Creditor rights, systemic risk and bank regulations: evidence from cross-country study

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Abstract:

In this paper, we investigate the extent to which creditor rights protection in bankruptcy induces banks to take more risk, leading to a higher level of systemic risk in the financial system. We apply ΔCoVaR, introduced by Adrian and Brunnermeier (2011), as the measure of systemic risk. Our sample uses 744 listed commercial banks and covers 34 countries. Our work shows that more legal protection leads to a higher level of systemic risk. This result supports the "dark side" of strong creditor rights in bankruptcy. We further find that developed countries contribute to the increase of systemic risk, while we find neutral impact for developing countries. Moreover, our results hold when we apply different measures for bank risk-taking and creditor rights.

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1 Introduction

Many previous studies have been interested in establishing a link between investor protection and financial development. La Porta, Lopez-de-Silanes, et al. (1998) were the pioneers in the law and finance literature. They demonstrated that legal protection is indeed relevant for the development of the financial market. They found that both creditor rights and information sharing are associated with faster output growth. In a more recent study lead by Houston, et al. (2010), it is shown that creditor protection encourages excessive bank risk-taking, which increases the probability of financial crisis. This result was obtained by using Z-score as a measure for bank risk-taking. However, the Z-Score† measure seems to capture individual bank risk rather than the impact of the distress of a single bank on the financial system of a specific country. Based on studies dealing with the last financial crisis, contagion through banking linkage cannot be neglected. (See, e.g., Acharya and Yorulmazer (2008); Goldstein and Razin (2013).)

This paper attempts to fill the gap in the literature by examining the link between creditor rights and bank systemic risk. To define bank systemic risk, our study builds on a novel procedure developed by Tobias and Brunnermeier (2011), the so-called CoVaR methodology. The CoVaR measure enables us to study the effect of the distress of a single bank on the financial system. Our main motivation is centered on the negative externality effects‡ spread by the 2008/2009 financial crisis. Since then, researchers have found that one single institution could have a large impact on the well-functioning (Acharya, Amihud and Litov 2011) of the financial system. We stress that systemic risk goes beyond the traditional view of a single bank's vulnerability to depositor run. At the heart of the concept is the notion of "contagion", a particularly strong propagation of failures from one institution to the whole financial system.

We suspect that creditor rights protection could have an impact on the behaviors of banks. More precisely, the level of creditor rights protection could influence bank

†It is most frequently attributed to Boyd and Graham (1986), Hannan and Hanweck (1988) and Boyd et al. (1993), although its roots can be traced back as a far as Roy (1952).

‡A negative externality occurs when a transaction between two parties results in costs, which accrue, in part, to one or more third parties – e.g., to society as a whole.

systemic risk in different ways. In a first scenario, more creditor rights could lead to low level of bank systemic risk. As argued by Acharya, Amihud and Litov (2011), firms invest less and take low levels of risk when creditor rights are well protected. Banks could impose repayment or grab the collateral, which increases the recovery if firms default. In a second scenario, we identify two channels through which more creditor rights lead to a higher level of systemic risk. On the one hand, banks may be less worried about the default of firms and may be willing to lend more to a wider set of borrowers. On the other hand, lower demand may lead to asset substitution; banks could choose a different business model based on investing in derivatives and other risky projects that increase bank systemic risk (Brunnermeier, Dong and Palia (2012)). If the negative effect of strong creditor protection outweighs its positive effect, we should find that more creditor rights lead to an increase in systemic risk at the bank level. To our knowledge, no other paper has studied the link between the level of systemic risk and creditor rights.

In this paper, we test empirically whether better protection for creditors induces banks to take more risk, leading to more systemic risk. We emphasize the effect of laws and legal protection on the behaviors of banks by extending the law and finance literature with the use of bank-level data for commercial banks in 34 countries. We can then analyze how banks respond to country-level differences in legal protection. Our analysis rests on a panel data set of 744 commercial banks from 34 countries from 2003 till 2011.

Using a random effects model that controls bank heterogeneity, we find that better creditor protection increases bank systemic risk. We further separate our sample into two subsamples and show that developed countries are sensitive to differences in the level of creditor rights at the country level, and that these legal protections significantly contribute to aggravating the stability of the financial system. While we find neutral impact on systemic risk in developing countries with different legal protection, our results support the idea that in developed countries, banks are more involved in complex instruments, are larger and more interconnected than in developing countries. We also conducted a different analysis by changing the bank risk measure and using Z-score defined as bank distance to insolvency. We find the same trend with significant results, highlighting the impact of legal protection on bank risk. Moreover, for a robustness check, we use several variables to substitute the creditor rights index and still find interesting results that confirm the conclusions of the previous analyses.

This paper contributes to the literature in at least three ways. First, we add to the law and finance literature by demonstrating new evidence from bank-level data, according to which better legal protection leads to a higher level of systemic risk. Far from a neutral effect, we argue that these institutional features have a pronounced influence on bank systemic risk. Second, our study contributes to the literature that explores the determinants of bank systemic risk. In fact, our paper adds to the existing literature by revealing an important determinant for bank systemic risk. Finally, in addition to laws in the book, we tested law enforcement by applying different measures for creditor rights protection.

Given the above explanations, it is important to understand how legal, regulatory and institutional environment influences banks' willingness to take risks. The rest of the paper is organized as follows. Section 2 provides a brief review of the most relevant literature. In section 3, we present the data and the methodology we used for exploring the link between creditor protection and systemic risk and whether it leads to more risk-taking. In section 4, we present our results. In section 5, we apply robustness checks and end with a conclusion.

2 Review of related literature

Bank systemic risk and creditor rights

The recent financial crisis has led bank regulators to rethink the rationale of banking regulation. In fact, Basel I and Basel II concentrated on the individual aspects of limiting banks' exposure to risk. The global financial crisis of 2008/2009 lead regulators and governments to adopt macro-prudential approaches that focus on the well-being of the banking system as a whole, with a main interest on inter-linkages between financial stability and the real economy (Borio 2011, Tobias and Boyarchenko 2012). Thus, as the crisis of 2008 shows, the contagion in the financial system as a whole through inter-linkages between banks worldwide enhances the probability of systemic risk. The Basel Committee on Banking and Supervision 2012 employed new Basel III requirements, which include additional attention to systematically important financial instructions. They have identified the most systematically important financial instructions (SIFI) as institutions that become "too big to fail". The criteria of identification of these financial

institutions are based on three main factors. First, the bank size plays a major role in increasing bank systemic risk: as shown in Hovakimian, Kane and Laeven (2012), larger banks are more complex and they are more engaged in market-based activities. Second, the degree of concentration in the banking sector could have a non-neutral impact on bank systemic risk. Boyd, De Nicolo and Jalal (2006) provide empirical evidence supporting the idea that bank concentration is associated with more bank risk. Third, the Basel III committee highlights bank interconnections as one of the major factors that increase systemic risk within the financial system. Bank linkage could have three types of propagation of financial distress: (a) Bank runs and financial contagion on interbank markets (Diamond and Dybvig 1983; Allen and Gale 2001); (b) depreciation of common assets (asset price contagion) (Kiyotaki and Moore 1997); (c) interlocking credit exposure (Allen and Gale 2001; Allen and Gale 2005). The increasing integration of the world economy and financial system implies that banking development in one country could affect the stability of banking activity in other areas. In our paper, we integrate bank size and banking concentration as control variables, since Basel III suggests that they clearly have an impact on bank systemic risk.

After the adoption of LLSV aggregated creditor rights, many researches have employed the index of creditor rights for measuring the impact of law on capital market development. We implement the LLSV index to measure the level of creditor rights at the country level. We show that creditor rights protection could be one of the major determinants of bank systemic risk. A large number of recent empirical papers examine the link between creditor protection and economic growth. In a study of 129 countries over 25 years, Djankov, McLiesh and Shleifer A. (2007) find that the ratio between private credit and gross domestic product is positively related to strong creditor rights, stronger legal protections, and information sharing among creditors. Another paper by John, Litov and Yeung (2008) finds that stronger corporate governance is linked to greater corporate risk-taking. However, Acharya, Amihud and Litov (2011) find that strong creditor rights lead to reduced corporate risk-taking in the form of diversifying acquisitions. In fact, when creditor rights are well protected, we would expect borrowers to take less risk, thus investing less in the long term, especially in projects with low probability of success. Even in the case of borrower default, stronger creditor rights in bankruptcy allow creditors to employ restrictions on reorganization and to force a change

in management during reorganization, which clearly has negative consequences on a firm's management if the firm enters financial distress.

On the other hand, a stronger protection may lead banks to grant their loans to a wider set of borrowers, potentially including riskier firms. Indeed, Djankov, McLiesh and Shleifer A. (2007) find that more protection leads to more bank lending. Typically, creditor rights influence relative supply and demand. Banks with better protection tend to increase credit supply; at the same time, as reported earlier, strong creditor protection encourages firms to lower their long-term investments, leading to lower demand for loans. Lower demand by firms could lead banks to asset substitution, more precisely to increasing their reliance on derivatives and other risky projects.

Another related literature review links the change in banks' business models to the level of systemic risk. Shifting from the traditional banking role, an important area of research has focused on the increasing reliance on non-interest income and non-deposit funding in banks. To investigate banks' reliance on non-interest income and the link with bank risk, Demirguc-Kunt and Huizinga H. (2010) test empirically whether a change in the balance sheet and revenue sources of banks triggered the 2008 crisis. This is backed by the financial theory, which insists on the likelihood of bank failure as a bank expands into other lines of business (Boyd, Chang and Smith 1998). It is beneficial for banks to rely on non-interest income in periods of prosperity, but devastating in periods of crisis. In fact, banks that ration borrowers might invest funds in risky projects that expose these banks to higher systemic risk.

To summarize, our empirical results support the empirical paper by Houston, et al. (2010) and the theoretical paper by Boyd and Hakenes (2013), where they find that more creditor rights increase bank risk. Overall, the strength of creditor rights clearly has an influence on the behaviors of banks. We try to find a link between bank systemic risk and creditor rights protection.

3 Data and methodology

We collect data from a large set of countries around the world. We cover the 2003-2011 period and include major developed countries. In total, our sample includes 744 listed commercial banks from up to 34 countries. Among the non-Eurozone countries, the United States accounts for roughly half the sample of listed banks. Our

source data to compute CoVaR are CRSP and COMPUSTAT databases for U.S. listed banks, and the COMPUSTAT World daily price database for the rest of the sample.

Our choice of listed commercial banks is based on the notion of risk diversification. The traditional banking model stands for collecting deposits and providing credits to customers for the investment needs. The concept of diversification allows banks to shift credit risk by investing in trading and derivatives that further increase bank systemic risk. The ability for banks to change their business models according to their legal protection allows us to empirically study the impact of creditor protection on bank systemic risk.

3.1 Sample construction

We collect information from two sources to construct our international panel dataset. Because our base unit of observation is the bank and because we need daily stock returns to compute the ΔCoVaR, we begin by extracting listed banks (SIC codes 60 and 61) from the CRSP database for the U.S., and from COMPUSTAT World daily for the rest of the world countries. For each U.S. listed bank, we collect Permno, return, adjusted prices, the number of shares outstanding and SIC code in the CRSP database. Adjusted prices and the number of shares outstanding enable us to compute market values. For the rest of the world countries, we obtained prices, the number of shares outstanding, adjustment factors, location, SIC code and ISIN code from COMPUSTAT World daily. We compute returns by taking into account identifiers for U.S. listed banks, while ISIN codes offer these for ROW countries. We also use the returns and market values of the banks included in our sample to compute value-weighted banking industry indices at the country level. In addition, we use the BankScope database to calculate bank size, which is the natural logarithm of a bank's total assets. We would expect bank size to be an economically significant driver of systemic risk, regardless of the home of a bank. In line with the too-big-to-fail hypothesis, increased probability of a government bailout in the case of default could cause managers to engage in excessively risky projects (Gandhi and Lustig 2015).

We collect information on the creditor index, and legal formalism from Professor Andrei Shleifer's Harvard web pages. The index was updated till 2003, so for our study,

we have an unchanged creditor rights index for the whole period. We retrieve country-level "macro" data from the World Bank's Banking and Regulation Surveys 2003, 2007 (See Barth, G. Jr. and R. (2004) for calculation) for the proxies for bank regulation. To complete the data, we also use the World Bank's Financial Development and Structure dataset, WDI, WGI, and World Economic Forum Global Competitiveness Report (2005). We finally merge our databases into one dataset to get our final panel data.

3.2 Measuring systemic risk

There has been an increased focus on developing measures for capturing an indicator of systemic risk that can be used by bank regulators or government institutions. We mention three measures that have been used recently to estimate this linkage: Tobias and Brunnermeier's (2011) conditional value-at-risk (CoVaR); Acharya, Pedersen, et al.'s (2010) marginal expected shortfall (MES); and Huang, Zhou and Haibin's (2011) distressed insurance premium (DIP). MES measures the expected loss of each financial institution conditional on a poor performance of the entire set of institutions; CoVaR measures the value-at-risk (VAR) of financial institutions conditional on other institutions experiencing financial distress; and DIP measures the insurance premium required to cover distressed losses in the banking system. The three measures are closely related since they capture the magnitude of losses incurred by financial institutions that are quite strongly linked to one another.

We adopt the measure of systemic risk named ΔCoVaR, implemented by Tobias and Brunnermeier (2011). Many recent research papers applied the CoVaR methodology in their analyses. For example, Wing Fong and Wong (2011) study interconnectivity among economies using sovereign credit default swap (CDS) spreads of 11 Asia-Pacific economies. Gauthier, Lehar and Souissi (2012) estimate systemic risk exposure of the Canadian banking system and define macro-prudential capital requirements as equal to an institution's contribution to systemic risk, using CoVaR as a risk allocation mechanism. Recently, De Bodt, Lobez and Schwienbacher (2013) used ΔCoVaR to show that the implementation of the euro increases systemic risk in the Eurozone. In fact, a strong correlation among commercial banks enables us to use conditional CoVaR measures as a loss probability conditioned on system-wide losses depending on correlation, even in a

period of growth (which could cause such conditional loss probabilities to increase prior to a systemic shock).

We focus on the measure of systemic risk using conditional value at risk (CoVaR), which measures tail dependence in the stock returns of individual financial institutions and compares the magnitudes of tail dependence estimates as a measure of the systemic risk created by the institution in question. The basic idea in the systemic risk literature is that, should a systemically important financial institution suffer a large loss and become distressed, it will shift the lower tail of the stock return distributions of other banks in the economy. The shift occurs because the institution's distress spreads throughout the financial sector and chokes off credit intermediation to the real economy.

CoVaR is calculated based on stock return data from CRSP for U.S. banks and Compustat world daily for the rest of the world. We target world-listed commercial banks with SIC codes 60 and 61. The CoVaR measure of systemic risk is the difference between two 99-percent VAR measures applied to the conditional return distribution of a portfolio of financial institutions: the 99-percent CoVaR conditional on the single financial institution in question experiencing a return equal to its 1-percent quantile, and the 99-percent CoVaR conditional on the same individual institution experiencing a median return. The idea is that, should there be systemic risk potential, a near-catastrophic loss by the financial institution in question would left-shift the 1-percent quantile of the conditional return distribution of a portfolio of financial firms. CoVaR is typically estimated using quantile regression on the grounds that such estimates are non-parametric and free from biases that may be introduced by inappropriately restrictive distributional assumptions.

3.2.1 Estimation Methodology

Linear regression is a statistical tool used to model the relation between a set of predictor variables and a response variable. It estimates the mean value of the response variable for a given level of the predictor variables. However, to capture the effect of an individual bank on the banking sector as a whole, the use of quantile regression is a must. In fact, what we need to capture is the difference between a contribution of a bank i being in distress and the same bank i being at the median level of the systemic risk of the banking sector.

To measure how much bank i contributes to the financial system's VaR during stressful times in bank i, Adrian and Brunnermeier look at the difference between the system's VaR conditional on bank i being at its VaR level minus the system's VaR conditional on bank i being at its median level.

$\Delta CoVaR^{j|i}$ = (CoVaR of institutions j conditional on institution i being at its VaR level) – (CoVaR of institutions j conditional on institution i being at its median level)

$$X^j = \alpha + B_q^i X^i + \varepsilon$$

This equation describes the regression of $\boldsymbol{X^j}$ on $\boldsymbol{X^i}$ for every institution i. The quantile regression coefficient $\boldsymbol{\beta_q^i}$ estimates the change in a specified quantile q of $\boldsymbol{X^j}$ produced by a one-unit change in $\boldsymbol{X^i}$.

We then estimate the 1-percent sample quantile and the median of the bank's stock return using the predicted hat-α and hat-β (X_{system} = hat-α_q + hat-β_q $X_{individual}$)

$$CoVaR_q^{j|X^{i=VaR_q^i}} = \hat{\alpha}_q^i + \hat{\beta}_q^i VaR_q^i$$

$$CoVaR_q^{j|X^{i=VaR_q^{50}}} = \hat{\alpha}_q^i + \hat{\beta}_q^i VaR_{50}^i$$

And finally, bank i contribution to bank j (or the financial system as j = Financial system at the country level) VaR is:

$$\Delta CoVaR_q^{j|i} = \hat{\beta}_q^i (VaR_q^i - VaR_{50}^i)$$

Two implementation issues need to be addressed. The first is the estimation frequency. We choose a yearly estimation frequency, based on daily observations. The second issue is choosing between equity returns and total returns. Tobias and Brunnermeier (2011) use so-called total returns to estimate ΔCoVaR. Due to the drastic reduction of our data in the case of using total returns, we choose equity returns on a daily basis, which allows us to collect data for a large sample of countries and, for each country, for a significant number of banks. In their paper, De Bodt, Lobez and Schwienbacher (2013) show that using equity returns instead of total returns gives a similar trend when using U.S. data that is available in the CRSP database.

3.3 Main independent variables

3.3.1.1 Measuring creditor rights

As mentioned earlier, the line of research in law and finance extended in the last decade. In particular, research suggests that efficient legal systems and stronger creditor rights are positively correlated with external financing and economic development. (Levine 1998; Levine 1999; Djankov, McLiesh and Shleifer A. 2007; Haselmann, Pistor and Vig 2010). Focusing on banking institutions, Laeven and Levine (2009) emphasize the important role of governance structure in shaping bank risk. They find that strong shareholder power and cash flow rights are associated with greater risk-taking behavior. The effects of national regulation on bank risk may also depend on the governance structure of the banks. Houston, et al. (2010) investigate the links between creditor rights and bank risk. Their findings further suggest that an environment featuring stronger credit rights also induces banks to take more risk.

Efficient bankruptcy procedures can ex-ante enhance the willingness to lend and hence contribute to the development of the economy and businesses. For example, when lenders can seize the collateral and the secured ones are paid first, they may extend their lending to a wider set of borrowers. Creditor protection encourages lenders to extend the credit facility to borrowers, but it merely illustrates the laws in the books. However, law enforcement also has a crucial role when firms reach insolvency, as it can make a firm's exit faster and less damaging for creditors. We implement law enforcement variables as a substitute to the LLSV index in the robustness check in section 5.1.

Following La Porta, Lopez-de-Silanes, et al. (1998), we use the creditor rights index to measure the powers of secured creditors in bankruptcy. This index consists of four components: (1) restrictions on organizations such as creditor's consent or minimum dividend; (2) no automatic stay or asset freeze imposed by a court on a creditor's ability to seize the collateral; (3) secured creditors are paid first, priority distribution when liquidation is enforced as secured creditors are served first; (4) no management stay if the current management does not stay in control of the firm during reorganization; in other words, the management is not allowed to run the business anymore. For each of these powers, a value of one is added to the index when a country's laws and regulations provide it to secured lenders. The aggregate creditor index therefore ranges from zero to four, indicating stronger creditor rights as the index increases.

3.3.1.2 Contract enforcement time

Another potential concern is that the effects of creditor rights depend not only on codified rights but also on the enforcement of those rights. For example, a country could have strong creditor protection laws, but applying these laws may be very costly in terms of time or money. Contract enforcement time reflects the efficiency of courts, the main institution enforcing the legal system. The variable represents the number of days it takes to enforce a commercial contract incurred in the enforcement process and is taken from La Porta, Lopez-de-Silanes, et al., Law and finance (1998) database. The proxy was first developed by Djankov, La Porta, et al. (2003), and has been updated in the World Bank's Doing Business database. We suspect that having more time to resolve a dispute could have a harmful effect on banks and increase the level of systemic risk.

3.3.1.3 Information sharing among creditors

Following the paper by Houston, et al. (2010), where they find that information sharing increases economic growth and reduces financial instability or financial crisis, we employ the level of information sharing among creditors as a control variable, since it is likely to have an important influence on credit availability and bank risk-taking. Banks, which retain a full history of the debtors' repayment, could grant loans more easily or extend the amount of credit to borrowers. In contrast, when facing significant information asymmetry, banks prefer to ration the debtors and invest elsewhere. In fact, information sharing could be a substitute for bank monitoring, which lowers the cost for banks, resulting in lower loan rates. A large literature review examines the role of credit information sharing in enhancing credit availability (Pagano and Jappelli 1993; Padilla and Pagano 1997; Djankov, McLiesh and Shleifer A. 200); Brown, Jappelli and Pagano 2009).

3.3.1.4 Private and public information sharing arrangements

In a number of countries, lenders (banks, finance companies, credit card companies, retailers, suppliers extending trade credit) routinely share information on the creditworthiness of their borrowers through credit bureaus, information brokers that in some cases are set up and owned by the lenders themselves, and in others are operated

independently for profit by a third party. Lenders supply the bureau with data about their customers. The bureau collects this information alongside data from other sources (courts, public registers, tax authorities) and compiles a file on each borrower. The lenders who provide data can later obtain a return flow of consolidated data about a credit applicant by requesting a credit report from the bureau. Most countries have public registries for a real estate collateral to protect the seniority rights of collateralized creditors, and bankruptcy information is publicly disseminated to alert present creditors and potential new lenders. These can be considered as basic forms of publicly enforced information sharing. But in several countries, government authorities have taken a much more active role in fostering the exchange of information between lenders by creating formal public credit registers, which operate in many respects like credit bureaus.

Indeed, empirical evidence shows that information availability has a positive effect on lending to the private sector. For example, Doblas-Madrid and Minetti (2009) find that, if borrowers' history is registered and publicly available, the borrowers improve their repayment performance. Another paper by Brown and Zehnder (2010) finds empirical evidence suggesting that the lending market would collapse in the absence of information sharing institutions. We expect that bureau institutions would have a positive effect on bank systemic risk and help mitigate the high level of risk.

3.3.1.5 Country-level bank regulation variables

We include a series of other political and institutional quality indexes. The World Governance Indicators (Kaufmann, Kraay and Mastruzzi 2008) are constructed from 276 individual variables taken from 31 different sources produced by 25 different organizations. The indices measure different dimensions of governance, including Government effectiveness, Rule of law, and Control of corruption. An explanation of the descriptions of the variables is available in Appendix 1.

Next, we employ data on the power and independence of a country's banking supervision authority from the database by Barth, Caprio and Levine, Rethinking Bank Regulation: Till Angels Govern (2006) (and updated in Barth et al. (2013)[§]). We use several indices as follows: the official Supervisory Power Index, Entry barriers,

§http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

Restrictions on banking activities. We expect stricter supervision and regulation to have a limiting influence on systemic risk. Another set of control variables is used to capture the structure of the financial sector in each country, and because these variables are time-changing, we retrieve the level and changes of structure over time. We include the following measures of the structure of the financial industry: Concentration (of the banking sector); we used our own calculation for this variable, total Market Cap. / GDP (at the country level). Using these sets of variables, we can control for micro-level factors that are based on specific business models used by banks, and macro-level factors that account for the differences in economic conditions and in the structure of the financial industry across countries.

We also include several country-level variables to control for differences in economic development and institutions across countries. We retrieve two variables from the World Economic Forum's Global Competitiveness Report (2005).** The first is the Effbank (Perceived efficiency of bankruptcy), which assesses the efficiency of bankruptcy law. The second variable is Loan (Perceived access to loans), which measures the ease of accessing business loans. A higher value corresponds to more access to loans. Finally, we include natural logarithm GDP per capita and inflation (extracted from the World Bank's World Development Indicator, WDI, dataset) as standard macroeconomic control variables.

In order to see clearly the relation between creditor protection and systemic risk, we draw a graph (Figure 1) that represents the average Delta-CoVaR by the creditor rights index. It is clear from the graph that more creditor protection aggravates the average bank systemic risk. In addition to the link between creditor protection and bank systemic risk, we show in Figure 2 the trend of ΔCoVaR for the period from 2003 to 2011. We can clearly observe a significant increase in bank systemic risk during the period of the financial crisis of 2008/2009.

Summary statistics

--- TABLE 1 ABOUT HERE ---

**http://www.ios-regensburg.de/fileadmin/doc/ios_db/Global_Competitiveness_Index_scores_EU_WB_CIS_2004-2013.xls

Table 1 provides summary statistics for countries' banks and legal regulatory institutions. Our sample includes 34 countries with about 744 commercial listed banks around the world. The statistics are based on country-level averages for the period 2003–2011 and show annual data for our main dependent variable measured by ΔCoVaR. We note that for ΔCoVaR< 0, the more the values approach zero, the lower the contribution of a bank to systemic risk. For main independent variables, we use the LLSV creditor rights index, which is an aggregate index ranging from 0 to 4, with higher values meaning more protection. The table indicates that there is ample variation in the bank systemic risk measures and in other relevant variables across countries in the sample periods. The table also shows an increase in the level of measured systemic risk when compared to the creditor rights index. It is important to explore the relation and to determine whether an increase in creditor protection may have led to more bank risk-taking. We note that the average LLSV index for our sample is 1.54, and the average bank systemic risk measure is -0.04. For the remainder of our control variables, we calculate the mean for each variable for the period from 2003 till 2011.

--- TABLE 2 ABOUT HERE ---

For Table 2, we employ descriptive statistics on variables that change over time. Among these variables is our dependent variable ΔCoVaR, in addition to bank size, bank concentration, MKT Cap./GDP, inflation and Ln (GDP per capita). We note that the level of bank systemic risk is at its highest during the financial crisis period, mostly in 2008. We see a sharp decrease of MLT Cap./GDP, which is also mainly affected by the financial crisis of 2008/2009. Moreover, the inflation reaches the lowest level at 0.84 points in 2008; it starts to increase again after 2009. For the rest of the variables, they seem to maintain the same trend throughout the period of the analysis.

--- TABLE 3 ABOUT HERE ---

Table 3 divides the sample into two subsamples based upon the level of creditor rights protection. We consider creditor protection to be low when the index is below 1.54 (the mean of creditor rights by country); otherwise, creditors have more power as the value increases. We then test for significance by means of the variables used in the study.

We find that our dependent variable ΔCoVaR, the measure of systemic risk, is significantly higher by 0.2 points when creditors are well protected. The average bank size is significantly larger in countries with better legal protection, in addition to banking concentration, the average of which is significantly higher in countries with better legal protection. Among the regulation variables, the average of entry requirements, restrictions on activities and supervisory power is significantly higher in countries with low legal protection. Among the macroeconomic variables, the average Ln (GDP per capita) is significantly higher in countries with low legal protection. The significant difference in means for most of our control variables gives us additional motivation to explore the relation between bank systemic risk and creditor rights through a series of control variables at the country level. We now turn to providing a more empirical explanation for the link between creditor protection and the level of systemic risk.

4 Empirical results regarding bank systemic risk

Because we analyze panel data, we cannot rely upon ordinary least squares regression techniques, as our error terms would be serially correlated. Typically, one must choose between a fixed-effects model and a random-effects model when analyzing panel data such as ours; however, we are constrained to use a random-effects model because our primary variables of interest, our indicators of creditor rights, are invariant at both the bank and country level. Therefore, we cannot estimate our models using fixed-effects methodology since these governance variables would be collinear with the fixed-effects dummy variables. Consequently, we estimate all models using country-level random effects.

We are also unable to treat each bank as an independent observation because we are examining governance indicators measured only at the country level. Consequently, we calculate robust standard errors clustered at the bank level as unreported results.

We estimate the effects of the power of creditors on bank systemic risk by using a panel framework, which allows us to evaluate whether over time creditor rights lead to higher/lower bank systemic risk. Our main dependent variable is the ΔCoVaR, and the key independent variable is the creditor rights index. The regression analysis is expressed as follows:

$\boldsymbol{\Delta CoVaR^{j|i}} = \propto + \beta_1$ Creditor rights measure + β_2 Information availability measures + B_3 Bank regulation control + B_4 Bank control $+B_5$ Macro controls s_j+ ε,

where the *i* and *j* subscripts indicate bank i and j for the bank industry at the country level, respectively α the constant, and β_k is a vector of parameters.

- We expect $\beta_1 < 0$, the coefficient of creditor rights to be negatively significant, as more protection leads to a high level of systemic risk
- We expect $\beta_1 > 0$, the coefficient of creditor rights to be positively significant, as more protection leads to a lower level of systemic risk.
- We expect $\beta_2 > 0$ as information sharing alleviates the effect of creditor rights and reduces the information asymmetry between borrowers and lenders.
- We expect $\beta_3 > 0$ as bank regulations should reduce bank systemic risk according to Basel III.
- We expect $\beta_4 < 0$, bank size to be negative, noting that bank control stands for bank size. Bank size is a major determinant of bank systemic risk; larger banks are more complex and have more influence on the financial system in the case of distress.
- We include macro-variables – log GDP per capita, and inflation – as these variables capture a country's level of economic development.

In the following regressions, we run the regression clustered at the country level, as our variables for creditor rights are unchanged over time. Our regression results are reported in Table 3.

--- TABLE 4 ABOUT HERE ---

Table 4 shows that a higher creditor rights index translates into higher levels of bank systemic risk (ΔCoVaR<0; once again, a higher estimated ΔCoVaR implies higher systemic bank risk). In Column (1), the coefficient of creditor rights is negative and statistically significant, supporting the evidence that more protection for lenders increases bank systemic risk. A one standard deviation increase in creditor rights (0.84) is associated with a change in ΔCoVaR of about -0.007, noting that the mean in ΔCoVaR is -0.04. Concerning our control variables, as expected, bank size increases bank integration in higher risks. A one standard deviation increase in bank size (2.07) is associated with a

change in ΔCoVaR of about -0.02484. For information availability, we do not find any relation between information and bank systemic risk. For our variable that captures law enforcement, Ln (number of days), we conclude that more time needed to solve insolvency increases the cost of bankruptcy for lenders and has an impact on systemic risk. For the government and regulatory institutions, we note mainly that higher degrees of bank entry requirements reduce bank systemic risk. From columns (2) to (5), we treat each variable of creditor rights separately in order to analyze the weight of each law on bank systemic risk. We find significant results for the dummy variable "secured creditors are paid first", with a high significant level of 5%, and the "no automatic stay" dummy, with a level of 1%. The high negative significance for "the secured creditors are paid first" is quite relevant as more legal protection encourages banks to lend more even to borrowers with risky projects (high probability of default rates). For the second legal index, "no automatic stay", banks can seize their collateral in the case of a borrower's default and hence they will be able to have full recovery of their loans. For the control variables they still show relevant results. Finally, in column 6, we exclude U.S. banks as it has been reported by some researches that these banks contribute more to systemic risk also because they have different bankruptcy procedures under chapter 7 and chapter 11. We still find significant results at the 1% level for our main independent variable. In addition, among the control variables, we find that higher banking concentration induces bank systemic risk. Our findings follow past literature that finds a link between concentration and bank stability and therefore the probability of financial distress (Boyd, De Nicolo and Jalal (2006)). In all the regressions, we include a dummy for the financial crisis period 2008/2009. We find that this dummy is highly significant at the 1% level; we might suspect that creditor rights increase systemic risk more in financial crisis periods.

However, we run a regression by clustering at the bank level as unreported results, given that we cannot assume independence between our observations. We observe the same bank each year, and by clustering at the bank level, we take into account this limitation. We still find significant results highlighting the impact of creditor rights on bank systemic risk.

--- TABLE 5 ABOUT HERE ---

Table 5 shows two different columns as we separate developed and developing countries. We distinguish the countries based on World Bank classifications, considering low, middle-income and upper-middle-income economies as developing, and upper-high-income economies as developed. Since banks are larger in developed countries, they may contribute more to systemic risk, and have a more complex business model and a wider range of activities. We have data on both developed and developing countries, so we tested whether this hypothesis is true. We find that creditor rights increase systemic risk only in developed countries. Our results may be influenced by the fact that we do not have sufficient data in our sample, since we have only 700 observations for all the period. We mention that many papers support the idea that the size and complexity of bank activities do matter when calculating bank systemic risk (Laeven, Ratnovski and H. 2014).

5 Robustness check

5.1 Alternative proxies for creditor protection

In our previous results, we showed that better legal protection for creditors increases bank systemic risk. Still, using the LLSV aggregate index for our sample may not truly capture what we need due to several reasons. First, the index is unchanged for the whole period of our study. Second, it captures the efficiency of laws and institutions "on the books", while law enforcement seems to matter in resolving bankruptcy disputes (Aggarwal and Goodell 2009). And finally, one of the advantages for using these proxies for creditor protection is that we can capture both laws "on the book" and the efficiency of debt contract enforcement. We extend our results by using four governance indicators: Control of Corruption, Rule of Law, Regulatory Quality, and Government Effectiveness. We note that all four of these variables are retrieved from Worldwide Governance indicators. Firstly, these governance variables include the process by which governments are selected, monitored and replaced. Secondly, the variables measure the capacity of the government to effectively formulate and implement sound policies. Finally, these variables capture the degree of respect of citizens and of the state for the institutions that

govern economic and social interactions among them. The variables used are updated on the website of the World Bank for the period from 2003 till 2011 and cover 34 countries studied in the sample. These variables range from -2.5 to 2.5, with higher values indicating better governance. We add to these variables the Efficiency of the Judicial System index, which assesses the judicial integrity in a certain country based on the way it affects business. The index is produced by the Business International Corporation and ranges between 0 and 10, with lower scores indicating a less efficient legal environment. Our source is LLSV (1998).

--- TABLE 6 ABOUT HERE ---

Table 6 exhibits the pair-wise correlations between the different proxies of legal enforcement, including the JLEI measure. We suspect that the correlation between these variables will prove to be high. Indeed, the correlations are all positive and highly significant. Focusing on the rule of law column, it is clear that it is positive and highly correlated with other variables of legal enforcement, which shows that all the variables are another face of the rule of law. We could conclude that countries that have better rule of law also have a better legal enforcement environment, lower corruption and more efficient governments.

--- TABLE 7 ABOUT HERE ---

Table 7 is divided into two parts. In the first part of the table, we summarize the variables used to construct our new measure for creditor rights protection. We use the governance indicators and judicial effectiveness index as these measures are updated on a yearly basis and capture law enforcement. In the second part of the table, we show the different measures to capture creditor rights protection by having the creditor rights index interact with the indicators of governance and the judicial effectiveness index. The variables capture the effect of law enforcement on creditor regulation. Countries with strong creditor protection could lose their advantage if rules and regulations are not enforced.

--- TABLE 8 ABOUT HERE ---

In Table 8, we replace the creditor rights index, which is our main independent variable, by several interaction variables including at the same time laws in the books and law enforcement. From column (1) to column (5), we use five different variables in order to capture the actual creditor right protection. Our results are highly significant for columns (2) and (3), emphasizing the importance of the rule of law and of regulatory quality for the presence of laws in the book (creditor rights index). For columns (4) and (5), the main independent variables still prove to be significant at 10% level. We notice that, for all five columns, bank size increases the level of systemic risk as well as the time to resolve the dispute between the lenders and their borrowers. These results are not surprising, as we found the same in our main regression. In addition, we find that, among bank regulation variables, bank entry requirements decrease the level of systemic risk, as better regulation limits bank risk-taking.

5.2 Individual bank risk (Z-score dependent variable)

We will employ another measure of risk that was used in many past research papers. We will calculate the *Z*-score of each bank, which equals to the return on assets plus the capital-asset ratio divided by the standard deviation of asset returns. Specifically, *Z*-score=(ROA+CAR)/σ(ROA), where ROA is the rate of return on assets, CAR is the ratio of equity to assets, and σ(ROA) is an estimate of the standard deviation of the rate of return on assets, all measured with accounting data. Intuitively, the measure represents the number of standard deviations below the mean by which profits would have to fall so as to just deplete equity capital (Boyd, De Nicolo and Jalal 2006). As a measure of a bank's distance from insolvency (Roy 1952), *Z*-score has been widely used in the recent literature (Laeven and Levine 2009). A higher value of *Z*-score indicates higher bank stability. Since the *Z*-score is highly skewed, we follow (Laeven and Levine 2009) and use the natural logarithm of the *Z*-score as the risk measure. For brevity, we use the label "*Z*-score" in referring to the logged *Z* score. The ROA and capital asset ratio are therefore calculated as the mean over 2003–2011, and σ (ROA) is the standard deviation of ROA estimated over the time period 2003–2011.

--- TABLE 9 ABOUT HERE ---

In Table 9, for columns (1) to (4), we consider the Z-score as a dependent variable. For column (1) we find that a one standard deviation increase in creditor rights (0.84) is associated with a change in Z-score of about -.13 (-0.158*0.84). For all the four columns the coefficients of creditor rights are significant, emphasizing the importance of creditor rights at the level of bank systemic risk. We include a number of variables to control for law enforcement at the country level. These variables are updated on a yearly basis and since they are highly correlated, as shown in table (6), we use them separately, one in each regression. The empirical results are reported in table (9).

5.3 Instrumental variable analysis (reverse causality issue)

The issue of reverse causality could arise when law reforms occur after a certain financial crisis. Thus, the problem of endogeneity could create a bias in the results. However, the potential for reverse causality is less of a concern than in pure cross-country analysis because we are examining the impact of creditor rights on bank-level systemic risk. Still, one may argue that after each financial crisis, laws could be changed to avoid taking huge risks. We conduct a robustness test using instrumental variable (IV) analysis. We implement instrumental variables based on the theoretical and empirical work in the law, institution, and finance literature (Acemoglu and Johnson 2005; Beck, Demirguc-Kunt and Levine 2003; La Porta, Lopez-de-Silanes, et al., Law and finance 1998; and La Porta, Lopez-de-Silanes, et al. 1999). La Porta, Lopez-de-Silanes, et al. (1999) and Beck, Demirguc-Kunt and Levine (2003) show that differences in legal traditions help explain differences in financial systems today. In addition, legal origin clearly appears as exogenous because it was forced by colonial powers in developing countries (Acemoglu and Johnson, Unbundling institutions 2005; La Porta, Lopez-de-Silanes, et al. 1999). We therefore include legal origin (English, French, German, and Nordic) as an instrumental variable for creditor rights using data from Djankov, McLiesh and Shleifer A. (2007). Moreover, we choose the variable latitude and include it as an instrumental variable. We therefore follow Beck, Demirguc-Kunt and Levine (2003) in using latitude as an instrumental variable for the creditor rights measure. We also include ethnic fractionalization as an instrumental variable because it has been found that economies with greater ethnic diversity tend to choose institutions that allow those in

power to expropriate resources from others (Beck, Demirguc-Kunt and Levine 2003; Beck, Demirguc-Kunt and Levine 2006). Lastly, it has also been reported that a country's cultural heritage, as proxies by religious composition, has a significant impact on shaping its political and financial institutions (La Porta, Lopez-de-Silanes, et al. 1999; Stulz and Williamson 2003). We finally include the country's religious composition as an additional instrumental variable.

--- TABLE 10 ABOUT HERE ---

As can be seen from Table 10, the empirical results are rather robust. The coefficients of creditor rights remain negative and significant. The results confirm our finding that stronger creditor rights induce more bank risk-taking.

5.4 Financial crisis impact

One might think that the impact of creditor rights on bank systemic risk will only be relevant during financial crisis periods. This idea in fact could be relevant, as in periods of growth banks take more risks and on the one hand lend more to riskier borrowers, while on the other hand they invest more in derivatives and securities with high risks. In both cases, these activities increase the likelihood of financial crisis and financial shocks. We collect a sample from 59 countries around the world with more than 1100 commercial banks and calculate the systemic risk of each bank; we include several control variables, such as bank size and information availability, as well as control for contract enforcement. The tables of statistics of the countries and variables used are available in appendix 1.

--- TABLE 11 ABOUT HERE ---

In Table 11, we run regressions while separating the sample into two subsamples, the period of the financial crisis of 2008/2009 and the period of non-financial crisis from 2003 till 2011 excluding the crisis periods. We consistently find that a higher creditor rights index translates into higher levels of bank systemic risk. (Once again a higher

estimated ΔCoVaR implies less bank risk and more stability.) In Columns (1) and (2), for non-financial crisis periods we note that the coefficient of creditor rights is negative and statistically significant, suggesting that the net effect of creditor rights on bank systemic risk is positive and significant. We also find significant results for bank size, and for the contract enforcement variable. In columns (3) and (4), we find similar results, therefore we conclude that in periods of crisis, creditor rights still have an impact on bank systemic risk.

Summary and conclusions

In summary, our results provide new evidence on the importance of legal and institutional environment on banking behaviors, and, more precisely, on risk-taking and the implications on the financial sector. Our results are robust since we applied several robustness checks in order to control for endogeneity issues and reverse causal effect. Our findings support the dark side of strong creditor rights, driving the increase of bank systemic risk.

To our knowledge, the latter could have two main channels leading to higher systemic risk. On the one hand, the traditional bank business model for investing in loans increases with creditor protection, which encourages banks to lend to riskier borrowers. Adopting excessive lending raises the probability of debtors' defaults, which could be explained by the large amount of bank loan loss provisions in the income statement. On the other hand, as mentioned earlier, firms decrease their long-term investments in countries where creditor protection is high, which in turn shifts the demand to lower levels. In this case, banks substitute bank loans with riskier investments that include trading activities, derivatives products and other financial instruments.

An interesting topic arises: we could ask through which channels creditor rights protection increases bank systemic risk. We leave the last question to future research papers that could add to the literature of banking behaviors and regulation.

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Table A

Variable Name	Description
Creditor rights	Index of components 1 through 4, where each component gets a weight of one if a country's legal system grants that creditors' right and zero otherwise. Ranges from zero to four, with higher values indicating stronger creditors rights. Source: LLSV (1998)
Resttrictions on reorganiztion (cr1)	Restrictions, such as creditors' consent, when a debtor files for reorganization. This component gets a weight of one if a country's legal system grants that creditors' right and zero otherwise. Source: LLSV (1998)
No automatic stay (cr2)	Right of creditors to seize collateral after a debtor's filing for reorganization is approved by the court. Source: LLSV (1998)
Secured creditor paid first (cr3)	Right of creditors to be paid first out of the proceeds of a liquidating firm. This component gets a weight of one if a country's legal system grants that creditors' right and zero otherwise. Source: LLSV (1998)
No management stay (cr4)	An administrator, rather than management, takes responsibility for running a firm during reorganization. This component gets a weight of one if a country's legal system grants that creditors' right and zero otherwise. Source: LLSV (1998)
Pb. Bureau	The variable equals 1 if a public credit registry operates in country, 0 otherwise. The variable is constructed as at January for every year from 1978 to 2003. Source : Djankov, McLeish, and Shleifer (2007), World Bank "Doing Business" database
Priv. Bureau	The variable equals 1 if a private credit bureau operates in the country, 0 otherwise. The variable is constructed as a January for every year from 1978 to 2003.Source : Djankov, McLeish, and Shleifer (2007), World Bank "Doing Business" database
Info	A dummy variable that equals one if an information sharing agency (public registry or private bureau) operates in the country during the sample period, zero otherwise. Source : Djankov, McLeish, and Shleifer (2007), World Bank "Doing Business" database
Ln(number of days)	The number of days to resolve a payment dispute through courts. The variable is constructed as at January 2003. Source : Djankov, McLeish, and Shleifer (2007), World Bank "Doing Business" database
Entry	This index measures the stringency for entry requirements into banking. It is constructed from the following variables in the database: WBG 1.8.1-1.8.8 (see Barth et al., 2004). Higher values indicate more requirements. Source: World Bank database: Banking Regulation Surveys 2001, 2003, 2007
Restrictions	This index includes restrictions on securities, insurance, and real estate activities plus restrictions on the banks owning and controlling non-financial firms. We follow the same definition as Barth et al. (2004): WBG 4.1 + 4.2 + 4.3 + 4.4, with "Unrestricted" and "permitted" equal 1; "restricted" and "prohibited" equal 0. Higher values indicate greater power. Source: World Bank database: Banking Regulation Surveys 2001, 2003, 2007
Supervisory Power	This index measures the level of power of the official supervisory authorities: whether the supervisory authorities have the authority to take specific actions to prevent and correct problems. We follow the same definition as Barth et al. (2004) : WBG 5.5 + 5.6 + 5.7 + 6.1 + 10.4 + 11.2 + 11.3.1 + 11.3.2 + 11.3.3 + 11.6 + 11.7 + 11.9.1 + 11.9.2 + 11.9.3 . Higher values indicate more oversight. Source: World Bank database: Banking Regulation Surveys 2001, 2003, 2007
Bank concentration	This variable gives the concentration of the banking sector in the country of the bank: assets of three largest commercial banks as a share of total commercial banking assets. Source: Own calculation
MKT Cap./GDP	This variable gives the ratio of total market capitalization to GDP in the country of the bank: total value of all listed in a stock market as a percentage of GDP. Source: World Bank database: Financial Development and structure Dataset (version of April 2013)
Ln(Gdp per capita)	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. Source : World Development Indicators
Inflation	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used. Source : World Development Indicators
Control of corruption	Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests The aggregate indicator is reported in standard normal units, ranging from approximately -2.5 to 2.5 with higher values corresponding to better outcomes, Source: Worldwide Governance Indicators
Government Effectiveness	Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The aggregate indicator is reported in standard normal units, ranging from approximately -2.5 to 2.5 with higher values corresponding to better outcomes, Source: Worldwide Governance Indicators
Rule of Law	Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.The aggregate indicator is reported in standard normal units, ranging from approximately -2.5 to 2.5 with higher values corresponding to better outcomes, Source: Worldwide Governance Indicators
Regulatory quality	Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The aggregate indicator is reported in standard normal units, ranging from approximately -2.5 to 2.5 with higher values corresponding to better outcomes, Source: Worldwide Governance Indicators
Judicial Legal Effectiveness	Assesses the judicial integrity in a certain country in the way it affects business, foreign firms in particular. The index is produced bt the Business International Corporation and rages from 0 to 10, with lower scores indicating less effcient legal environement. Source : LLSV (1998)
Effbank, Perceived effiency of bankruptcy (WEF)	Assessment of the effiency of bankruptcy law. Scale from 0 to 6, where higher scores indicate higher compliance. Source : World Economic Forum Global Competitiveness Report (2005)
Loan, Perceived access to loans (WEF)	Assessment of the ease of accessing business loans. Scale from 0 to 6, where higher scores indicate higher compliance. Source : World Economic Forum Global Competitiveness Report (2005)

Table 1. Summmary statistics for banks and country legal and insitutions regulations from Jan 1, 2003 to December 31, 2011

Country	(1) Nbr Obs.	(2) (ΔCoVaR)	(3) Size	(4) Bank concentration	(5) Creditor rights	(6) Pb. Bureau	(7) Priv. Bureau	(8) Info	(9) Ln(number of days)
Argentina	57	-0.07	8.62	0.61	1	1	1	1	6.25
Australia	64	-0.08	11.02	0.77	3	1	0	1	5.06
Austria	44	-0.11	10.2	0.96	3	1	1	1	5.92
Belgium	6	-0.11	12.67	1	2	0	1	1	4.72
Botswana	22	-0.04	6.88	0.86	3	1	0	1	5.04
Brazil	102	-0.06	9.28	0.87	1	1	1	1	6.34
Bulgaria	12	-0.17	7.34	0.93	2	0	1	1	6.09
Chile	14	-0.13	9.94	0.69	2	1	1	1	5.72
Colombia	48	-0.08	9.3	0.78	0	1	0	1	5.89
Croatia	39	-0.15	6.74	0.96	3	0	0	0	6.03
Denmark	173	-0.05	7.24	0.97	3	1	0	1	4.42
Egypt, Arab Rep.	98	-0.09	7.72	0.57	2	0	1	1	6.02
Finland	4	-0.05	8.95	1	1	1	0	1	5.48
France	169	-0.05	10.43	0.83	0	0	1	1	4.32
Germany	101	-0.08	10.47	0.92	3	1	1	1	5.21
Greece	63	-0.04	10.43	0.7	1	1	0	1	5.02
Ireland	2	-0.03	12.55	1	1	1	0	1	5.38
Italy	166	-0.06	9.98	0.81	2	1	1	1	7.24
Japan	862	-0.03	10.22	0.5	2	1	0	1	4.09
Korea, Rep.	51	-0.07	9.75	0.95	3	1	0	1	4.32
Malaysia	90	-0.05	9.99	0.58	3	1	1	1	5.7
Mexico	15	-0.11	9.4	0.94	0	1	0	1	6.04
Morocco	61	-0.05	8.64	0.79	1	0	1	1	5.48
Norway	139	-0.04	8.31	0.81	2	1	0	1	4.47
Peru	22	-0.07	8.92	0.79	0	1	1	1	6.09
Poland	94	-0.06	9.24	0.57	1	1	0	1	6.91
Russian Federation	22	-0.1	9.01	0.92	2	0	0	0	5.8
Singapore	61	-0.03	9	0.98	3	1	0	1	4.23
South Africa	82	-0.05	9.23	0.7	3	1	0	1	5.62
Spain	46	-0.12	12.29	0.92	2	1	1	1	5.13
Switzerland	168	-0.03	9.48	0.53	1	1	0	1	5.14
Thailand	93	-0.04	9.07	0.59	2	1	0	1	5.97
United Kingdom	95	-0.06	10.88	0.84	4	1	0	1	5.66
United States	2,353	-0.02	7.67	0.45	1	1	0	1	5.52
Total	5,438	-0.04	8.76	0.59	1.54	0.93	0.18	0.99	5.27

Country	Nbr Obs.	(10) Entry	(11) Restrictions	(12) Supervisory Power	(13) MKT Cap./GDP	(14) Effbank	(15) Loan	(16) ln(Gdp per Capita)	(17) Inflation
Argentina	57	7	1	10	25.72	3.4	1.7	8.79	9.12
Australia	64	7	2	13	117.31	6.5	4.8	10.59	2.89
Austria	44	8	3	10	27.73	6.2	3.7	10.66	1.99
Belgium	6	8	3	11	52.98	5.8	4.2	10.71	2.84
Botswana	22	8	2	5	29.77	4.7	3.3	8.73	8.41
Brazil	102	8	3	14	59.77	4.8	3.4	9.03	5.59
Bulgaria	12	8	1	11	15.23	3.3	2.7	8.8	2.97
Chile	14	4	1	11	129.91	5.6	4	9.52	2.37
Colombia	48	8	1	13	43.87	5.1	3.1	8.49	4.49
Croatia	39	7	4	10	52.23	3.3	2.9	9.56	2.78
Denmark	173	8	2	10	64.72	6.7	5.1	10.88	2.07
Egypt, Arab Rep.	98	8	2	14	55.88	3.9	3.3	7.56	9.81
Finland	4	7	3	9	47.13	6.3	5.2	10.74	2.5
France	169	7	2	8	78.01	5.9	4.2	10.53	1.9
Germany	101	6	3	8	43.53	6.3	3.5	10.55	1.73
Greece	63	7	3	10	47.01	4.8	3.8	10.09	3.27
Ireland	2	8	3	12	39.33	5.8	5	11	3.11
Italy	166	8	1	7	34.26	5	3.5	10.41	2.25
Japan	862	7	2	12	81.31	5.2	2.5	10.54	-0.14
Korea, Rep.	51	8	3	11	82.86	5	3.7	9.85	3.26
Malaysia	90	8	1	13	132.65	5.8	3.8	8.82	2.46
Mexico	15	8	4	11	36.19	4.2	2.3	9.09	4.16
Morocco	61	8	1	13	60.66	4.5	2.8	7.77	1.77
Norway	139	8	1	8	54.75	5.8	4.7	11.25	1.89
Peru	22	6	1	12	57.07	4.7	2.6	8.51	2.46
Poland	94	8	2	9	30.32	4.2	3.3	9.2	2.74
Russian Federation	22	8	4	8	56.37	3.2	2.4	9.36	8.34
Singapore	61	8	1	13	185.71	6.3	4.3	10.44	2.37
South Africa	82	8	2	10	221.15	5.3	3.7	8.65	5.76
Spain	46	7	3	11	85.65	5	3.8	10.26	2.78
Switzerland	168	8	3	14	221.96	6	3.9	11	0.81
Thailand	93	8	0	10	66.17	5.1	3.4	8.16	3.12
United Kingdom	95	8	4	8	123.66	6.6	5.1	10.57	2.58
United States	2,353	8	2	13	121.02	6.3	4.6	10.74	2.51
Total	5,438	7.7	2.01	11.78	99.93	5.76	3.95	10.34	2.37

Table 2. Yearly descriptive statistics of (ΔCoVaR) and a number of control variables used in the analysis.

	(1)	(2)	(3)	(4)	(5)	(6)		(7)
Year	(ΔCoVaR)	MKT Cap./GDP	Size	ln(Gdp per capita)	Bank concentration	Inflation		Number of banks
2003	-0.01	93.46	8.54	10.2	0.63	1.87		500
2004	-0.02	104.4	8.6	10.26	0.61	2.08		534
2005	-0.02	111.27	8.57	10.32	0.61	2.58		565
2006	-0.03	118.46	8.73	10.31	0.6	2.63		566
2007	-0.05	122.48	8.77	10.35	0.57	2.47		599
2008	-0.08	98.44	8.84	10.43	0.58	3.88		617
2009	-0.04	79.48	8.83	10.34	0.6	0.84		657
2010	-0.03	91.1	8.89	10.38	0.58	1.99		690
2011	-0.04	87.06	8.96	10.45	0.55	2.96		710
Mean	-0.04	99.93	8.76	10.34	0.59	2.37	Nbr Obs.	5438

Table 3. Characteristics for banks and country legal and institutions regulations

This table compares the mean characteristics at the bank level and country level as well. We divided Laporta Index (1998) into two subgroups , and test equality of means between low creditor rights and high creditor rights countries. The sample includes 744 commercial banks from 34 countries around the world and includes most developped countries. Our sample includes the following countries: Argentina, Australia, Austria, Belgium, Botsawana, Brazil, Bulgaria, Chile, Colombia, Croatia, Denmark, Egypt, Arab Rep., Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Rep., Malaysia, Mexico, Morocco, Norway, Peru, Poland, Russian Federation, Singapore, South Africa, Spain, Switzerland, Thailand,United Kingdom, United States. Variables used in this table are explained in the Table A , variables descriptions section.

Variables	Mean of bank and countries characteristics with Low Creditor rights protection (dummy variables equal 0, and 1)	Mean of bank and countries characteristics with high Creditor rights protection (dummy variables equal 2, 3 and 4)	Difference	Test for equality of means (p-value)
Bank level characteristics				
(ΔCoVaR)	-0.03	-0.05	0.02	0.00
Size	8.15	9.61	-1.45	0.00
Country level : Regulation , institutions				
Pb. Bureau	0.93	0.92	0.00	0.00
Priv. Bureau	0.13	0.25	-0.12	0.51
Ln(number of days)	5.52	4.94	0.58	0.00
Entry	7.89	7.44	0.45	0.00
Restrictions	2.06	1.95	0.10	0.00
Supervisory power	12.56	10.69	1.87	0.00
MKT Cap./GDP	112.89	81.97	30.91	0.00
Bank concentration	0.52	0.69	-0.18	0.00
Info	1.00	0.97	0.03	0.00
Ln(Gdp per capita)	10.48	10.16	0.32	0.00
Inflation	2.65	1.98	0.67	0.00
Loan	4.31	3.44	0.87	0.00
effbank	5.99	5.42	0.57	0.00

Table 4. (ΔCoVaR) and creditor rights including crisis dummy : Bank level basic OLS regresions

The dependent variable is the DeltaCoVaR measure for systemic risk with higher values implies more stability. The estimation is based on OLS regressions. P-values are computed by the heteroskedasticity-robust standard errors clustered for countries and t-stats presented in parentheses *, **, *** Represent statistical significance at the 10%, 5%, and 1% levels respectively.

	(1)		(2)		(3)		(4)		(5)		(6)	
(ΔCoVaR) dependent variable	**Total Sample**		**Total Sample**		**Total Sample**		**Total Sample**		**Total Sample**		**Excluded U.S.**	
Creditor rights	-0.009**	(-2.10)									-0.011**	(-2.50)
Resttrictions on reorganiztion (cr1)			0.009	(0.91)								
No automatic stay (cr2)					-0.047***	(-2.61)						
Secured creditor paid first (cr3)							-0.025**	(-2.05)				
No management stay (cr4)									-0.008	(-0.97)		
Size	-0.012***	(-4.13)	-0.012***	(-4.13)	-0.012***	(-4.14)	-0.012***	(-4.05)	-0.012***	(-4.13)	-0.016***	(-7.69)
Pb. Bureau	0.025	(1.60)	0.004	(0.18)	0.059**	(2.47)	0.020	(1.16)	0.007	(0.39)	0.043***	(2.66)
Priv. Bureau	0.002	(0.17)	-0.008	(-0.51)	0.028	(1.64)	-0.007	(-0.46)	-0.007	(-0.43)	0.019	(1.41)
Ln(number of days)	-0.015**	(-2.05)	-0.007	(-1.01)	-0.023***	(-2.80)	-0.013*	(-1.66)	-0.009	(-1.35)	-0.021**	(-2.50)
Info	0.018	(0.65)	0.047	(1.42)	-0.023	(-0.61)	0.018	(0.65)	0.043	(1.35)	-0.011	(-0.32)
Entry	0.014***	(2.78)	0.009	(1.44)	0.012**	(2.22)	0.011**	(2.37)	0.012**	(2.06)	0.019***	(2.79)
Restrictions	0.004	(0.80)	0.003	(0.68)	0.011*	(1.67)	0.001	(0.31)	0.003	(0.67)	0.011*	(1.92)
Supervisory power	-0.003*	(-1.70)	-0.001	(-0.42)	-0.001	(-0.76)	-0.002	(-0.98)	-0.002	(-1.31)	-0.005**	(-2.10)
MKT Cap./GDP	-0.000	(-0.35)	-0.000	(-0.64)	-0.000	(-0.79)	-0.000	(-0.22)	-0.000	(-0.54)	-0.000	(-1.08)
Bank concentration	-0.032	(-1.35)	-0.034	(-1.57)	-0.010	(-0.40)	-0.042*	(-1.78)	-0.033	(-1.39)	-0.103**	(-2.42)
Ln(Gdp per capita)	-0.009	(-0.97)	-0.004	(-0.51)	-0.017	(-1.55)	-0.005	(-0.62)	-0.006	(-0.68)	-0.021**	(-2.49)
Inflation	-0.001	(-0.48)	-0.001	(-0.44)	-0.001	(-0.50)	-0.001	(-0.40)	-0.001	(-0.48)	-0.004***	(-2.67)
effbank	0.025**	(2.53)	0.026**	(2.16)	0.026**	(2.42)	0.030***	(3.02)	0.025**	(2.24)	0.029***	(3.02)
Loan	-0.017*	(-1.85)	-0.019**	(-1.99)	-0.006	(-0.62)	-0.019**	(-2.24)	-0.020*	(-1.91)	-0.007	(-0.70)
Crisis dummy	-0.023***	(-2.77)	-0.024***	(-2.82)	-0.019**	(-2.30)	-0.023***	(-2.80)	-0.024***	(-2.86)	-0.012	(-1.42)
Observations	5438		5438		5438		5438		5438		3085	
R-squared	0.22		0.22		0.22		0.22		0.22		0.21	
year dummies	YES		YES		YES		YES		YES		YES	
Countries	34		34		34		34		34		33	

Table 5. (ΔCoVaR) and creditor rights : Developed vs. Developing

The dependent variable is the DeltaCoVaR , it measures the level of systemic risk with higher values implies more stability. Separation of countries is based on the World Bank data, countries with lower than middle range income are classified as developing countries. The estimation is based on OLS regressions. P-values are computed by the heteroskedasticity-robust standard errors clustered for countries and t-stats presented in parentheses *, **, *** Represent statistical significance at the 10%, 5%, and 1% levels respectively.

	(1)		(2)	
(ΔCoVaR) dependent variable	**Developing countries**		**Developed countries**	
Creditor rights	0.006	(0.13)	-0.021***	(-2.61)
Size	-0.015***	(-3.33)	-0.012***	(-4.08)
Pb. Bureau	0.061	(0.93)	0.017	(0.48)
Priv. Bureau	0.035	(0.61)	-0.033	(-1.31)
Ln(number of days)	0.012	(0.27)	-0.005	(-0.44)
Info	0.305	(1.01)	0.043	(-0.67)
Entry	0.015	(0.51)	0.013	(1.59)
Restrictions	0.025*	(1.72)	0.002	(0.28)
Supervisory power	-0.007	(-0.39)	-0.005	(-1.07)
MKT Cap./GDP	-0.000	(-0.64)	-0.000	(-0.09)
Bank concentration	-0.109	(-0.85)	0.026	(0.99)
Ln(Gdp per capita)	-0.058**	(2.28)	-0.025	(-1.16)
Inflation	-0.005***	(-3.06)	-0.002	(-0.77)
Effbank	0.051	(0.96)	0.042**	(2.44)
Loan	-0.029	(-0.43)	-0.034***	(-3.09)
Observations	702		4736	
Banks	107		637	
R-squared	0.13		0.2	
Countries	12		22	

Table 6. Correlation of law enforcement measures

The table presents the pairwise correlations between the variables used as alternative measures to the creditor rights protection variable. All variables proxy for the law enforcement in each of the 34 countries used in the analysis. P-values are between parenthesis.

	Control of Corruption	Rule of law	Regulatory Quality	Judicial Legal Effectiveness	Government Effectiveness
Control of Corruption	1				
Rule of law	0.9229* (0.000)	1			
Regulatory Quality	0.8973* (0.000)	0.9347* (0.000)	1		
Judicial Legal Effectiveness	0.8335* (0.000)	0.8800* (0.000)	0.8100* (0.000)	1	
Government Effectiveness	0.9472* (0.000)	0.9536* (0.000)	0.9190* (0.000)	0.8886* (0.000)	1

Table 7. Summmary statistics countries creditor rights and law enforcement index , calculated by the mean from Jan 1, 2003 to December 31, 2011

Country	Creditor rights	Government Effectiveness	Control of Corruption	Rule of law	Regulatory Quality	Judicial Legal Effectiveness
Argentina	1	-0.12	-0.44	-0.67	-0.71	1.23
Australia	3	1.79	2.04	1.76	1.71	8.90
Austria	3	1.78	1.83	1.85	1.53	8.39
Belgium	2	1.62	1.53	1.39	1.27	6.89
Botswana	3	0.5	0.95	0.64	0.48	6.02
Brazil	1	-0.1	-0.02	-0.23	0.1	4.15
Bulgaria	2	0.13	-0.23	-0.1	0.61	2.24
Chile	2	1.26	1.5	1.34	1.47	6.61
Colombia	0	-0.08	-0.23	-0.46	0.2	3.00
Croatia	3	0.58	-0.02	0.13	0.52	1.82
Denmark	3	2.21	2.47	1.94	1.84	9.53
Egypt, Arab Rep.	2	-0.38	-0.58	-0.12	-0.32	
Finland	1	2.25	2.2	1.97	1.86	9.21
France	0	1.57	1.41	1.44	1.24	7.64
Germany	3	1.56	1.77	1.67	1.54	8.55
Greece	1	0.65	0.18	0.76	0.82	5.56
Ireland	1	1.49	1.76	1.69	1.92	7.77
Italy	2	0.46	0.27	0.45	0.94	4.07
Japan	2	1.44	1.33	1.29	1.13	7.59
Korea, Rep.	3	1.12	0.44	0.94	0.85	
Malaysia	3	1.13	0.2	0.52	0.52	7.75
Mexico	0	0.21	-0.36	-0.58	0.27	2.98
Morocco	1	-0.14	-0.29	-0.17	-0.18	5.22
Norway	2	1.9	2.04	1.92	1.44	8.69
Peru	0	-0.3	-0.28	-0.65	0.42	1.75
Poland	1	0.51	0.3	0.51	0.84	1.83
Russian Federation	2	-0.44	-1.05	-0.76	-0.36	
Singapore	3	2.19	2.24	1.67	1.81	8.99
South Africa	3	0.52	0.26	0.1	0.54	7.14
Spain	2	1.17	1.14	1.15	1.21	5.30
Switzerland	1	1.97	2.1	1.82	1.61	9.05
Thailand	2	0.32	-0.27	-0.06	0.26	5.28
United Kingdom	4	1.67	1.75	1.68	1.72	9.21
United States	1	1.6	1.43	1.57	1.52	8.37

Country	Creditor rights	Creditor rights x Government Effectiveness	Creditor rights x Control of corruption	Creditor rights x Rule of law	Creditor rights x Regulatory Quality	Creditor rights x Judicial Legal Effectiveness
Argentina	1	-0.1158982	-0.4418257	-0.6682701	-0.7145448	1.225028
Australia	3	5.378034	6.109915	5.27808	5.116516	26.69863
Austria	3	5.344165	5.493604	5.553075	4.597197	25.15535
Belgium	2	3.241259	3.053791	2.773504	2.534939	13.77667
Botswana	3	1.495976	2.859848	1.921396	1.431819	18.06662
Brazil	1	-0.0957223	-0.0232194	-0.2283508	0.0988695	4.153215
Bulgaria	2	0.2535666	-0.4525138	-0.2097014	1.226887	4.487502
Chile	2	2.517375	3.008947	2.680223	2.932035	13.2174
Colombia	0	0	0	0	0	0
Croatia	3	1.725105	-0.0635363	0.3944138	1.558969	5.473106
Denmark	3	6.6419	7.401382	5.834115	5.531942	28.59167
Egypt, Arab Rep.	2	-0.7592043	-1.166641	-0.2346911	-0.6342472	
Finland	1	2.251766	2.200286	1.966226	1.858104	9.212821
France	0	0	0	0	0	0
Germany	3	4.666182	5.312933	4.995878	4.616	25.66304
Greece	1	0.6456617	0.1821749	0.7554862	0.8183268	5.562152
Ireland	1	1.494773	1.75821	1.691156	1.921022	7.770074
Italy	2	0.9109466	0.5360006	0.892087	1.872418	8.139927
Japan	2	2.874234	2.668986	2.579194	2.253707	15.17712
Korea, Rep.	3	3.369821	1.307948	2.833245	2.562687	
Malaysia	3	3.396114	0.5973513	1.564468	1.548168	23.2597
Mexico	0	0	0	0	0	0
Morocco	1	-0.1431642	-0.2862684	-0.1717102	-0.1848031	5.222344
Norway	2	3.797675	4.088292	3.839174	2.882332	17.37154
Peru	0	0	0	0	0	0
Poland	1	0.5128296	0.3004286	0.510625	0.8382566	1.829907
Russian Federation	2	-0.8829057	-2.101158	-1.521685	-0.7264919	
Singapore	3	6.575935	6.710002	5.011056	5.440776	26.9836
South Africa	3	1.56785	0.7750952	0.2895247	1.628224	21.40696
Spain	2	2.332259	2.276711	2.300906	2.422942	10.59836
Switzerland	1	1.968053	2.097578	1.824246	1.612591	9.047302
Thailand	2	0.633009	-0.5476067	-0.1290756	0.5152915	10.56844
United Kingdom	4	6.699568	7.012123	6.700997	6.883929	36.82338
United States	1	1.596151	1.432865	1.566366	1.520764	8.370555

Table 8. Alternative variables for creditor protection : Bank level basic OLS regresions

The sample consists on 744 listed commercial banks from 34 countries for the period 2003-2011. The Dependent variable is (ΔCoVaR) for the systemic risk measurement. Alternative proxies are computed using a large updated database that measures law enforcement at the country level on yearly basis. We use the effective creditor rights index as the interaction between creditor rights and the law enforcement. Control variables include bank size, information sharing and bank regulation in addition to country macro-variables .The estimation is based on OLS regressions. P-values are computed by the heteroskedasticity-robust standard errors clustered for countries and t-stats presented in parentheses *, **, *** Represent statistical significance at the 10%, 5%, and 1% levels respectively.

	(1)		(2)		(3)		(4)		(5)	
(ΔCoVaR) dependent variable	**Total Sample**		**Total Sample**		**Total Sample**		**Total Sample**		**Total Sample**	
Creditor rights x Control of corruption	-0.002	(-0.57)								
Creditor rights x Rule of law			-0.009***	(-2.79)						
Creditor rights x Regulatory Quality					-0.009***	(-2.70)				
Creditor rights x Judicial Legal Effectiveness							-0.002*	(-1.71)		
Creditor rights x Government Effectiveness									-0.006*	(-1.86)
Size	-0.014***	(-5.67)	-0.013***	(-5.46)	-0.013***	(-5.52)	-0.013***	(-4.73)	-0.013***	(-5.61)
Pb. Bureau	0.016	(0.70)	0.033**	(2.05)	0.027*	(1.68)	0.046**	(1.98)	0.028	(1.56)
Priv. Bureau	-0.008	(-0.41)	-0.003	(-0.17)	-0.008	(-0.45)	0.002	(0.14)	-0.003	(-0.18)
Ln(number of days)	-0.011	(-1.09)	-0.019**	(-2.23)	-0.013	(-1.56)	-0.022***	(-2.71)	-0.016*	(-1.81)
Info	0.042	(1.12)	0.033	(1.04)	0.033	(1.04)	0.038	(0.86)	0.024	(0.74)
Entry	0.010	(1.50)	0.011*	(1.82)	0.010	(1.52)	0.014**	(2.31)	0.012**	(1.98)
Restrictions	0.006	(0.83)	0.009	(1.30)	0.007	(1.05)	0.008	(1.18)	0.006	(0.91)
Supervisory power	-0.002	(-0.99)	-0.004*	(-1.81)	-0.004*	(-1.75)	-0.005	(-1.62)	-0.003	(-1.42)
MKT Cap./GDP	-0.000	(-0.15)	-0.000	(-0.24)	-0.000	(-0.10)	0.000	(0.05)	-0.000	(-0.12)
Bank concentration	-0.014	(-0.31)	-0.013	(-0.30)	-0.003	(-0.07)	-0.013	(-0.28)	-0.012	(-0.27)
Ln(Gdp per capita)	-0.016**	(-2.13)	-0.017**	(-2.25)	-0.016**	(-2.18)	-0.020**	(-2.20)	-0.018**	(-2.26)
Inflation	-0.004*	(-1.73)	-0.004*	(-1.76)	-0.004*	(-1.69)	-0.003	(-1.37)	-0.004*	(-1.76)
effbank	0.030**	(2.36)	0.035***	(3.45)	0.035***	(3.37)	0.034**	(2.05)	0.033***	(2.97)
Loan	-0.016	(-1.49)	-0.014	(-1.43)	-0.016	(-1.59)	-0.015	(-1.24)	-0.015	(-1.50)
Observations	5438		5438		5438		5267		5438	
R-squared	0.18		0.18		0.18		0.18		0.18	
Countries	34		34		34		34		34	

Table 9. Cross-section OLS regressions : Z-score aternative risk-taking measure

The dependent variable is the natural logarithm of Z-score in columns 1 to 4 . Following Boyd, De Nicolò, and Al Jalal (2006), CAR is capital-asset ratio, averaged over 2003–2011. Higher values of ZSCORE implies more stability. The estimation is based on OLS regressions. p-Values are computed by the heteroskedasticity-robust standard errors clustered for countries and t-stats are presented in parentheses. *, **, *** Represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Z-score dependent variable	**Z-score**	**Z-score**	**Z-score**	**Z-score**
Creditor rights	-0.158**	-0.179**	-0.116*	-0.173**
	(-2.14)	(-2.22)	(-1.68)	(-2.28)
Size	0.072	0.086	0.073	0.078
	(0.63)	(0.77)	(0.65)	(0.67)
Pb. Bureau	-0.527	-0.431	-0.653	-0.474
	(-1.24)	(-0.96)	(-1.49)	(-1.11)
Priv. Bureau	0.079	0.212	0.001	0.143
	(0.20)	(0.51)	(0.00)	(0.36)
Info	-0.181	-0.350	0.038	-0.236
	(-0.21)	(-0.42)	(0.05)	(-0.28)
Entry	0.148	0.205	0.085	0.174
	(0.66)	(0.90)	(0.39)	(0.76)
Restrictions	-0.267*	-0.278*	-0.238*	-0.273*
	(-1.75)	(-1.68)	(-1.69)	(-1.72)
MKT Cap./GDP	0.002***	0.002**	0.002***	0.002**
	(3.59)	(2.53)	(2.61)	(2.55)
Ln(Gdp per capita)	0.909***	0.901***	0.931***	0.909***
	(8.35)	(8.02)	(8.80)	(8.05)
Bank concentration	0.566**	0.419**	0.359	0.547*
	(2.14)	(2.10)	(1.42)	(1.90)
effbank	-0.248	-0.418	-0.146	-0.338
	(-0.75)	(-1.28)	(-0.45)	(-1.10)
Loan	-0.012	0.028	0.032	0.007
	(-0.04)	(0.10)	(0.13)	(0.03)
Government Effectiveness	-0.125			
	(-0.92)			
Control of Corruption		0.095		
		(0.92)		
Rule of law			-0.342**	
			(-2.03)	
Regulatory Quality				-0.002
				(-0.01)
Observations	5407	5407	5407	5407
R-squared	0.09	0.08	0.09	0.08
Countries	34	34	34	34

Table 10. Instrumental variables estimation : (ΔCoVaR) and creditor rights

The dependent variable is DeltaCovaR. The results are based on instrumental variables estimations. Instrumental variables include ethnic fractionalization, latitude, religions, and legal origins.T-stats are presented in parenthesis *, **, *** Represent statistical significance at the 10%, 5%, and 1% levels, repectivley.

	(1)		(2)	
(ΔCoVaR) dependent variable	**Total Sample**		**Total Sample**	
Creditor rights	-0.010***	(-2.96)	-0.009***	(-2.74)
Size	-0.013***	(-15.47)	-0.012***	(-14.38)
Pb. Bureau	0.027**	(2.27)	0.023*	(1.91)
Priv. Bureau	-0.001	(-0.09)	-0.004	(-0.47)
Ln(number of days)	-0.014***	(-3.08)	-0.012***	(-2.68)
Entry	0.011**	(2.57)	0.012***	(2.84)
Restrictions	0.005**	(1.97)	0.005*	(1.95)
Supervisory power	-0.003***	(-2.70)	-0.002	(-1.29)
MKT Cap./GDP	0.000	(0.42)	-0.000***	(-3.65)
Bank concentration	-0.020*	(-1.88)	-0.019*	(-1.81)
Ln(Gdp per capita)	-0.017***	(-5.04)	-0.014***	(-4.06)
Inflation	-0.004***	(-6.98)	-0.004***	(-6.81)
effbank	0.025***	(3.94)	0.026***	(4.17)
Loan	-0.013**	(-2.50)	-0.013**	(-2.50)
Crisis dummy			-0.027***	(-14.68)
Observations	5377		5377	
R-squared	0.17		0.19	
Financial crisis dummy	NO		YES	
Banks	725		725	

Table 11. Financial crisis impact on bank systemic risk

The dependent variable is the DeltaCoVaR , it measures the level of systemic risk with higher values implies more stability. We divided the sample into two subgroups , the first two columns we exclude the financial crisis periods and the third and forth coloumn we exclude the non financial crisis periods. The estimation is based on OLS regressions. P-values are computed by the heteroskedasticity-robust standard errors clustered for countries and t-stats presented in parentheses *, **, *** Represent statistical significance at the 10%, 5%, and 1% levels respectively.

	(1)	(2)	(3)	(4)
(ΔCoVaR) dependent variable	**Non financial crisis**	**Non financial crisis**	**Financial crisis**	**Financial crisis**
Creditor rights	-0.006***	-0.006***	-0.009***	-0.009***
	(-2.85)	(-2.64)	(-3.38)	(-3.37)
Size	-0.011***	-0.013***	-0.014***	-0.014***
	(-11.06)	(-12.49)	(-11.19)	(-11.19)
Pb. Bureau	0.006	0.009	0.026***	0.024**
	(0.98)	(1.36)	(2.60)	(2.35)
Priv. Bureau	-0.010*	-0.009	-0.008	-0.008
	(-1.79)	(-1.58)	(-0.97)	(-0.99)
Info	0.011	0.010	0.004	0.006
	(0.90)	(0.83)	(0.28)	(0.41)
Ln(number of days)	-0.011***	-0.012***	-0.018***	-0.018***
	(-5.20)	(-5.79)	(-6.35)	(-6.14)
Observations	5960	5960	1925	1925
R-squared	0.13	0.12	0.19	0.15
Banks	1122	1122	1025	1025
Countries	59	59	59	59
Year dummies	YES	NO	YES	NO

Appendix. Table of statistics including 59 countries around the world

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Country	(ΔCoVaR)	Creditor rights	Size	Pb. Bureau	Priv. Bureau	info	Ln(number of days)
Argentina	-0.07	1	8.6	1	1	1	6.25
Australia	-0.08	3	11.0	1	0	1	5.06
Austria	-0.11	3	10.2	1	1	1	5.92
Bangladesh	-0.04	2	6.8	0	1	1	5.90
Belgium	-0.11	2	12.7	0	1	1	4.72
Botswana	-0.04	3	6.9	1	0	1	5.04
Brazil	-0.06	1	9.3	1	1	1	6.34
Bulgaria	-0.17	2	7.3	0	1	1	6.09
Chile	-0.10	2	9.8	1	1	1	5.72
China	-0.06	2	12.3	0	1	1	5.48
Colombia	-0.08	0	9.3	1	0	1	5.89
Croatia	-0.15	3	6.7	0	0	0	6.03
Denmark	-0.05	3	7.2	1	0	1	4.42
Egypt, Arab Rep.	-0.09	2	7.7	0	1	1	6.02
Finland	-0.05	1	8.9	1	0	1	5.48
France	-0.05	0	10.4	0	1	1	4.32
Germany	-0.08	3	10.5	1	1	1	5.21
Ghana	-0.06	1	6.4	1	0	1	5.30
Greece	-0.04	1	10.4	1	0	1	5.02
Hong Kong, China	-0.09	4	10.0	1	0	1	5.35
India	-0.05	2	9.0	0	0	0	6.05
Indonesia	-0.03	2	7.9	0	1	1	6.35
Ireland	-0.03	1	12.5	1	0	1	5.38
Israel	-0.07	3	10.0	1	0	1	6.37
Italy	-0.06	2	10.0	1	1	1	7.24
Japan	-0.03	2	10.2	1	0	1	4.09
Jordan	-0.05	1	7.6	0	1	1	5.83
Kazakhstan	-0.10	2	8.8	0	0	0	5.99
Kenya	-0.11	4	6.9	1	0	1	5.89
Korea, Rep.	-0.07	3	9.7	1	0	1	4.32
Kuwait	-0.07	3	8.7	1	0	1	5.97
Lebanon	-0.04	4	9.4	0	1	1	6.58
Malaysia	-0.05	3	10.0	1	1	1	5.70
Mexico	-0.11	0	9.4	1	0	1	6.04
Morocco	-0.05	1	8.6	0	1	1	5.48
Nigeria	-0.12	4	8.1	0	1	1	6.59
Norway	-0.04	2	8.3	1	0	1	4.47
Oman	-0.07	0	7.3	0	0	0	6.12
Pakistan	-0.08	1	7.1	1	1	1	5.98
Peru	-0.07	0	8.9	1	1	1	6.09
Philippines	-0.04	1	7.7	1	0	1	5.94
Poland	-0.06	1	9.2	1	0	1	6.91
Russian Federation	-0.10	2	9.0	0	0	0	5.80
Saudi Arabia	-0.11	3	9.8	0	1	1	5.89
Singapore	-0.03	3	9.0	1	0	1	4.23
South Africa	-0.05	3	9.2	1	0	1	5.62
Spain	-0.12	2	12.3	1	1	1	5.13
Sri Lanka	-0.07	2	6.2	1	0	1	6.09
Sweden	-0.12	1	12.6	1	0	1	5.34
Switzerland	-0.03	1	9.5	1	0	1	5.14
Taiwan, China	-0.06	2	9.8	1	1	1	5.35
Thailand	-0.04	2	9.1	1	0	1	5.97
Tunisia	-0.02	0	6.9	0	1	1	3.30
Turkey	-0.03	2	9.0	1	1	1	5.80
Ukraine	-0.24	2	8.2	0	0	0	5.59
United Arab Emirates	-0.10	2	8.8	0	1	1	6.42
United Kingdom	-0.06	4	10.9	1	0	1	5.66
United States	-0.02	1	7.7	1	0	1	5.52
Venezuela, RB	-0.05	3	9.4	0	1	1	6.10
Vietnam	-0.12	1	9.0	0	1	1	6.00
Zimbabwe	0.00	4	4.2	0	0	0	5.86

Figure 1:ΔCoVaR from 2003 till 2011 by creditor rights index (LLSV, 1998)

The graph shows the relation between the average-level ΔCoVaR during the sample period 2003 till 2011 and the aggregate creditor rights index.

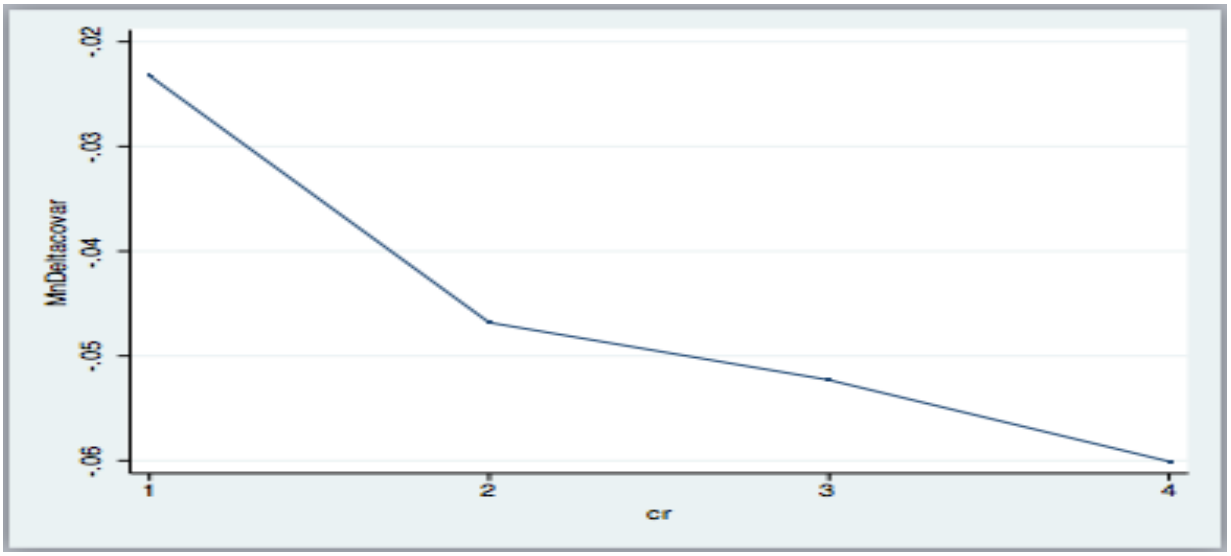

Figure 2: ΔCoVaR from 2003 till 2011 for all the countries in the sample

The graph shows the average-level ΔCoVaR during the sample period 2003 till 2011