of banks, and *private monitoring* is an index of monitoring on the part of the private sector. *Deposit insurance* is a dummy variable equal to one where there is an explicit deposit insurance; see Table A.1 in Demirgüç-Kunt, Karacaovali, and Laeven (2005). n.a.=not available.

Country	Number of banks	Number of large banks	Log GDP	*Current account*	*Concentration*	ADRI	*Institution*	*Official*	*Capital*	*Restrict*	*Private monitoring*	*Deposit insurance*
Australia	8	5	10.50	−5.32	0.62	4	1.60	13	4	10	7	0
Austria	6	4	10.57	2.83	0.61	2.5	1.59	10	5	7	4	1
Belgium	3	3	10.54	2.65	0.81	3	1.36	11	3	7	6	1
Brazil	7	4	8.68	1.25	0.54	5	−0.08	14	5	9	7	1
Canada	8	6	10.58	1.40	0.56	4	1.64	6	4	8	6	1
China	11	10	7.61	9.53	0.59	1	−0.56	10	4	15	7	0
Denmark	4	1	10.83	2.89	0.78	4	1.83	10	5	9	7	1
France	16	5	10.52	−0.51	0.62	3.5	1.18	8	8	9	7	1
Germany	13	11	10.48	6.13	0.68	3.5	1.51	8	7	7	7	1
Great Britain	11	9	10.60	−3.31	0.50	5	1.56	8	6	4	7	1
Greece	9	3	10.09	−11.10	0.67	2	0.66	10	4	8	7	1
Hong Kong	9	2	10.22	12.08	0.68	5	1.45	11	4	5	7	0
Iceland	3	1	10.90	−7.55	n.a.	4.5	1.87	8	7	10	7	1
India	19	2	6.63	−1.06	0.33	5	−0.15	10	8	11	6	1
Ireland	5	5	10.87	−3.57	0.53	5	1.56	12	2	7	7	1
Israel	5	2	9.97	5.04	0.77	4	0.59	10	4	12	7	0
Italy	16	8	10.37	−2.59	0.32	2	0.59	7	4	12	7	1
Japan	81	22	10.44	3.91	0.39	4.5	1.24	12	6	11	8	1
Korea	5	4	9.89	0.57	0.51	4.5	0.63	11	4	9	8	1
Malaysia	10	1	8.69	16.01	0.46	5	0.36	13	6	11	7	1
Netherlands	4	3	10.63	9.33	0.78	2.5	1.63	7	5	6	8	1
Norway	3	1	11.19	17.23	0.95	3.5	1.72	8	8	11	6	1
Portugal	4	2	9.82	−10.03	0.88	2.5	1.01	14	8	12	6	1
Russia	4	1	8.84	9.54	0.19	4	−0.76	8	7	8	6	1
Singapore	3	3	10.36	25.42	0.86	5	1.48	13	7	10	8	0
South Africa	6	5	8.60	−6.31	0.75	5	0.48	10	9	10	8	0
Spain	10	6	10.24	−8.97	0.63	5	0.92	11	9	7	8	1
Sweden	4	4	10.68	8.59	0.94	3.5	1.72	5	4	10	6	1
Switzerland	13	2	10.89	14.40	0.87	3	1.79	14	6	8	6	1
Taiwan	16	7	9.68	7.18	0.27	3	0.76	13	7	13	7	1
Turkey	9	1	8.96	−6.03	0.50	3	−0.07	n.a.	n.a.	n.a.	n.a.	1
USA	63	22	10.71	−6.00	0.32	3	1.27	13	6	11	7	1

With these restrictions, our data set has 440 deposit-taking banks (banks hereafter). We want to focus our analysis on banks that can be viewed of systemic importance. The Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank) uses the $50 billion of assets threshold for systemic importance. In our sample, there are 164 banks in 32 countries with total assets in excess of $50 billion as of December 2006. The countries in which these banks are located have 387 banks with assets in excess of $10 billion. Most of our analysis focuses on the sample of 164 large banks. We also discuss results for the sample of 387 banks in countries with large banks. More important, we also report results for a broader sample that includes financial institutions that are not subject to the Basle Accords. This broader sample includes the US investment banks. All samples are based on information available at the end of 2006, so that they include banks that failed during the crisis.

Table 1 reports the countries that have at least one large bank. Japan has the largest number of banks in the sample, followed by the US. Several countries have only one large bank. In the remainder of this section, we describe the data as well as the performance measure that we use. Univariate statistics for the data discussed in this section are reported in Tables 1 and 2. Table 1 reports country characteristics. Table 2 reports data for the 164 large banks. We winsorize the bank-level explanatory variables at the 1% and 99% levels.

2.1. Bank returns

Our bank performance measure is a bank's buy-and-hold dollar stock returns. Our main focus is on returns from the middle of 2007 to the end of 2008. We call this the crisis period. The start of the period seems

Table 2
Summary statistics.

The sample includes the 164 banks in Bankscope with returns available from Datastream, with a loans-to-assets ratio larger than 10%, a deposits-to-assets ratio larger than 20%, and total assets larger than $50 billion as of 2006. Returns are in percent. Firm characteristics are computed using data from 2006, prior to the beginning of the financial crisis. *Tier 1* is the ratio of Tier 1 capital to risk-weighted assets, *income diversity* from Laeven and Levine (2009) is defined as one minus the absolute value of the ratio of the difference between net interest income and other operating income to total operating income, *non-interest* is the share of operating income not due to interest income, *log Z* is the distance to default estimated as Z=mean(ROA+CAR)/volatility(ROA) where CAR is the capital-to-asset ratio and ROA is return on assets for the period 1996–2006, *beta* is the slope of the regression of weekly excess stock returns on the MSCI World excess return for the period 2004–2006, *real estate beta* is the slope of the regression of weekly excess stock returns on the Fama and French real estate industry excess return in a regression that controls for the MSCI World excess return for the period 2004–2006, *idiosyncratic volatility* is the annualized standard deviation of the residuals from the market model estimated over the same period, and *funding fragility* is the ratio between the sum of deposits from other banks, other deposits, and short-term borrowing over total deposits plus money market and short-term funding. *Other earning assets* is the ratio between the sum of derivatives, other securities, and other remaining assets and the sum of loans and other earning assets. The other bank characteristics are *deposits*, *loans*, *liquid assets* (normalized by total assets), and *tangible equity* (equity minus intangible assets whenever available or equity when intangible assets are not available divided by total assets). The bank balance sheet and income variables are winsorized at the 1% and 99% levels and are expressed in percentage terms. The regulation variables come from Caprio, Laeven, and Levine (2007) using data in the 2007 database (revised in June 2008) downloaded from the World Bank (http://econ.worldbank.org). *Official* is an index of the power of the commercial bank supervisory agency, *capital* is an index of regulatory oversight of bank capital, *restrict* is an index of regulatory restrictions on the activities of banks, and *private monitoring* is an index of monitoring on the part of the private sector. The variable *institution* is the simple average of six indicators reported by Kaufmann, Kraay and Mastruzzi (2008) called voice, political stability, government effectiveness, regulatory quality, rule of law, and corruption. *State* takes value 1 if the state's stake in a bank exceeds 10%. ADRI is the anti-director index of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) as revised in Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008). *Deposit insurance* is a dummy variable equal to one where there is an explicit deposit insurance; see Table A.1 in Demirgüç-Kunt, Karacaovali, and Laeven (2005). *Ownership* is the level of ultimate ownership of the largest shareholder. To construct *board* we follow Aggarwal, Erel, Stulz, and Williamson (2009) and sum 25 board attributes that are available for US firms as well as for foreign firms from the Riskmetrics CGQ dataset. *Log GDP* is the log of real gross domestic product (GDP) per capita in dollars for 2006, *current account* is the ratio between the current account deficit and GDP for 2006, and *concentration* is the ratio between the assets of the three largest banks in each country and total assets of the national banking system in 2006.

Variable	Number of observations	Minimum	Maximum	Average	Median	Standard deviation
Stock returns						
2006	157	−34.49	267.06	32.37	27.11	38.02
July 2007–December 2008	164	−99.95	29.14	−51.84	−52.70	27.74
Bank characteristics						
Tier 1	146	4.40	17.50	8.81	8.35	2.33
Tangible equity	164	1.24	14.06	5.54	5.18	2.67
Deposits	164	22.79	91.23	59.35	57.57	18.10
Funding fragility	161	1.39	96.68	25.93	22.55	19.99
Loans	164	19.55	82.81	55.86	58.71	14.61
Liquid assets	164	1.96	65.14	19.60	16.76	14.22
Other earning assets	161	6.78	75.13	30.22	28.97	14.09
Income diversity	162	0.04	0.99	0.53	0.51	0.25
Non-interest	164	2.57	85.58	41.25	41.01	18.86
Log Z	157	0.55	5.89	3.45	3.45	1.05
Beta	159	0.25	2.30	1.02	1.00	0.40
Real estate beta	159	−0.40	0.36	−0.03	−0.02	0.14
Idiosyncratic volatility	159	9.75	60.43	24.55	21.59	9.23
Regulation and institution						
Official	163	5.00	14.00	10.50	11.00	2.43
Capital	163	2.00	9.00	5.68	6.00	1.63
Restrict	163	4.00	15.00	9.64	10.00	2.64
Private monitoring	163	4.00	8.00	7.06	7.00	0.78
Deposit insurance	164	0.00	1.00	0.84	1.00	0.37
Institution	164	−0.76	1.87	1.06	1.25	0.62
State	160	0.00	1.00	0.08	0	0.27
ADRI	164	1.00	5.00	3.63	3.50	1.15
Corporate governance						
Ownership	160	0.26	94.98	23.83	11.49	24.74
Board	104	6.00	21.00	12.29	11.48	3.74
Macroeconomic variables						
Log GDP	164	6.63	11.19	10.11	10.46	0.92
Current account	164	−11.10	25.42	1.24	1.40	7.09
Concentration	163	18.68	94.95	53.22	52.66	18.31

uncontroversial. Banks performed poorly during the first quarter of 2009 as well, but one could argue that the returns of banks during that time were heavily influenced by uncertainty about resolution mechanisms and the possibility of nationalization. Not surprisingly, the average buy-and-hold dollar return in our sample is extremely poor at −51.84% for large banks. The standard deviation of these returns, 27.74%, is surprisingly high. These returns contrast sharply with the average return in 2006 of 32.37%.

2.2. Bank balance sheet and income characteristics

We investigate the hypothesis that characteristics of bank balance sheets and income statements before the start of the crisis help explain the performance of banks during the crisis. We obtain these data from Bankscope for 2006. Not all banks in our data set report results using US Generally Accepted Accounting Principles (GAAP). In 2006, the International Financial Reporting Standard (IFRS) had the effect to force banks to report more assets than US GAAP standards because of more restrictions on keeping special purpose vehicles off balance sheets and in netting positions. The impact of these differences on our results is likely to be strongly attenuated in the regressions that have country fixed effects. Unfortunately, we cannot restate balance sheets and income statements to a common standard. Because our main results hold when we exclude the US, we believe that our results related to accounting variables are not explained by differences in accounting standards across banks. Our choice of variables is partly dictated by data availability. For instance, it would be useful to have measures of the exposure of banks to subprime loans, but such data are not available from Bankscope or, for that matter, any public source.[1]

We use two different variables to capture the capital ratios of banks: (1) *Tier 1*, defined as the ratio of Tier 1 capital to total risk-weighted assets; and (2) *tangible equity*, defined as the ratio of tangible equity to total assets. When we do not have data for intangible assets, we use total equity in the numerator. The first measure is a regulatory capital ratio and the other is a ratio that capital markets paid much attention to during the crisis [see the arguments in Acharya, Gujral, and Shin (2009)]. The average Tier 1 capital is 8.81% of risk-weighted assets in our sample, which is more than twice the Basle I requirement. While the lowest value of the Tier 1 ratio exceeds the Basle I requirement, the tangible equity ratio has a much lower minimum of 1.24%. Everything else equal, we would expect banks' performance during the crisis to be positively related to capital ratios before the crisis because a bank with more capital would suffer less from the debt overhang problem (Myers, 1977) and would have more flexibility to respond to adverse shocks. To capture the composition of the liabilities we use *deposit*, which is defined as the ratio of deposits to assets. Deposit financing is not subject to runs with deposit insurance, but money market funding is subject to runs as discussed in Gorton (2010). We would, therefore, expect that banks with more deposit financing and with less funding fragility to have performed better. The range of *deposit* is quite wide, as the lowest value is 22.79% and the highest is 91.23%. We use a measure of funding fragility from Demirgüç-Kunt and Huizinga (2010). This measure, *funding fragility*, is defined as deposits from other banks, other deposits, and short-term borrowing as a fraction of total deposits plus money market and short-term funding. *Funding fragility* has a median of 22.55% and a standard deviation of 19.99%.

We use several variables to characterize the asset side of the banks. First, we use *loans* defined as the ratio of loans to total assets. Banks where *loans* is higher are banks with a smaller portfolio of securities. If banks that held fewer loans had more credit-risky securities, we would expect these banks to have performed worse because of the increase in credit spreads that took place during the crisis. However, we do not have data on the holdings of securities, and banks that held government securities instead of loans would presumably have fared better. Therefore, we have no prediction for the relation between loans and performance. The range of *loans* is similar to the range of *deposit*. In some regressions, we also use *other earning assets*, which is the ratio of derivatives and other securities to loans plus other earning assets. To the extent that banks performed poorly because of holdings of securities and derivatives, we would expect *other earning assets* to have a negative coefficient. We also use *liquid assets* which we define as the ratio of liquid assets to total assets. Everything else equal, we would expect banks with more liquid assets to be in a better position to reduce their balance sheet and to cope with financing difficulties. Banks with more diversified activities derive less of their income from interest income. We use non-interest income, *non-interest*, as a fraction of total income and the measure of income diversity of Laeven and Levine (2009), *income diversity*, defined as the absolute value of the difference between net interest income and other operating income divided by total operating income, as measures of the extent to which a bank's activities are diversified away from the traditional banking loan business. The range of *non-interest* is extremely wide as the lowest value is 2.57% and the highest is 85.58%.

We also use a bank's idiosyncratic volatility, *beta*, and its distance to default, $\log z$, as measures of risk. To compute idiosyncratic volatility and beta, we estimate a market model weekly from 2004 to 2006. The market portfolio is the MSCI World index and the risk-free rate is the three-month T-bill rate. The distance to default is introduced by Laeven and Levine (2009) and is measured as the ratio of the return on assets plus the capital-asset ratio divided by the standard deviation of the return on assets. A higher distance to default means that a larger negative return is required to render the bank insolvent. As a final measure of a bank's risk, we use the exposure of its return to US real estate. We estimate this exposure with four different real estate indices: the Standard and Poor's home builders weekly index, the Asset backed securities weekly index (ABX), the Case-Shiller monthly index, and the Fama-French real estate portfolio return. The exposure to real estate is the slope on the real estate index when that index is added to the market model regression. We report the results using the exposure measured with the Fama-French real estate industry portfolio from 2003 to 2006. Though much variation exists in the real estate beta between the most exposed and the least exposed firms, the average beta is close to zero.

The last variable we consider is an indicator for state ownership, *state*. This variable takes value one if the state owns more than 10% of a bank. Eight percent of the banks in our sample have that level of state ownership.

[1] US call reports for 2006 did not have that information either.

2.3. Regulation

The regulation hypothesis for the performance of banks during the crisis is that lax regulation led banks to take risks that they would not have taken with tighter regulation. With this hypothesis, we would expect stricter regulation to be associated with better bank performance during the crisis. To test this hypothesis, we use the data from the third survey of bank regulations conducted by the World Bank and discussed in Barth, Caprio, and Levine (2008). The survey results were made available in the summer of 2007. The survey consists of questions sent to regulators. Most questions required a yes or no answer. The third survey had more than three hundred questions and had responses from 142 countries. The four indices we use are as follows:

1. *Official*, an index of the power of the commercial bank supervisory agency, including elements such as the rights of the supervisor to meet with and demand information from auditors, to force a bank to change the internal organizational structure, to supersede the rights of shareholders, and to intervene in a bank;
2. *Capital*, an index of regulatory oversight of bank capital, including indicators for whether the sources of funds that count as regulatory capital can include assets other than cash and government securities, and whether authorities verify the source of capital;
3. *Restrict*, an index of regulatory restrictions on the activities of banks, consisting, for example, of limitations in the ability of banks to engage in securities market activities, insurance activities, real estate activities, and to own nonfinancial firms;
4. *Private monitoring*, an index that measures the degree to which regulations empower, facilitate, and encourage the private sector to monitor banks.

Table 1 shows the value of the regulation variables for the different countries in our sample. Except for private monitoring, the regulation indices vary widely across countries. It is important to note that the regulation variables concern depository banks. They do not capture, for instance, the regulatory status of US investment banks, which are not in our sample of large banks. These regulatory variables do not capture the stance of regulators either. A country's regulations might give considerable flexibility to banks, but regulators might prevent banks from using that flexibility.

Much attention has been paid to the moral hazard created by deposit insurance, and empirical research shows that explicit deposit insurance is associated with less bank stability (Demirgüç-Kunt and Detragiache, 2002). We therefore also investigate whether banks performed worse during the crisis in countries with explicit deposit insurance. We obtain our data for the existence of an explicit deposit insurance scheme from Demirgüç-Kunt, Karacaovali, and Laeven (2005). Most countries in our sample have explicit deposit insurance.

2.4. Bank-level governance

If poor governance was one of the main causes of the crisis, we would expect that banks with better governance fared better during the crisis. Better governance could have acted through two channels. Many observers have argued that traders and executives of banks had incentives to take risks that were not in the best interests of shareholders [see, for instance, Diamond and Rajan (2009)]. If these observers are right, we would expect banks with better governance to have set incentives and controls to avoid taking risks that did not benefit shareholders. Hence, these banks should have performed better during the crisis if the risks that worked out poorly during the crisis were not in the interests of shareholders when they were taken. Though this type of argument has been advanced by many observers, it does not follow from finance theory that risk taking is negatively related to governance quality. Following Merton (1977), a considerable literature makes the case that greater risk taking can be in the interests of shareholders in the presence of deposit insurance.[2] Further, empirical evidence shows that poor governance can lead executives to take fewer risks to protect their private benefits from control [see, for instance, John, Litov and Yeung (2008)]. These papers predict that banks with better governance will take more risks, which would have led to poor performance during the crisis if the risks taken before the crisis had unexpected bad outcomes. The second channel through which governance could have affected performance is that once the crisis affected banks adversely, banks with better governance might have been better at coping with the crisis effectively because of better decisions [see Graham and Narasimhan (2004) for a similar perspective on how firms weathered the Great Depression]. With this channel, banks with better governance might have made wiser decisions during the crisis and hence they would have had better returns.

Recent cross-country research emphasizes the importance of the nature of ownership for bank performance and risk taking. Most relevant for our study, Laeven and Levine (2009) consider the potential conflicts between managers and owners and analyze the relations between the risk taking of banks, their ownership structures, and bank regulations. They find that bank risk is generally higher in banks that have controlling shareholders with large stakes. However, they show that this effect is mitigated by the presence of strong shareholder protection laws. They conclude further that the impact of regulation on bank risk depends on whether the bank has a large controlling shareholder. Specifically, stricter regulation decreases bank risk when a bank is widely held but increases it when it has a large controlling shareholder. We follow their approach to estimate the ownership of the controlling shareholder. We call this estimate *ownership*.

We use data on board attributes collected by Institutional Shareholder Services (ISS) to construct an index for

[2] For an analysis of the moral hazard of deposit insurance under current US rules, see Pennacchi (2009).

whether the board is shareholder-friendly in 2006, *board*. The data are widely used among institutional investors. The advantage of these data is that they are computed consistently across countries. Board attributes collected by ISS attempt to capture aspects of the functioning of the board of directors that relate to board independence, composition of committees, size, transparency, and how work is conducted. A firm has a specific board attribute if that attribute meets a minimum standard of good governance as defined by ISS. Following Aggarwal, Erel, Stulz, and Williamson (2009), we add the attributes to form the index. The index is higher for more independent boards and is lower for staggered boards.

Though governance indices are widely used in empirical research, they have both strengths and weaknesses. In particular, theoretical work shows that a governance attribute can be valuable for one firm but can destroy wealth in another firm, so that on theoretical grounds there is no necessary relation between such an attribute and firm value [see, for instance, Coles, Naveen, and Naveen (2008)]. The literature has also questioned whether governance indices measure the right governance attributes [see, for instance, Bhagat, Bolton, and Romano (2008)]. A further difficulty is that, as noted by Adams and Mehran (2003) for the US, regulation typically affects governance more for financial institutions than it does for other firms. In this paper, our ambition in using the board index is limited. The index evaluates boards according to criteria that are considered to be important by governance observers in the US, and we investigate whether these attributes are related to bank performance during the crisis. As can be seen in Table 2, there is a wide range of values for the board index. The range is narrower within countries. However, substantial variation emerges in the board index within the US as well. The standard deviation of the index within the US for the banks in our sample is roughly half its standard deviation across all banks.

2.5. Country-level governance and macroeconomic variables

Considerable evidence shows that country-level governance variables are important determinants of firm policies and valuations as well as of financial development. Empirical work shows that risk taking is affected by shareholder rights as well as by a country's institutions, such as the institutions protecting property rights [see, for instance, John, Litov, and Yeung (2008)]. We would expect that banks in countries with better institutions would be more likely to take decisions that maximize shareholder wealth. If bank executives took bad risks because they were not sufficiently focused on the interests of shareholders, we would expect banks to perform better during the crisis in countries with more protection of shareholder rights and stronger institutions. However, private benefits of control are higher in countries with poor shareholder rights and poor institutions. It could be that executives took fewer risks in such countries to protect their own interests. Hence, banks from these countries could perform better because executives paid less attention to maximizing shareholder wealth before the crisis. As proxies for country-level governance, we use the country-level indicators of Kaufmann, Kraay, and Mastruzzi (2008). These indicators are obtained from combining several hundred individual variables measuring political stability, government effectiveness, regulatory quality, enforcement of the rule of law, corruption, and the extent to which a country's citizens are able to participate in selecting their government. We follow Kaufmann, Kraay, and Mastruzzi (2008) and consider the mean of the six variables for each country. We call this index *institutions* and a higher value of the index indicates better institutions. We measure shareholder protection using the anti-director index (ADRI) of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) as revised in Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008). ADRI takes values from zero to five. A higher value means better shareholder rights. Our sample's lowest value is one. The country governance indices are shown for each country in Tables 1 and 2 provides summary statistics for these indices.

The last three variables we report in Table 2 are a country's log gross domestic product (GDP) per capita, its current account balance to GDP, and, finally, the concentration of the banking sector measured as the ratio of the assets of the three largest banks divided by the total assets of the banking sector. We also show these variables for each country in Table 1. All three variables exhibit a fairly wide range. Some argue that decreasing franchise value for banks forces them to take on more risk [e.g., Gorton and Rosen (1995)]. We use concentration as a proxy for the value of bank franchises because a more concentrated banking system enables banks to earn monopoly rents.

3. Determinants of bank performance during the crisis

In this section, we first compare the characteristics of the banks that had the worst return performance (bottom quartile) and those that had the best return performance (top quartile) during the crisis. We then estimate multiple regressions to investigate the determinants of performance.

3.1. Characteristics of worst- and best-performing banks

Table 3 divides the sample into the top and bottom quartiles of return performance from the middle of 2007 to the end of 2008. By construction, the difference in average returns between these two groups is extremely large. The bottom-performing quartile banks had an average return over that period of −85.23%; in contrast, the top-performing banks had an average return of −15.15%. Strikingly, however, the banks that performed poorly during the crisis had extremely high returns in 2006 as their average return was 38.71%. In contrast, the banks that performed better during the crisis had a lower average return of 25.96% in 2006.

We see that the best-performing banks had significantly more equity and hence lower leverage at the end of 2006. The better-performing banks are more traditional banks. An extremely large difference exists in the ratio of deposits to assets between the best-performing and the worst-performing banks. At the end of 2006, the average

Table 3
Summary statistics for banks in the first and fourth quartiles of stock return performance from July 1, 2007 to December 31, 2008.

This table compares the characteristics of banks in the bottom quartile of stock return performance relative to those in the top quartile of stock return performance. The sample includes the 164 banks in Bankscope with returns available from Datastream, with a loans-to-assets ratio larger than 10%, a deposits-to-assets ratio larger than 20%, and total assets larger than $50 billion as of 2006. Returns are in percent. Firm characteristics are computed using data from 2006, prior to the beginning of the financial crisis. *Tier 1* is the ratio of Tier 1 capital to risk-weighted assets, *income diversity* from Laeven and Levine (2009) is defined as one minus the absolute value of the ratio of the difference between net interest income and other operating income to total operating income, *non-interest* is the share of operating income not due to interest income, *log Z* is the distance to default estimated as Z=mean(ROA+CAR)/volatility(ROA) where CAR is the capital-to-asset ratio and ROA is return on assets for the period 1996–2006, *beta* is the slope of the regression of weekly excess stock returns on the MSCI World excess return for the period 2004–2006, *real estate beta* is the slope of the regression of weekly excess stock returns on the Fama and French real estate industry excess return in a regression that controls for the MSCI World excess return for the period 2004–2006, *idiosyncratic volatility* is the annualized standard deviation of the residuals from the market model estimated over the same period, *funding fragility* is the ratio between the sum of deposits from other banks, other deposits, and short-term borrowing over total deposits plus money market and short-term funding, and other earning assets is the ratio between the sum of derivatives, other securities, and other remaining assets and the sum of loans and other earning assets. The other bank characteristics are *deposits*, *loans*, *liquid assets* (normalized by total assets), and *tangible equity* (equity minus intangible assets whenever available or equity when intangible assets are not available divided by total assets). The bank balance sheet and income variables are winsorized at the 1% and 99% levels and are expressed in percentage terms. The regulation variables come from Caprio, Laeven, and Levine (2007) using data in the 2007 database (revised in June 2008) downloaded from the World Bank (http://econ.worldbank.org). *Official* is an index of the power of the commercial bank supervisory agency, *capital* is an index of regulatory oversight of bank capital, *restrict* is an index of regulatory restrictions on the activities of banks, and *private monitoring* is an index of monitoring on the part of the private sector. The variable *institution* is the simple average of six indicators reported by Kaufmann, Kraay, and Mastruzzi (2008) called voice, political stability, government effectiveness, regulatory quality, rule of law, and corruption. *State* takes value 1 if the state's stake in a bank exceeds 10%. ADRI is the anti-director index of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) as revised in Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008). *Deposit insurance* is a dummy variable equal to one where there is an explicit deposit insurance; see Table A.1 in Demirgüç-Kunt, Karacaovali, and Laeven (2005). *Ownership* is the level of ultimate ownership of the largest shareholder. To construct *board* we follow Aggarwal, Erel, Stulz, and Williamson (2009) and sum 25 board attributes that are available for US firms as well as for foreign firms from the Riskmetrics CGQ dataset. *Log GDP* is the log of real gross domestic product (GDP) per capita in dollars for 2006, *current account* is the ratio between the current account deficit and GDP for 2006, and *concentration* is the ratio between the assets of the three largest banks in each country and total assets of the national banking system in 2006. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Variable	Mean of banks in the bottom quartile of the distribution of returns	Mean of banks in the top quartile of the distribution of returns	Test for equality of means (*p*-values)
Stock returns			
2006	38.71	25.96	0.094*
July 2007–December 2008	−85.23	−15.15	0.000***
September 12–October 10, 2008	−47.47	−22.07	0.000***
Bank characteristics			
Tier 1	8.56	9.61	0.064*
Tangible equity	4.10	6.35	0.000***
Deposits	50.10	68.58	0.000***
Funding fragility	32.54	20.77	0.016**
Loans	56.40	55.37	0.753
Liquid assets	20.45	16.70	0.226
Other earning assets	29.76	29.85	0.975
Income diversity	0.56	0.42	0.014**
Non-interest	43.60	34.04	0.025**
Log Z	3.61	3.25	0.088*
Beta	1.10	1.00	0.282
Real estate beta	−0.01	−0.04	0.310
Idiosyncratic volatility	22.39	26.48	0.025*
Regulation and institution			
Official	10.07	11.34	0.014**
Capital	5.19	6.05	0.0133**
Restrict	8.00	10.49	0.000***
Private monitoring	6.83	7.29	0.005***
Deposit insurance	1.00	0.80	0.003***
Institution	1.35	0.90	0.001***
State	0.00	0.15	0.011**
ADRI	3.66	3.65	0.961
Corporate governance			
Ownership	18.82	29.65	0.058*
Board	13.43	11.38	0.051*
Macroeconomic variables			
Log GDP	10.55	9.84	0.000***
Current account	−0.03	2.76	0.053*
Concentration	57.01	48.79	0.050**

deposits-to-assets ratio was 68.58% for the best-performing banks and 50.10% for the worst-performing ones. The funding fragility measure is more than 50% higher for the worst-performing banks, specifically 32.54% versus 20.77% for the best-performing banks. Neither the ratio of loans to assets nor the ratio of liquid assets to

assets was significantly different between the two groups of banks. The worst-performing banks were significantly more diversified than the best-performing banks. Neither the exposure to the market portfolio nor the exposure to real estate differs between the worst-performing banks and the best-performing banks. Surprisingly, the worst-performing banks had less ex ante risk using the distance to default measure and using idiosyncratic volatility.

The better-performing banks come from significantly more tightly regulated countries, i.e., from countries with more powerful supervisors, more restrictions on what counts as capital, more restrictions on banking activities, and more private monitoring. Banks that performed better also come from countries with a worse institutional environment. The anti-director index does not differ between the best-performing banks and the worst-performing banks. The worst-performing banks have a significantly more shareholder-friendly board.

Finally, the worst-performing banks come from countries with higher GDP per capita, with a lower current account, and with higher bank concentration. The result for the current account is consistent with the view that sharp inflows of capital (the other side of the coin from a current account deficit) led to a worse credit boom. The result for bank concentration suggests that decreases in franchise value because of higher competition might not have been a factor. However, bank concentration does not measure competition faced by banks from financial institutions outside the banking sector.

3.2. Multiple regressions

The comparisons made in Subsection 3.1 show that the banks that performed the worst during the crisis had on average, in 2006, better returns, more leverage, less deposits, more funding fragility, lower ex ante risk, and more shareholder-friendly boards, and they came from countries with less strict regulation. The problem with these comparisons is that many of these bank characteristics are correlated. Further, they might be correlated with unobserved country characteristics. In this Subsection, we therefore estimate multiple regressions to evaluate the relation between bank characteristics and bank performance. In some of these regressions, we control for country fixed effects. We cannot control for country fixed effects in all regressions because of multicollinearity when we use our regulatory and macroeconomic variables. We therefore estimate regressions without the regulatory and macroeconomic variables but with country fixed effects (Panel A of Table 4) and regressions with regulatory and macroeconomic variables but without country fixed effects (Panel B of Table 4). In estimating the significance of the regression coefficients, we allow for clustering at the country level.

Regression 1 of Panel A of Table 4 estimates the relation between bank performance and bank characteristics using country fixed effects for the sample of large banks. The sample includes only financial institutions that have loans and deposits. We do not report the estimates of the country fixed effects. The Tier 1 ratio has a positive significant coefficient. The deposit ratio does as well. To judge the economic significance of these coefficients, a 1 standard deviation increase in *Tier 1* is associated with an increase in return of 12.92 percentage points and a 1 standard deviation increase in the deposit ratio is associated with an increase in return of 11.25 percentage points. Both effects are economically significant. Perhaps not surprisingly in light of Table 2, banks that performed better in 2006 have substantially worse returns during the crisis. Banks with more exposure to US real estate, as measured by their real estate beta, performed significantly worse. Banks in which the controlling shareholder has a larger stake performed significantly better.[3] So do banks with more non-interest income. Loans and the distance to default are not significant. Beta has a significant negative coefficient.

Regression 2 has the same dependent and independent variables but a larger sample which includes smaller banks than Regression 1, in that we use the sample of banks with more than $10 billion in assets instead of the sample using banks with more than $50 billion in assets. Tier 1, non-interest income, and beta are no longer significant and *loans* has a negative significant coefficient. Otherwise, the results are similar. Regression 3 is the same as Regression 1, except that we now add the board index. With the requirement of having data for the board index, our sample of large banks falls to 96. Board has a negative significant coefficient. A 1 standard deviation increase in the board index is associated with a decrease in return of 9.91 percentage points. *Ownership* is not significant when the board index is included.

Regression 4 replaces the non-interest income with the income diversity index and adds *SIV*, an indicator variable for banks that have exposure to one or several structured investment vehicles (SIVs). We use the list of such banks given in Acharya, Schnabl and Suarez (2010). Following Acharya, Schnabl, and Suarez (2010), we would expect banks with exposure to SIVs to be banks that more aggressively engaged in regulatory arbitrage. The coefficient on *SIV* is not significant. In other words, given the other bank characteristics in our regressions, the banks with exposure to SIVs did not perform worse than other banks. This result is surprising given the attention paid to SIVs early in the crisis and the concerns arising from the assets contained in SIVs and brought back by banks on their balance sheet. The coefficient on the income diversity index is not significant either.

Regression 5 replaces *deposits* with the measure of funding fragility. We see that the coefficient on this measure is negative and highly significant. This coefficient provides further support for the hypothesis that runs on short-term funding made the crisis worse in showing that

[3] In a paper that uses OECD countries and includes private and public banks with assets in excess of $1 billion, Gropp and Köhler (2010) find that the return on equity (ROE) during the crisis is negatively related to a variable similar to our ownership variable. Fahlenbrach and Stulz (2011) find evidence of a negative relation between performance and CEO share ownership for a sample of US banks. Our sample includes non-OECD countries and only much larger banks. The ownership variable differs from CEO share ownership because the controlling shareholder is not always the CEO and our ownership variable does not include options.

Table 4
Return regressions for July 2007–December 2008.

The regressions estimate the relation between buy-and-hold stock returns over the period July 2007–December 2008 and bank characteristics except for Regression 8 of Panel A where the dependent variable is loan growth instead of stock returns. The sample includes the 164 banks in Bankscope with returns available from Datastream, with a loan-to-assets ratio larger than 10%, a deposit-to-assets ratio larger than 20%, and total assets larger than $50 billion as of 2006. Returns are in percent. Firm characteristics are computed using data from 2006, prior to the beginning of the financial crisis. *Tier 1* is the ratio of Tier 1 capital to risk-weighted assets, *income diversity* from Laeven and Levine (2009) is defined as one minus the absolute value of the ratio of the difference between net interest income and other operating income to total operating income, *non-interest* is the share of operating income not due to interest income, *log Z* is the distance to default estimated as Z=mean(ROA+CAR)/volatility(ROA) where CAR is the capital-to-asset ratio and ROA is return on assets for the period 1996–2006, *beta* is the slope of the regression of weekly excess stock returns on the MSCI World excess return for the period 2004–2006, *real estate beta* is the slope of the regression of weekly excess stock returns on the Fama and French real estate industry excess return in a regression that controls for the MSCI World excess return for the period 2004–2006, *funding fragility* is the ratio between the sum of deposits from other banks, other deposits, and short term borrowing over total deposits plus money market and short-term funding, and *other earning assets* is the ratio between the sum of derivatives, other securities and other remaining assets and the sum of loans and other earning assets. The other bank characteristics are *deposits*, *loans*, and *tangible equity* (equity minus intangible assets whenever available or equity when intangible assets are not available divided by total assets). The bank balance sheet and income variables are winsorized at the 1% and 99% levels and are expressed in percentage terms. The regulation variables come from Caprio, Laeven, and Levine (2007) using data in the 2007 database (revised in June 2008) downloaded from the World Bank (http://econ.worldbank.org). *Official* is an index of the power of the commercial bank supervisory agency, *capital* is an index of regulatory oversight of bank capital, *restrict* is an index of regulatory restrictions on the activities of banks, and *private monitoring* is an index of monitoring on the part of the private sector. The variable *institution* is the simple average of six indicators reported by Kaufmann, Kraay, and Mastruzzi (2008) called voice, political stability, government effectiveness, regulatory quality, rule of law, and corruption. *ADRI* is the anti-director index of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) as revised in Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008). *Deposit insurance* is a dummy variable equal to one where there is an explicit deposit insurance; see table A.1 in Demirgüç-Kunt, Karacaovali, and Laeven (2005). *Ownership* is the level of ultimate ownership of the largest shareholder. To construct *board* we follow Aggarwal, Erel, Stulz, and Williamson (2009) and sum 25 board attributes that are available for US firms as well as for foreign firms from the Riskmetrics CGQ dataset. *Log GDP* is the log of real gross domestic product (GDP) per capita in dollars for 2006, *current account* is the ratio between the current account deficit and GDP for 2006, *concentration* is the ratio between the assets of the three largest banks in each country and total assets of the national banking system in 2006. *SIV* is an indicator variable for banks that have exposure to one or several structured investment vehicles (SIVs) according to the list of such banks given in Acharya, Schnabl, and Suarez (2010). *Bank for International Settlements* is the exposure of a national banking system towards the US from the BIS Quarterly Review of December 2009 (table 9d, consolidated foreign claims of reporting banks – ultimate risk basis). *P*-values are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Regressions with country fixed effects

Variable	Regression 1: large banks	Regression 2: all banks	Regression 3: large banks with board	Regression 4: large banks	Regression 5: large banks with board	Regression 6: banks and non-banks	Regression 7: large banks with board	Regression 8: large banks with board Index
Constant	−70.944	−16.589	19.347	17.408	137.627	33.468	15.850	119.173
	(0.501)	(0.731)	(0.839)	(0.848)	(0.124)	(0.662)	(0.875)	(0.190)
Tier 1	4.009	1.760	5.697	4.691	45.026		5.639	1.333
	(0.016)**	(0.178)	(0.011)**	(0.003)**	(0.008)***		(0.014)**	(0.531)
Tangible equity						2.122		
						(0.112)		
Deposits	0.649	0.535	0.641	0.608			0.643	
	(0.002)***	(0.000)***	(0.004)***	(0.012)**			(0.004)***	
Funding fragility					−0.636	−0.250		−0.465
					(0.000)***	(0.005)***		(0.148)
Loans	−0.305	−0.503	−0.665	−0.559	−0.938		−0.586	0.033
	(0.475)	(0.004)***	(0.140)	(0.133)	(0.043)*		(0.395)	(0.927)
Other earning assets							0.119	1.005
							(0.832)	(0.095)*
2006 return	−0.270	−0.056	−0.466	−0.274	−0.555	−0.258	−0.465	−0.109
	(0.003)***	(0.319)	(0.020)**	(0.003)***	(0.002)***	(0.165)	(0.021)**	(0.586)
Log assets	−2.244	−2.369	−3.499	−5.017	−5.530	−2.420	−3.666	−4.252
	(0.553)	(0.264)	(0.260)	(0.164)	(0.088)**	(0.337)	(0.248)	(0.177)
Beta	−27.775	−22.184	−16.805	−36.058	−23.070	−22.845	−16.679	−8.587
	(0.024)**	(0.112)	(0.361)	(0.008)***	(0.133)	(0.1118)	(0.370)	(0.780)
Real estate beta	−53.811	−52.807	−66.374	−57.659	−65.649	−61.371	−65.427	−11.443
	(0.004)***	(0.055)*	(0.001)***	(0.001)***	(0.003)***	(0.001)***	(0.001)***	(0.795)
Log Z	3.958	3.076	2.026	1.945	3.283	0.518	1.971	−2.768
	(0.235)	(0.043)**	(0.529)	(0.561)	(0.244)	(0.907)	(0.530)	(0.652)
Non-interest	0.213	−0.122	−0.010		0.108	0.348	−0.007	0.264
	(0.018)**	(0.511)	(0.930)		(0.546)	(0.105)	(0.962)	(0.410)
Ownership	0.295	0.166	0.305	0.241	0.311	0.400	0.305	−0.160
	(0.097)*	(0.088)*	(0.162)	(0.118)	(0.203)	(0.249)	(0.162)	(0.364)
Board			−2.651		−3.421	−3.013	−2.689	−2.862
			(0.006)***		(0.001)***	(0.015)**	(0.003)***	(0.120)
Income diversity				−2.943				
				(0.628)				
SIV				9.903				
				(0.207)				

Table 4 (*continued*)

Panel A: Regressions with country fixed effects

Variable	Regression 1: large banks	Regression 2: all banks	Regression 3: large banks with board	Regression 4: large banks	Regression 5: large banks with board	Regression 6: banks and non-banks	Regression 7: large banks with board	Regression 8: large banks with board Index
Number of observations	132	279	96	130	96	111	96	87
Adjusted R^2	0.658	0.558	0.739	0.678	0.744	0.591	0.739	0.404

Panel B: Regressions with regulation variables

Variable	Regression 1: large banks	Regression 2: all banks	Regression 3: large banks	Regression 4: large non-US banks	Regression 5: all non-US banks	Regression 6: US banks and non-banks	Regression 7: large banks
Constant	−92.126	−80.185	−61.866	−16.948	21.301	135.573	113.356
	(0.325)	(0.106)	(0.207)	(0.857)	(0.644)	(0.118)	(0.543)
Tier 1	3.157	12.131		2.629	1.616		1.691
	(0.015)**	(0.057)*		(0.060)*	(0.115)		(0.2386)
Tangible equity						3.764	
						(0.135)	
Deposits	0.393	0.546		0.175	0.250		
	(0.011)**	(0.001)***		(0.181)	(0.043)**		
Funding fragility						−0.123	−0.301
						(0.468)	(0.082)*
Loans	−0.142	−0.347		0.001	−0.416		−0.506
	(0.642)	(0.056)*		(0.997)	(0.035)* *		(0.027)**
2006 return	−0.181	−0.135		−0.208	−0.141	0.440	−0.010
	(0.037)**	(0.057)*		(0.063)*	(0.053)*	(0.331)	(0.945)
Log assets	−0.667	−2.755		0.586	−2.708	−10.706	−1.678
	(0.848)	(0.130)		(0.880)	(0.173)	(0.006)***	(0.475)
Beta	−13.171	−13.345		−21.138	−16.312	−25.586	6.030
	(0.031)**	(0.089)*		(0.011)**	(0.060)*	(0.210)	(0.643)
Real estate beta	−29.808	−42.225		−38.195	−30.128	−103.676	0.308
	(0.202)	(0.056) *		(0.099)*	(0.050)**	(0.019)**	(0.994)
Log Z				1.867	1.701	2.268	
				(0.448)	(0.262)	(0.667)	
Non-interest						0.334	
						(0.167)	
Income diversity				−10.899	−32.355		
				(0.367)	(0.004)***		
Ownership	0.338	0.152		0.232	0.131	0.307	−0.045
	(0.032)**	(0.139)		(0.084)*	(0.138)	(0.544)	(0.539)
Board						−1.056	−1.342
						(0.626)	(0.019)**
Log GDP	−2.109	−0.647	−6.719	−5.421	0.734		−1.597
	(0.557)	(0.845)	(0.220)	(0.051)*	(0.655)		(0.908)
Current account	−0.005	0.300	0.547	0.762	0.731		−1.163
	(0.990)	(0.369)	(0.066)*	(0.065)*	(0.045)**		(0.002)*
Official	−1.520	−0.544	−0.012				−1.670
	(0.116)	(0.589)	(0.991)				(0.116)
Capital	1.536	1.304	2.233				2.206
	(0.437)	(0.510)	(0.265)				(0.131)
Restrict	2.309	1.390	2.738				4.109
	(0.015)**	(0.129)	(0.054)**				(0.000)***
Private monitoring	4.611	7.872	4.314				−4.245
	(0.355)	(0.137)	(0.390)				(0.349)
Deposit insurance	−4.962	−0.599	−3.106				−28.409
	(0.585)	(0.941)	(0.658)				(0.005)***
ADRI			0.434	2.211	5.738		
			(0.865)	(0.615)	(0.086)*		
Bank for International Settlements				−2.787	−3.177		
				(0.053)*	(0.009)***		
Institution			8.415				
			(0.343)				
Number of observations	133	281	163	109	219	62	89
Adjusted R^2	0.403	0.407	0.120	0.417	0.474	0.416	0.281

banks more vulnerable to such runs performed more poorly. The economic significance of the coefficient estimate is large as a 1 standard deviation in the funding fragility measure decreases returns by 12.71 percentage points.

We now turn to a regression that uses all large financial institutions. With such a regression, *Tier 1* is not available for some institutions and some of the added financial institutions do not have deposits. We estimate a regression similar to Regression 3. We use funding fragility instead of *deposits* and use *tangible equity* instead of Tier 1 capital. The estimates are shown in Regression 6. We have 111 observations because this regression also includes our board index. *Tangible equity* has a positive insignificant coefficient. The return for 2006 and ownership have insignificant coefficients. However, *funding fragility* has a negative coefficient that is highly significant. As in Regression 3, the board index has a negative significant coefficient. It follows from this that adding the non-bank financial institutions does not affect our conclusions. We also estimate regressions similar to Regressions 1 and 2 with all financial institutions but do not report the results in the table. In the regression similar to Regression 1, tangible equity is marginally significant and ownership is significant at the 10% level. For the regression similar to Regression 2, the log of assets has a negative significant coefficient, and the distance to default and ownership have positive significant coefficients.

Regression 7 adds a variable that is informative about the composition of a bank's assets, namely the ratio of derivatives and other securities to loans plus other earning assets. This measure is not significant. Introducing that measure does not change our conclusions.

Though we do not reproduce the results in the table, we investigate further the relation between ownership, the board index, and returns. First, we check whether the relation between returns and ownership is linear. We use Regression 3 for this experiment. We find that if we use an indicator variable for concentrated ownership, which is defined to take a value of one when ownership by the controlling shareholder exceeds 10%, that indicator variable is not significant. We then use an indicator variable for ownership of less than 10% and another indicator variable for ownership between 10% and 20%. These indicator variables have negative insignificant coefficients. Finally, we allow the slope on *ownership* to vary depending on the level of ownership with breakpoints at 10% and 20%. The slope is insignificant for all levels of ownership. Throughout these experiments, however, the board index always has a negative significant coefficient.

An issue with the negative coefficient on the board index is that better governance could have been helpful during the crisis even though firms with better governance were more exposed before the crisis to risks that performed poorly during the crisis. To examine this possibility, we estimate a regression (not reproduced in the table) in which we interact our funding fragility measure with the board index. The motivation is that banks with more funding fragility had more problems during the crisis, so that if good governance was helpful in addressing issues arising during the crisis, then firms with better governance should have performed better for a given level of funding fragility. We find that the interaction has a positive significant coefficient, but the net impact of the board variable is negative for all observations.

We now turn to loan growth. We measure loan growth from 2007 to 2009. Regressing loan growth on the crisis return (not tabulated) produces a statistically and economically significant relation. A 1 standard deviation increase in the crisis return corresponds to an increase in loan growth of 7.88 percentage points. It follows that predicting crisis returns is helpful to predict loan growth during the crisis. The last regression of Panel A of Table 4 investigates the relation between loan growth and the variables we use to explain returns. The regression uses the funding fragility measure. Its coefficient is negative but not significant. The coefficient on the board index is negative with a p-value of 0.12.

We now investigate the relation between regulatory variables and crisis returns of banks in Panel B of Table 4. The regulatory indices we use apply to banks subject to the Basle Accords. We therefore show regression estimates only for such banks. In Regression 1 we replace the country fixed effects of Regression 1 of Panel A of Table 4 with country-level variables that include the regulatory variables, the ratio between current account and GDP, and the log of GDP per capita. The regression omits the distance to default and non-interest income because these variables are not significant if they are included. We find that the coefficient on restrictions of bank activities is positive and significant. A 1 standard deviation increase in *restrict* is associated with an improvement in returns of 6.10 percentage points. None of the other regulatory variables is significant. Regression 2 is the same regression, but now the sample includes all banks with assets in excess of $10 billion. No regulatory variable is significant in that regression.

The bank characteristics could be viewed as depending on the regulatory variables and other country characteristics. Consequently, regressions that have both bank characteristics and regulatory variables could underestimate the relation between performance and regulation. To investigate this possibility, we also estimate regressions of bank performance on country variables only. Regression 3 in Panel B of Table 4 shows the estimates for such a regression using the sample of large banks. The sample is larger because we require no information about banks except for their performance during the crisis. We find that the performance of banks is positively related to the current account. The coefficient on the index of restrictions of bank activities is positive and significant. The estimates of this regression are therefore consistent with the estimates of Regression 1. The highest correlation coefficient among the regulatory variables is only 0.223 for the correlation coefficient between the index of the power of supervisors and the index of restrictions on bank activities, so the information conveyed by the various indices differs.

Regressions 4 and 5 of Panel B use only non-US banks. In these regressions, we add country characteristics.

To the log of GDP per capita, we add the current account-to-GDP ratio, *institution*, ADRI, and the measure of exposure of the banking system to the US. We find that the current account has a positive significant coefficient and the exposure measure has a negative significant coefficient in Regression 4, which uses the sample of large banks. The same variables are significant in Regression 5 that uses the sample of banks with assets in excess of $10 billion. While *income diversity* and *deposits* have significant coefficients in Regression 5, they do not in Regression 4. In addition, the anti-director index has a positive significant coefficient in Regression 5.

Regression 6 of Panel B of Table 4 estimates regression 3 of Panel A for all financial institutions with assets in excess of $10 billion in the US for which our board index is available. The estimates are consistent with the results in Panel A, but some variables, including the board index, are no longer significant. One potential reason is that the sample is smaller. Another reason is that, as seen in Panel A, regression 2, and in Panel B, regression 2, our results weaken substantially when smaller banks are added. Not surprisingly, however, bank strategies differ between large and small banks. When we estimate the regression for large US banks (not tabulated), the board index has a significant negative coefficient, but the regression has only 22 observations.

The last regression of Panel B of Table 4 uses loan growth as the dependent variable. We find that banks in countries where banking activities were more restricted experienced more loan growth during the crisis. Banks with more loans to assets before the crisis had less loan growth during the crisis. Perhaps more important, and consistent with Cornett, McNutt, Strahan, and Tehranian (2011), banks with greater funding fragility had lower loan growth during the crisis. Finally, banks with a more shareholder-friendly board had lower loan growth.

3.3. Risk and bank characteristics

To better understand the role of the governance and regulatory variables, we estimate (but do not tabulate) regressions using information available from Bloomberg on write-downs for 65 banks in our sample from 17 countries for our sample period. Because of the small sample, the information from these regressions is limited, but it is nevertheless interesting. We regress the ratio of write-downs to assets on the board index, the Tier 1 capital ratio, the log of assets, the ratio of deposits to assets, the index of the power of the supervisor, the index of capital supervision, and the index on restrictions on bank activities. We find that the write-down ratio is positively related to the board index and to the index of the power of supervisors. The index is negatively related to the log of assets. Neither the Tier 1 capital ratio nor the index of regulatory oversight of bank capital is significant. This regression supports our interpretation that banks with a more shareholder-friendly board took more risks that worked out poorly. The positive significant coefficient on the index of the power of supervisors suggests that banks with stronger supervisors were forced to take write-downs more aggressively than other banks. However, a concern with this interpretation is that we would expect more powerful supervisors to force banks to raise capital more aggressively. Yet, when we use Bloomberg's data on capital raising, no regulatory variable, nor, for that matter, any other variable is significant.

To investigate whether regulation reduced the risk of banks ahead of the crisis, we investigate how the risk of banks in 2006 is related to bank and country characteristics. In particular, we would like to understand how governance and regulation affected bank risk taking as it could be observed through leverage choice, distance to default, and idiosyncratic volatility. Such an investigation is especially important to interpret the positive relation between performance and the index of restrictions on bank activities shown in Panel B of Table 4. One interpretation of this result is that more restrictions on bank activities forced banks to be less risky. However, such an interpretation would seem somewhat counterintuitive because diversification would reduce risk. Another interpretation of this result is that banks in countries with more restrictions were lucky ex post. That is, they did not get to enter new activities that turned out poorly. The first interpretation should be associated with a negative relation between risk measures and restrictions on bank activities.

In Table 5, we first estimate regressions similar to those of Table 4 using idiosyncratic volatility (multiplied by one hundred) as the dependent variable. Regression 1 uses the sample of large banks. This regression has bank characteristics and country fixed effects. Banks with more loans and other earning assets have higher idiosyncratic volatility. Larger banks and banks with more Tier 1 capital have lower idiosyncratic volatility. A strong positive relation exists between idiosyncratic volatility and ownership by the controlling shareholder. No other variable is significant. In Regression 2, we also include the board index as a regressor. No variable except ownership is significant in this specification. Finally, Regression 3 uses the regulatory variables, the current account, and the log of GDP per capita instead of country fixed effects. *Tier 1*, the log of assets, the log of GDP per capita, and the index of capital regulation all have negative significant coefficients. Further, the banks in countries with a formal deposit insurance regime and with more active private monitoring of banks have higher idiosyncratic risk. The coefficient on *restrict* is positive but not significant, so that there is no evidence that greater restrictions on bank activities led banks to take less risk.

Regressions 4 to 6 use the distance to default (multiplied by 100) as the dependent variable. Banks with more other earning assets have a lower distance to default. Banks with higher ownership by the controlling shareholder have a lower distance to default. In addition, banks with a more shareholder-friendly board have a lower distance to default. Finally, the log of GDP and the index of capital regulation have a positive coefficient, while the current account, the index of powers of the supervisors, the index of private monitoring, and the deposit insurance variable all have a negative coefficient. The coefficient on *restrict* is negative but insignificant. Again, no evidence shows that greater restrictions on bank activities led banks to take less risk before the crisis.

Table 5
Risk regressions.

The regressions estimate the relation between various measures of ex ante risk over the period July 2007–December 2008 and bank characteristics. The sample includes the 164 banks in Bankscope with returns available from Datastream, with a loans-to-assets ratio larger than 10%, a deposits-to-asset ratio larger than 20%, and total assets larger than $50 billion as of 2006. Returns are in percent. The measures of ex ante risk are *idiosyncratic volatility* which is the annualized standard deviation of the residual of a regression of weekly returns on the MCSCI World excess return for the period 2004–2006, *distance to default* which is the log of the distance to default where the distance to default is Z = mean (ROA+CAR)/volatility(ROA) where CAR is the capital-to-asset ratio and ROA is return on assets for the period 1996-2006, and *tangible equity* defined as equity minus intangible assets whenever available or equity when intangible assets are not available divided by total assets. Firm characteristics are computed using data from 2006, prior to the beginning of the financial crisis. *Tier 1* is the ratio of Tier 1 capital to risk-weighted assets, *other earning assets* is the ratio between the sum of derivatives, other securities, and other remaining assets and the sum of loans and other earning assets. The other bank characteristics are *deposits* and *loans*. The bank balance sheet and income variables are winsorized at the 1% and 99% levels and are expressed in percentage terms. The regulation variables come from Caprio, Laeven, and Levine (2007) using data in the 2007 database (revised in June 2008) downloaded from the World Bank (http://econ.worldbank.org). *Official* is an index of the power of the commercial bank supervisory agency, *capital* is an index of regulatory oversight of bank capital, *restrict* is an index of regulatory restrictions on the activities of banks, and *private monitoring* is an index of monitoring on the part of the private sector. *Deposit insurance* is a dummy variable equal to one where there is an explicit deposit insurance; see Table A.1 in Demirgüç-Kunt, Karacaovali, and Laeven (2005). *Ownership* is the level of ultimate ownership of the largest shareholder. To construct *board* we follow Aggarwal, Erel, Stulz, and Williamson (2009) and sum 25 board attributes that are available for US firms as well as for foreign firms from the Riskmetrics CGQ dataset. *Log GDP* is the log of real gross domestic product (GDP) per capita in dollars for 2006, and *current account* is the ratio between the current account deficit and GDP for 2006. *P*-values are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Variable	Idiosyncratic volatility			Log of distance to default			Tangible equity		
	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6	Regression 7	Regression 8	Regression 9
Constant	29.065	23.965	72.249	745.045	805.287	431.342	1652.521	1199.787	2601.311
	(0.034)**	(0.188)	(0.003)***	(0.005)***	(0.005)***	(0.149)	(0.059)*	(0.320)	(0.012)**
Tier 1	−0.627	−0.326	−0.628	3.985	4.243	5.384			
	(0.074)*	(0.376)	(0.075)*	(0.528)	(0.493)	(0.303)			
Deposits	−0.072	−0.072	−0.002	−0.378	0.367	−0.792	2.196	4.109	0.869
	(0.294)	(0.168)	(0.972)	0.667)	(0.578)	(0.327)	(0.329)	(0.153)	(0.695)
Loans	0.125	0.051	0.068	−1.336	−0.714	−0.414	0.023	0.083	−0.311
	(0.015)**	(0.234)	(0.313)	(0.013)**	(0.216)	(0.606)	(0.992)	(0.967)	(0.889)
2006 return	0.040	−0.044	−0.020	−0.176	0.639	0.132	−1.365	−1.163	−0.816
	(0.178)	(0.516)	(0.534)	(0.517)	(0.347)	(0.655)	(0.139)	(0.598)	(0.275)
Log assets	−0.976	−0.568	−1.565	−9.875	−11.026	0.076	−66.938	61.883	95.964
	(0.054)**	(0.377)	(0.013)**	(0.318)	(0.316)	(0.994)	(0.059)*	(0.176)	(0.003)***
Other earning assets	0.109	0.037	0.087	−2.102	−1.330	−1.557	1.770	0.624	1.360
	(0.001)***	(0.197)	(0.037)**	(0.000)***	(0.001)***	(0.012)**	(0.205)	(0.629)	(0.353)
Ownership	0.088	0.066	0.139	−1.121	−1.257	−1.384	0.339	−0.215	0.484
	(0.001)***	(0.012)**	(0.009)***	(0.099)*	(0.035)**	(0.005)***	(0.675)	(0.877)	(0.585)
Board		0.226			−10.036			16.581	
		(0.438)			(0.044)**			(0.063)*	
Log GDP			−5.720			44.512			−70.221
			(0.003) ***			(0.017)**			(0.173)
Current account			0.231			−4.694			0.122
			(0.173)			(0.008)***			(0.976)
Official			0.060			−9.836			22.970
			(0.871)			(0.052)*			(0.183)
Capital			−1.969			15.854			−17.277
			(0.031)**			(0.028)**			(0.411)
Restrict			0.193			−6.686			2.509
			(0.599)			(0.194)			(0.869)
Private monitoring			4.732			−30.826			25.824
			(0.033)**			(0.057)*			(0.174)
Deposit insurance			9.916			−155.342			67.515
			(0.005)***			(0.000)***			(0.383)
Country fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Number of observations	136	98	135	132	96	131	153	101	152
Adjusted R^2	0.760	0.708	0.444	0.577	0.600	0.389	0.518	0.422	0.276

The last three regressions in the table, Regressions 7 to 9, use tangible equity (multiplied by one hundred) as the dependent variable. The only coefficients that are significant are the log of assets, where larger banks have less equity, and the board index, where banks with more shareholder friendly boards have more tangible equity.

We also estimate regressions with risk measures as dependent variables and only regulatory indices, the deposit insurance variable, and GDP per capita as independent variables (not tabulated). We find that the log GDP per capita is negatively related and deposit insurance is positively related to idiosyncratic volatility. Tangible equity is positively related to the index of power of supervisors. We also investigate the relation between beta and regulatory variables. We find that beta is higher for banks in countries with more restrictions on banking activities and is higher in countries with formal deposit insurance. Finally, we estimate regressions with the real

estate beta as the dependent variable. We find that banks with higher returns in 2006 have a higher real estate beta, and banks with a board whose incentives are better aligned with the interests of shareholders had a lower real estate beta. None of the regulatory variables is related to the real estate beta.

Table 5 shows that restrictions on bank activities were not associated with less observable bank risk in 2006. Therefore, the fact that banks in countries with more restrictions on bank activities performed better during the crisis might be due to luck. They did not have the opportunity to engage in activities that unexpectedly turned out badly during the crisis.

3.4. Alternative specifications

In addition to the regressions discussed in Subsection 3.2, we investigate the robustness of our results using other specifications and other data. Rather than estimating the distance to default using an average of past ROAs to forecast ROA, we also used the ROA of 2006 only. The results are similar with that approach. We estimate all our regressions without the real estate beta and reach the same conclusions. We also use different real estate indices. Doing so does not affect our conclusions, but of the other indices we tried, only the S&P builder index has a negative significant coefficient. Given the importance of the US and Japan in the data set, we estimate our regressions omitting each of these countries, one at a time. Most of our results are unaffected when we do so. However, the board index is only marginally significant when excluding US banks in some specifications, and the ownership variable attracts a significantly negative coefficient when estimating the specification of Regression 3 of Table 4 without Japan.

The regressions in Table 4 do not include the country's market return as an explanatory variable. The rationale for this is that the market return depends on the performance of the banking sector during the crisis. Nevertheless, we check to see whether our inferences are altered by the inclusion of the market index as an explanatory variable to address the concern that the market index might be an omitted variable whose omission biases the estimates of the coefficients on the country-specific independent variables. We find that our conclusions are unchanged.

We also estimate the regressions of Table 4 using different variables. In particular, we use the index for bank concentration. It is never significant. We also use the liquidity ratio. It is not significant either, but it is highly correlated with some other bank characteristics we use. We replace the distance to default with the idiosyncratic volatility. Idiosyncratic volatility is generally not significant. We add the indicator variable for state ownership and doing so does not affect our conclusions. We also estimate the regressions using additional governance variables that are available from ISS concerning the ease with which a bank can be taken over, whether audit procedures are shareholder-friendly, and whether compensation schemes are shareholder friendly. These variables are not significant. Finally, we use the insider ownership variable from Worldscope instead of the controlling ownership variable. Our results are unchanged using that variable. We also investigate interactions of the regulatory variables with bank characteristics and the ownership indicator variables as in Laeven and Levine (2009). This investigation is not successful because of multicollinearity between the noninteracted variables and the interacted variables.

Government interventions took place in the last quarter of our crisis sample period. To investigate whether they affect our inferences, we reestimate our regressions using returns computed with an end date just prior to the bankruptcy of Lehman Brothers. We find that the estimates of the coefficients on our bank characteristics are not substantially affected. However, the index of restrictions on banking activities is not significant over that period.

Finally, we check whether the relation between having a shareholder-friendly board and stock returns is negative before the crisis. A negative relation would not be consistent with our interpretation that banks with shareholder friendly-boards took actions that were not perceived by the market ex ante to be against the interests of shareholders. In a placebo test, we estimate our regressions for 2006 instead. In these regressions, the coefficient on our board variable is not significant.

4. Conclusion

In this paper, we investigate the determinants of the relative stock return performance of large banks across the world during the period from the beginning of July 2007 to the end of December 2008. Importantly, however, our study is not about why the crisis happened. Instead, it is an investigation of the validity of various hypotheses advanced in the literature and the press as to why banks performed so poorly during the crisis.

Analyses of the crisis that emphasize the fragility of banks financed with short-term funds raised in the money markets are strongly supported by our empirical work, as are analyses that emphasize the role of bank capital. We find that large banks with more Tier 1 capital, more deposits, less exposure to US real estate, and less funding fragility performed better. Banks from countries with current account surpluses fared significantly better during the crisis, while banks from countries with banking systems more exposed to the US fared worse. These latter results show that macroeconomic imbalances and the traditional asset contagion channel were related to bank performance during the crisis.

We find no support for analyses that attribute an important role to governance in the crisis because banks with more shareholder-friendly boards, which are banks that conventional wisdom would have considered to be better governed, generally fared worse during the crisis. Either conventional wisdom is wrong, as suggested by Adams (2009), or this evidence is consistent with the view that banks that grew more in sectors that turned out to perform poorly during the crisis were pursuing policies favored by shareholders before the crisis as their boards were more shareholder-friendly but suffered more during the crisis when these risks led to unexpectedly large losses. Evidence supportive of the latter interpretation is that the performance of large banks during the crisis is negatively related to their performance in 2006.

In other words, the banks that the market rewarded with large stock returns in 2006 are the banks whose stock suffered the largest losses during the crisis.

No systematic evidence shows that stronger regulation led to better performance of banks during the crisis. However, we do find evidence that banks from countries that had more restrictions on banks in 2006 fared better during the crisis. Because no evidence exists that these banks had less risk ex ante, banks with more restrictions on their activities could have had higher returns because they did not have the opportunity to diversify into activities that unexpectedly performed poorly during the crisis. Though the existence of a formal deposit insurance scheme is associated with more idiosyncratic risk before the crisis, banks benefiting from such a scheme did not perform worse during the crisis. The regulatory indices are measures of formal rights and duties of regulators and banks, but activist regulators could have affected risk taking by banks quite differently from passive regulators even when these different regulators had the same rights. Further research should attempt to construct indices that reflect the stance of the regulators.

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