
**Is there evidence of a trade-off between financial stability and efficiency of
financial intermediation?**

Preliminary insights from the global financial crisis of 2007-2009

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Abstract

In response to the global financial crisis of 2007-2009, the focus on financial stability concerns has understandably been dominant in the discussion of international financial reform, posing a challenge to domestic policymakers facing the trade-off between financial stability and allocative efficiency of financial intermediation. In this paper, I conduct a cross-country analysis to investigate whether the efficiency level of a financial system can be deemed as one of the explaining factors of the financial crisis. After deriving summary measures of efficiency and propensity to financial distress in the banking system, I find significant statistical association between the two mentioned metrics and the crisis of 2007-2009, although the measure of propensity to financial distress is found to be a better predictor of the crisis than the efficiency one. I also find evidence in favor of the hypothesis that there is a trade-off between financial stability and efficiency of financial intermediation, and, more specifically, that larger buffer stocks of capital may actually curtail intermediation activity. Moreover, there is a clear indication that high- and non-high-income countries are on the opposite ends of the stability vs. efficiency spectrum. Non-high-income countries, with less efficient, less globally integrated, and more capitalized financial systems, appeared to be more protected against the global crisis. This suggests that, although the current focus on improved prudential regulation must be maintained, there is not much room for one-size-fits-all regulatory reform proposals, even if these proposals come on behalf of the necessary global governance. Instead, domestic regulators in non-high-income countries must also consider other context-specific structural and institutional reforms, in order to improve the efficiency level of their financial systems.

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1. Introduction

One of the consequences of the 2007-2009 global financial crisis was that the Group of Twenty (G20), which initially acted as a crisis management steering group, became the premier forum for global economic governance (Cooper 2010). The G20 assumed the G7's role of setting the agenda for international financial reform, and focused on issues related to financial stability.

Instead of altering the previous policy orientation, the G20 mostly subscribed to and reinforced the prudential agenda adopted by the G7 since its 1995 Halifax Summit. Precepts like *“deepening of cooperation among regulators and supervisory agencies”* and *“closer international cooperation in the regulation and supervision of international institutions and markets to safeguard the financial system and prevent an erosion of prudential standards”* were present in the G7 Halifax Communiqué, but could have also been found in the G20 Washington, Pittsburg or London Communiqué. However, despite the continuity of policy orientation, the advent of G20 meant that “global leaders now cover a more diverse group of countries, economies, financial systems and cultures, encompassing a broader set of perspectives and starting points, than before. The G7 was narrowly homogeneous; the G20 is widely heterogeneous” (Persaud 2010).

This unequal configuration of global financial governance is quite a relevant issue. Indeed, Norton (2007) suggests that, before the emergence of the G20, the formulation of international financial standards was driven by highly industrialized countries, whose main concerns – financial crisis avoidance and resolution, financial stability, financial services liberalization, and regional and global cooperation – were tenuously interconnected with substantive development goals. Moreover, he implied that no policy consideration had been

“given to which standards, and in which form, would be best for emerging economies, just as no real concern was expressed for the financial systems of lesser-developed economies”. Hence, there is a potential clash between the international financial reform agenda, mostly focused on financial stability concerns, and national priorities in developing countries, which poses a twofold challenge¹ for domestic regulators: 1) to strike a balance between stability and efficiency oriented financial reforms, which includes not only banking regulation but also institutional reforms, and 2) to strike a balance between nationally appropriate and internationally consistent financial regulations, taking into consideration the public interest’s welfare-maximizing perspective, and the pressures from national and international interest groups.

This paper examines the trade-off between the stability of the financial system and the aggregate efficiency of financial intermediation within the context of domestic regulations. More specifically, this study investigates whether there is a statistical association between the efficiency levels of different national financial systems, the conventional measures of propensity to financial distress in banking systems, and the 2007-2009 global financial crisis. Thus, the central guiding questions are: First, were countries with more efficient financial systems more susceptible to a banking crisis in 2007-2009, while less efficient financial systems were more resilient? If so, did more efficient financial systems also exhibit signs of greater propensity to financial distress in their banking systems before the outbreak of the global crisis? In other words, is there evidence that the trade-off between stability and efficiency was an underlying factor in the recent crisis? Finally, what policy implications may be drawn from this analysis?

The purpose of this research is not to design a statistical warning system to predict future crises, but rather to explain what factors contributed to the financial crisis of 2007-2009, using a

¹ These challenges were originally highlighted by Viñals, J. (2010). Five challenges for regulatory reform. Effective Financial Market Regulation after Pittsburgh - Achievements and Challenges, Berlin, Germany, Federal Ministry of Finance. Other dimensions in which the regulatory agenda must strike the right balance were also outlined.

principal component logistic regression model in a cross-sectional analysis between 53 countries of different income groups and financial development levels. In doing so, I address the implications for domestic regulatory reforms, given the trade-offs faced by policymakers and the pressures for international regulatory convergence under the auspices of the new global governance architecture.

The remainder of the paper is organized as follows: Section 2 provides a brief literature review of the main concepts related to the “stability vs. efficiency” trade-off. Sections 3 and 4 outline the research methodology and the empirical design, respectively. Section 5 exposes the results and preliminary findings of the multivariate analysis, while Section 6 presents the results of the complementary analysis and policy implications. Lastly, Section 7 provides a summary of key findings and conclusions.

2. Literature Review

The trade-off between stability and efficiency of financial intermediation particularly interests financial regulators around the globe. For this reason, a recent report from the Central Bank Governance Group (2009) states that financial stability is not an absolute objective *per se*, and that policymakers must consider its trade-off with allocative and dynamic efficiency of financial intermediation. According to the report, banking systems in the mid-20th century were regarded as robust, but in most cases robustness came at the expense of efficiency and dynamism.

Similarly, Fell and Schinasi (2005) argue that a set of rules and regulations that strictly restrict financial activity can actually prevent systemic problems and achieve ‘stability’. Yet, it would do so at the expense of economic and financial efficiency. In other words, due to this *ex ante* trade-off, the best way to ensure financial stability is thwarting financial activity.

It is worth mentioning that this paper is concerned with the concept of allocative, and not necessarily productive efficiency. In this regard, Caruana (2003) notes that the financial sector efficiency can be analyzed from a dual perspective: 1) that of the system as a whole, a macro (or allocative) perspective, and 2) that of individual institutions, a micro perspective. For the former, an efficient financial system enables funds to be channeled from lenders who have excess savings, to borrowers who lack them. Hence, an efficient financial system exhibits a greater volume of funds directed toward productive investment, which boosts economic growth and leads to higher standards of living.

However, this approach that connects financial intermediation to growth is not new. Levine (2004) cites Bagehot (1873), Schumpeter (1912), Gurley and Shaw (1955), Goldsmith (1969), and McKinnon (1973), among those who argue that the finance-growth nexus cannot be neglected without substantially limiting our understanding of economic growth. Similarly, Turner et al. (2010) recall Walter Bagehot's "*Lombard Street*" (1873) and Sir John Hicks' "*Theory of Economic History*" (1969), to support the idea that the mobilization of savings in the British banking system placed Britain in an advantageous position relative to France and Germany during the Industrial Revolution. The UK's more advanced banking system fostered the productive investment of savings, rather than leaving them "dormant". In sum, as claimed by Knoop (2008), the more quickly and cheaply financial systems transfer money between borrowers and lenders, turning savings into consumption and investment, the higher and more stable consumption, investment, production, and aggregate output there is. Furthermore, extensive empirical research on the growth benefits of financial development² shows that higher

² For a summary of the most relevant empirical studies on this issue, see Levine, R. (2004). "Finance and Growth: Theory and Evidence." National Bureau of Economic Research Working Paper Series No. 10766(published as Levine, Ross, 2005. "Finance and Growth: Theory and Evidence," Handbook of Economic Growth, in: Philippe

levels of financial development stimulate long-run growth, due to scaling effects (increasing the number of financial transactions and the level of aggregate savings), and rising efficiency levels (improving the quality of financial decisions, improving the efficiency of resource allocation, and reducing the costs of financial intermediation).

In this context, Barth, Caprio et al. (2006) remark that, via regulation, governments must guarantee that the banking system carry out a socially efficient allocation of resources, and that it successfully perform other financial functions³. A socially efficient allocation does not imply Pareto Optimality. Instead, it implies the maximization of output with minor variance, which is distributionally preferred. As a result, the public interest view involves regulatory practices that expand output and opportunities for the many, while minimizing unnecessary risks. Since banking crises reduce growth and worsen the income distribution, they become socially expensive. Hence, in order to allocate resources in a socially efficient manner, crisis prevention must be considered a public policy target. This target has been present in a number of attempts to define financial stability. Mishkin (1991), for instance, described a financial crisis as a disruption of financial markets, in which funds are not efficiently channeled to those with the most productive investment opportunities, leading to a contraction in economic activity. In Padoa-Schioppa's (2002) words, "financial stability is a condition where the financial system is able to withstand shocks without giving way to cumulative processes, which impair the allocation of savings to investment opportunities and the processing of payments in the economy". Therefore, financial stability must be regarded as a means to an end, and not as an end in itself. It must

Aghion & Steven Durlauf (ed.), Handbook of Economic Growth, edition 1, volume 1, chapter 12, pages 865-934 Elsevier.).

³ Namely facilitating payments, mobilizing savings, allocating capital, monitoring managers, and providing tools for the management and trading of a variety of risks.

prevent a temporary and perhaps severe loss of financial efficiency, which can be detrimental for the economy as a whole.

This line of argument has been adopted in the working definition of financial stability stated in many in Financial Stability Reports issued by central banks around the world. By way of illustration, the European Central Bank (ECB 2010) has defined financial stability as “a condition in which the financial system is capable of withstanding shocks and the unraveling of financial imbalances”, thereby mitigating “the likelihood of disruptions in the financial intermediation process that are severe enough to significantly impair the allocation of savings to profitable investment opportunities.” Other examples are the Austrian National Bank, the Norges Bank (Central Bank of Norway), the Reserve Bank of Australia, and the Central Bank of Argentina, to name but a few.

However, Allen and Wood (2006) propose an alternative to Mishkin’s definition of financial stability. Although they agree on the importance of an efficient allocation of savings to investment, Allen and Wood exclude it from their definition of financial stability. They point out that, even if Mishkin were right in stating that financial stability requires the efficient allocation of savings to investment opportunities, his definition would be defective because it is not expressed in terms of observables. Despite their disagreements, both authors recognize that a good definition of financial stability should clearly be related to welfare, because financial stability is a worthy public policy objective precisely due to its direct impact on welfare. Furthermore, they also reinforced the fact that other policy objectives against which financial stability can be traded off have not been quantified yet. Decisions on trade-offs are made implicitly, after individual measures are discussed and agreed on as part of the political process, and not explicitly through cost–benefit analyses.

The trade-off between financial stability and efficiency of financial intermediation goes in both directions. First, as Turner et al. (2010) alert, some recent proposals to reform the financial sector can limit growth. For this reason, it is important to account for the potential growth-retarding effects when proposing reforms to the financial sector. Their main concern is that the current obsession with “bashing the bankers” neglects the theoretical and empirical evidence of the financial sector’s contribution to economic growth. Conversely, as Knoop (2008) remarks, the macroeconomic benefits of financial development, which include increasing standards of living and rising growth, have been less controversial than its potential costs: namely, increased macroeconomic volatility, particularly in the absence of careful regulation and sound infrastructure. In the same vein, Fell and Schinasi (2005) allude to the fact that greater efficiency might be accompanied by higher levels of asset market volatility and of propensity to financial stress.

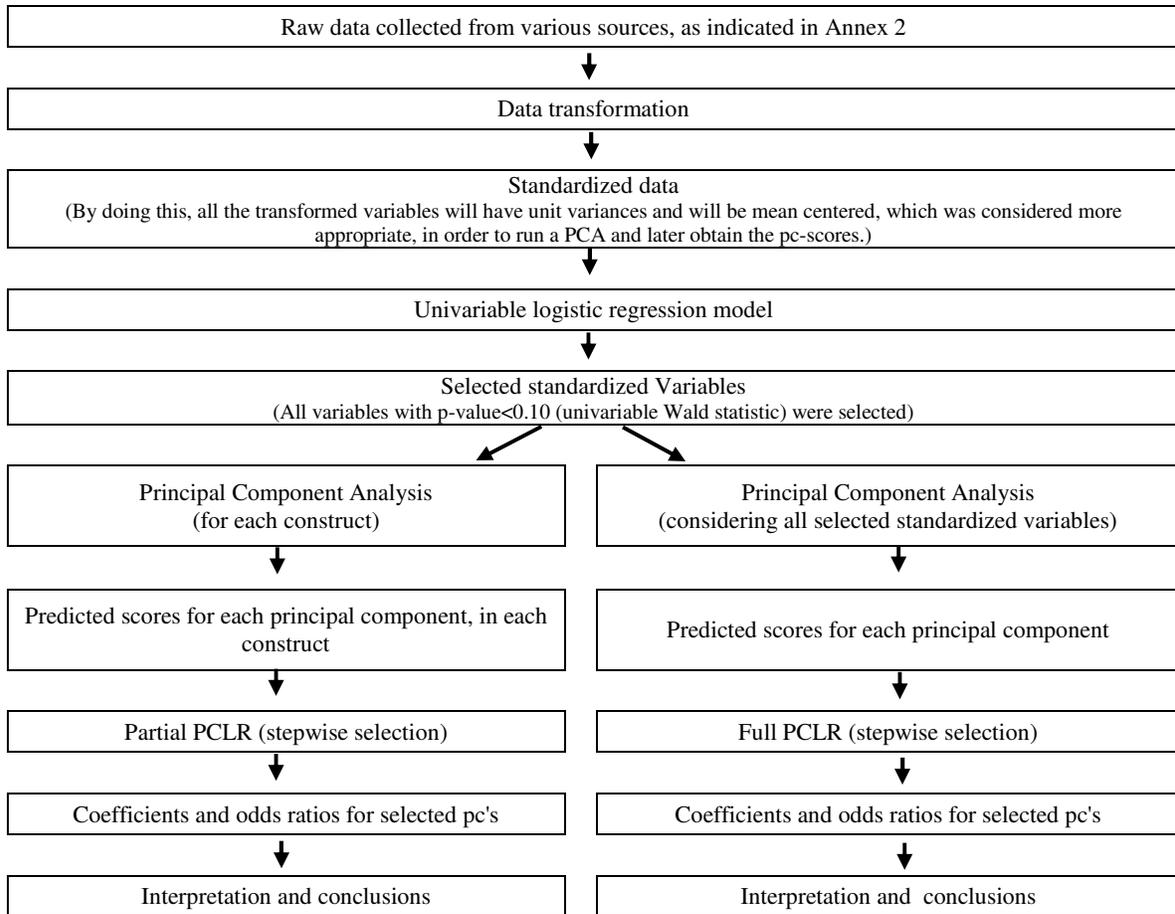
Finally, Griffith-Jones (2003) approach this regulatory conundrum by stating that “while international financial efficiency cannot be achieved without market stability, stability without efficiency is pointless. The provision of both is a global public good”. Griffith-Jones also points out that this is an important issue for poor people in developing countries, who often shoulder significant costs during financial instability, but are also hurt by inefficient capital markets—perhaps more silently but no less severely than by “loud” financial crises.

3. Research Methodology

In order to quantitatively measure the stability vs. efficiency trade-off, I applied a Principal Component Logistic Regression (PCLR) model, as proposed by Aguilera, Escabias & Valderrama (2006). In PCLR, original predictor variables are first submitted to a Principal Component Analysis (PCA), a multivariate technique that explains a set of correlated variables

with a reduced number of uncorrelated ones with maximum variance, called principal components (pc's). Then, a reduced set of pc's, or more specifically the corresponding pc-scores, is selected with a stepwise method, and used as covariates of the logistic regression model. This procedure is graphically summarized in Figure 1.

Figure 1: Summary of methodological procedures



It is worth mentioning that I decided to use correlation matrices instead of covariance matrices in PCA, which implies that variables were standardized to be mean centered and to have unit variances (Jackson 1991). In addition, the variables considered in PCA were derived from the results of a preliminary univariate analysis (univariable logistic regression model) of each theoretically relevant variable, to assess the association between response and predictor variables.

Furthermore, since PCA is also a useful statistical technique for feature extraction (Li and Sun 2011), I applied the PCLR model in two stages. First, I considered each concept separately, fitting a preliminary PCLR model for the construct “Efficiency” and another for the construct “Propensity to financial distress”. Second, to check for robustness, I fit a full PCLR model using the pc-scores from a PCA that comprised the entire set of variables from both constructs.

Two conceptual and methodological aspects deserve further consideration.

Firstly, I refer to each concept as a “construct”, which formally means an “idea formed by combining several pieces of information or knowledge”. This choice of terminology alludes to the fact that some ideas cannot be entirely captured by a single measure, but instead must be approached with an array of defining proxy variables. However, there is a methodological constraint related to the number of events per covariate (or events per parameter) in this model. Simulation studies indicate that the ratio of outcome events (frequency of the least frequent outcome) to independent variables should be 10:1 or higher, and that the fewer events per independent variable, the more unreliable the regression coefficients are. (Hosmer and Lemeshow 2000; Ottenbacher, Ottenbacher et al. 2004). Given this constraint, and considering that the least frequent outcome in this study (crisis events) has around 20 observations, the application of a PCA model is useful for scaling a number of variables down to a lower number of new derived ones that adequately summarize the original information. In other words, it reduces the dimension of the subsequent logistic regression model by substituting the observed variables for a sequence of uncorrelated linear composites (pc-scores), which are weighted linear combinations of the observed variables.

Secondly, exploratory data analysis shows that there may be non-negligible collinearities among the independent variables used as proxies for the two concepts. This is a relevant

methodological drawback for a maximum-likelihood estimated logistic model, which is not accurate in the presence of multicollinearity (Hosmer and Lemeshow 2000; Aguilera, Escabias et al. 2008). In fact, this is one of the main reasons I chose PCLR as my basic research methodology, since it is specifically designed to deal with multicollinearity in logistic regression models, by using a set of uncorrelated pc-scores as covariates.

4. Empirical design

4.1 Dependent Variable and Sample

The dependent variable was the same in all cross-country principal component logistic regressions: a binary banking crisis dummy variable that took the value “1” if the country experienced a banking crisis from 2007 to 2009, and “0” otherwise.

Information about specific events of banking crisis was extracted from the most recent update of the on systemic banking crises database issued by Laeven and Valencia (2010), which includes the aftermath of the 2007 U.S. mortgage crisis. According to these authors, a systemic banking crisis occurs when two conditions are jointly met: 1) there are signs of significant financial distress in the banking system, and 2) there are banking policy intervention measures in response to the losses in the banking system⁴. After identifying 13 countries that met these criteria, Laeven and Valencia (2010) include 10 “borderline cases”, and a shorter list of countries that were more seriously affected by the financial turmoil, but did not intervene at a large enough scale to be deemed a systemic crisis. Furthermore, they mention a third subset of countries that

⁴ In addition, Laeven and Valencia (2010) “consider policy interventions in the banking sector to be significant if at least three out of the following six measures have been used: 1) extensive liquidity support (5 percent of deposits and liabilities to nonresidents); 2) bank restructuring costs (at least 3 percent of GDP); 3) significant bank nationalizations 4) significant guarantees put in place 5) significant asset purchases (at least 5 percent of GDP), and 6) deposit freezes and bank holidays.”

did not meet the definition of crisis, but actually announced pre-emptive interventions to support the financial sector. In order to determine the binary banking crisis dummy variable used in this study, both systemic and borderline cases were considered as crisis events, while the other mentioned countries were considered as non-crisis events.

Because of data availability issues, I excluded one (Mongolia) of the 23 crisis event cases, and selected 31 non-crisis event cases. It is worth mentioning that Laeven and Valencia (2010) clearly indicate that the recent crisis mostly impacted advanced economies, in particular those with large and integrated financial systems. Hence, the sample group of countries was selected according to the following criteria:

1. All countries classified as “Advanced Economies” in the Global Financial Stability Report (IMF, October 2010), except for Malta, due to data availability issues,
2. All countries members of the G20, and selected European countries that, via European Union, may also be considered, albeit indirectly, members of the G20; and
3. Other selected countries from the same region and/or income group as the countries selected according to the previous criteria.

The final list of countries analyzed in this study is presented in Annex 1.

Finally, with regard to the starting year of each crisis event, only the United States and the United Kingdom met the criteria of systemic crisis in 2007, while all other cases, systemic or borderline, met them in 2008. Nonetheless, I considered 2007 as the formal starting year of the global crisis and, therefore, the measure for all independent variables was derived as an average of their observed values in the period between 2004 and 2006.

4.2 Independent variables

The independent variables are meant to be proxies for each construct under examination. When applicable, they refer to a broader concept of financial system, comprising the deposit taker banking system and other non-deposit takers financial intermediaries. As mentioned before, all variables were standardized in a preliminary procedure, and refer to the average of the observed values in the period of 2004-2006. The remainder of this Section briefly reviews the main proxies for the examined constructs.

4.2.1 Efficiency of financial intermediation

All variables used as proxies for the construct “Efficiency” were selected from the Financial Development and Structure Database (Beck, Demirgüç-Kunt et al. 2010), revised in November, 2010. I included indicators of financial depth and intermediation efficiency. To measure financial depth, I used the indicator related to **Private Credit by Deposit Money Banks and Other Financial Institutions to GDP**. According to Beck, Demirgüç-Kunt et al. (2010), this indicator is based on raw data from the International Financial Statistics (IFS) of the International Monetary Fund (IMF), and captures one of the most important functions of financial intermediaries – credit allocation. It represents, therefore, a very specific dimension of this construct, because it is associated with the actual volume of credit delivered to non-financial entities by financial intermediaries.

Among the indicators most directly related to a stricter concept of intermediation efficiency, I used the following: 1) **Net interest margin**, which is the accounting value of a bank’s net interest revenue as a share of its total earning assets, and not the spread between lending and deposit rates (difference between ex-ante contracted loan and deposit interest rates); 2) **Overhead costs**, which is also an accounting value of a bank’s overhead costs as share of its

total assets; 3) **Cost-income ratio**, which measures the overhead costs relative to gross revenues with higher ratios, thus indicating lower levels of cost efficiency; and 4) **Bank Credit to Bank Deposits**, a proxy for the extent to which banks intermediate society's savings into private sector credits. Regarding the latter variable, some authors question the actual validity of this indicator as a good proxy for efficiency. Caprio, D'Apice et al. (2010), among others, point out that while a high loan-deposit ratio indicates high intermediation efficiency, a ratio significantly above one also suggests that private sector lending is funded with non-deposit sources, which could result in funding instability. Nonetheless, despite this alleged drawback, the aforementioned indicator is probably the best aggregate rate of intermediation available. Therefore, I decided to retain it amongst the group of independent variables.

It is also worth pointing out a disclaimer made by Beck, Demirgüç-Kunt et al. (2010) with respect to the fact that indicators based on accounting values were constructed from raw bank-level data, extracted from the BankScope database. This database covers less than 100% of most countries' banking sectors, which, according to the authors, this poses relatively few problems in the case of efficiency measures.

Finally, although the variables of financial depth and intermediation efficiency were gathered in the same construct, there is a significant association between them. More specifically, Beck (2007) shows that "countries with lower net interest margins, thus less inefficiency and less deadweight loss for savers and borrowers, experience higher levels of financial intermediary development, and higher levels of savings intermediated to the country's private sector". He clarifies, however, that this "negative association between the efficiency and the depth of financial intermediation is a correlation rather than a causal relationship".

In my sample, the pairwise correlation between the standardized variables of financial depth and net interest margin was equal to -0,5595, confirming Beck's statement (2007). Nonetheless, I emphasize that the use of both variables is relevant to characterize this construct, which aims to capture the financial system's ability to channel funds towards productive investment and therefore help to boost economic growth. The collinearity between these two variables, and between all other pairs of variables in this construct (see Annex 3b), are statistically treated by means of Principal Component Analysis methodology, which is indeed more effective as a variable reduction procedure when there are linear relationships between variables.

4.2.2 Propensity to financial distress in the banking system

Galati and Moessner (2011) point out that there is no commonly shared definition of financial stability, and that the various approaches can be broadly assigned to two groups. The first defines financial stability in terms of robustness of the financial system to external shocks, and the second emphasizes the endogenous nature of financial distress, describing financial stability based on the financial system's resilience to shocks originating from within or on the vulnerability to financial distress in response to normal-size shocks as opposed to large shocks. Using a different terminology, Borio and Drehmann (2009) analytically distinguish between financial instability and financial distress (or a financial crisis), defining the latter as an event in which substantial losses at financial institutions threaten to cause serious dislocations on the real economy. On the other hand, financial stability was described as the converse of financial instability, coming to be a situation in which normal-sized shocks to the financial system are sufficient to produce financial distress, i.e. in which the financial system is fragile. Thus, in both

definitions the concept of financial distress is present, being a consequence of external shocks that hit a fragile financial system or the result of inherent frailty of specific financial institutions.

The construct “Propensity to Financial Distress” aims to capture the twofold dimension of a banking system: 1) its overall exposure to risks, which is a proxy for exposure to shocks; and 2) its capacity to remain solvent in the event that these risks materialize into actual losses or, in other words, its resiliency/robustness level.

Proxies for overall exposure to risks included both domestic and international events, in order to address two possible factors in the global financial crisis as outlined in recent literature.

Firstly, the level of international financial integration of domestic financial systems was deemed to have played a very specific role in this crisis. For instance, the Turner Review (Turner 2009) reported that the UK experienced a significant increase in overseas bank financing of its current account deficit, while The Financial Crisis Inquiry Report (United States. Financial Crisis Inquiry Commission 2011) pointed out the role of foreign investors in financing the housing bubble, and also emphasized the so-called “global savings glut” as an important contributing factor for the crisis.

This study does not focus on foreign capital flows, but on the international exposure of the financial system. The chosen proxy, labeled Aggregate Foreign Financial Exposure, is equal to the sum of foreign assets and foreign liabilities of banks and other financial intermediaries, given that both positions can be independent channels for international crisis spillover. In addition to market risks, foreign assets and foreign liabilities may represent events of distress associated with international credit risk and liquidity risk⁵, respectively, not to mention their role in allegedly fuelling housing bubbles.

⁵ In this regard, Rodrik mentions that “external finance is a fair-weather friend: there when it is least needed, and absent when it could do some good”. Quoting a running joke of the 1930s, he also states that “foreign finance is like

Secondly, I used a conventional proxy for increments in risks associated with credit growth, whether or not it was financed by international funding. As an illustration of the vast literature on the implications of credit growth for financial stability, Turner (2009) argues that rapid credit growth in the recent UK crisis was “accompanied by a degradation of credit standards, and fuelling property price booms which for a time made those lower credit standards appear costless”. I also tested other traditional measures of asset quality, namely the measures of “Nonperforming Loans to Total Loans” and “Provisions to Nonperforming Loans” for the banking sector.

I used two measures of capital-to-assets ratio as proxies for the banking system’s capacity to remain solvent: 1) the Bank Regulatory Capital to Risk-Weighted Assets, or the Capital Adequacy Ratio (CAR), which is compiled according to guidelines devised by the Basel Committee on Banking Supervision (BCBS), in either Basel I or Basel II, and 2) a measure of the banking system’s total leverage calculated as the ratio of bank capital and reserves to non-risk-weighted total assets. As Beltratti and Stulz (2009), I expect more capital to yield less financial distress, given that capital provides a ‘cushion’ to absorb adverse shocks.

Lastly, I used a traditional indicator of banking stability, the so-called “z-score”, which is the ratio of return on assets plus the capital-asset-ratio to the standard deviation of return on assets. According to Beck, Demirgüç-Kunt et al. (2010), “if profits are assumed to follow a normal distribution, it can be shown that the z-score is the inverse of the probability of insolvency”, because “z indicates the number of standard deviations that a bank’s return on assets has to drop below its expected value before equity is depleted and the bank is insolvent”.

an umbrella which a man is allowed to borrow, but must return as soon it starts to rain”. (Rodrik, D. (2011). The globalization paradox : democracy and the future of the world economy. New York, W. W. Norton & Co.)

Annex 2 lists the chosen independent variables and their sources, while Annexes 3a and 3b display their summary statistics and their pairwise correlations, respectively.

5. Results and Preliminary Findings

5.1 Preprocessing procedures and Principal Component Analysis

As previously mentioned, all standardized variables went through a univariable logistic regression model, in which the dependent variable was the binary banking crisis dummy variable (equal to “1” if a country qualified as crisis, and 0 otherwise). Annex 4 reports the results of these analyses. Then, variables whose univariable Wald test had a p-value < 0.10 were selected for the Principal Component Analysis of each construct, and for the full set of variables in a subsequent robustness check.

5.2 Efficiency

From the preprocessing procedures, 3 out of 5 variables exhibited statistically significant coefficients: Private Credit By Deposit Money Banks and Other Financial Institutions / GDP (*zcred_bofi_aver*) and Bank Credit To Bank Deposits (*zcred_dep*), both with positive coefficients and a 1% statistical significance; and Net Interest Margin (*zint_margin*), with a negative coefficient and a statistical significance of 10%. Overhead Cost (*zoverhead*) and Cost-Income Ratio (*zcost_inc*) did not present statistically significant coefficients when regressed individually against the dependent variable.

These preliminary results are broadly consistent with the findings of Caprio, D'Apice et al. (2010), who estimated similar results using Probit models on the same crisis dummy variable analyzed in this paper, which is built upon Laeven and Valencia's classification (2010).

As stated before, all statistically significant variables were subjected to a Principal Component Analysis, whose results are shown in Table 1.

Table 1: Principal Component Analysis – Efficiency

Variable		Eigenvectors		
Label	Code	Component 1 (pc_ffic1)	Component 2 (pc_ffic2)	Component 3 (pc_ffic3)
Net Interest Margin	zint_margin	-0.5928	0.5139	0.6200
Private Credit By Deposit Money Banks and Other Financial Institutions / GDP	zcred_bofi_aver	0.6433	-0.1610	0.7485
Bank Credit To Bank Deposits	zcred_dep	0.4845	0.8426	-0.2351
Eigenvalues		1.80431	0.779531	0.416155
Proportion of variance		60.1%	26.0%	13.9%

Subsequently, principal component scores were generated, labeled as the new variables “pc_ffic1”, “pc_ffic2”, and “pc_ffic3”, and included as independent variables in a multivariate logistic model, using a stepwise method (backward elimination, with a 5% significance level for removal from the model) based on the conditional likelihood ratio test⁶.

The main parameters from estimated model are shown in Table 2.

Table 2: Principal Component Logistic Model – Efficiency

Dependent variable: “crisis_bin” (dummy)

Variable	Coefficients		Odds Ratio		Wald test (P> z)	Likelihood ratio test (Prob > chi2)	Pseudo R2
	Estimated	Std. Err.	Estimated	Std. Err.			
pc_ffic1	.9062454	.3099879	2.475012	.7672239	0.003	0.0005	0.1723
_cons	-.5310149	.3306179	-	-	0.108		
pc_ffic2	.6356357*	.4410483*	1.888222*	.8327972*	0.1385**	Removed from the full model	
pc_ffic3	-.0414121*	.5460564*	.9594336*	.5239049*	0.9395**		

* information estimated in the full model

** p-value considered for removing the variable from the model

⁶ In this regard, Aguilera, Escabias & Valderrama (2006) highlighted that pc’s with the largest variances are not necessarily the best predictors because minor pc’s with small variances could be highly correlated with the response variable so that they must be considered as explicative variables in the optimum model. This means that pc’s might be included in the model according to their predictive ability.

This model provides a good fit with a correct classification rate of 73% (cut-off = 0.5) and an area under ROC Curve (0.7619) that indicates an acceptable discrimination, according to thresholds suggested by Hosmer and Lemeshow (2000). Annex 5 shows the main measures of goodness-of-fit in comparative perspective.

In order to interpret these results, two sequential steps should be followed. First, a simple analysis of the odds ratio suggests that with a one-unit increase in *pc_effic1*, a country would have $e^{0.9062454} = 2.475$ chances of experiencing a banking crisis compared to not having a crisis. However, *pc_effic1* is a derived and not an observed variable, i.e., it is a linear combination (eigenvector of coefficients) of each observed variable in the PCA. Hence, it is necessary to interpret its corresponding eigenfunction in order to understand the weights of each original variable in the estimation of *pc_effic1*. As stated in Table 1, the eigenfunction is:

$$pc_effic1 = -0.5928\ zint_margin + 0.6433\ zcred_bofi_averg + 0.4845\ zcred_dep$$

Thus, the higher the financial depth (*zcred_bofi_averg*) and rate of intermediation (*zcred_dep*) combined with lower net interest margins (*zint_margin*), the higher the value of *pc_effic1*, which implies a more efficient financial intermediation system in a country. Hence, the more efficient the financial intermediation (higher value of *pc_effic1*), the higher the probability of crisis, as the odds ratio indicates.

This preliminary result suggests that more efficient financial systems were more susceptible to banking crises such as the one in 2007-2009, providing evidence in favor of the hypothesis that there is a trade-off between financial stability and aggregate efficiency in financial intermediation.

In addition, as illustrated in Figures 2 and 3, the data suggest a strong relation between the proxy of Efficiency (*pc_effic1*), the predicted probability of crisis and the country's income

level. This coincides with the findings of Laeven and Valencia (2010), who claim that the 2007-2009 crisis was concentrated in advanced economies, and with the literature that show relevant association between financial development and economic growth (Knoop 2008).

Figure 2: Box plot of pc_effic1 by income group

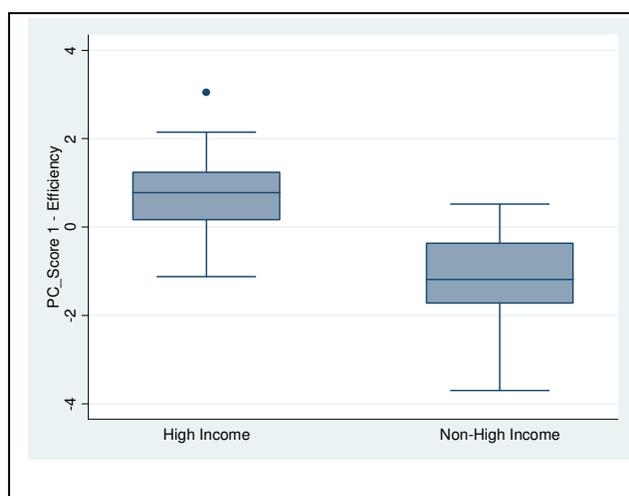
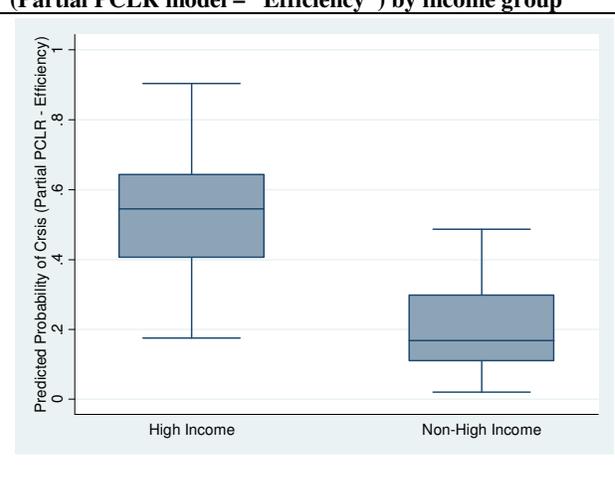


Figure 3: Box plot of Predicted Probability of Crisis (Partial PCLR model – “Efficiency”) by income group



5.3 Propensity to Financial Distress

The same procedures described in subsection 5.2 were applied to the independent variables of the construct “Propensity to Financial Distress”. Consequently, from the results showed in Annex 4, the following comments are pertinent.

First, the variable for aggregate foreign financial exposure has a positive and statistically significant coefficient at 1% level of significance, which corresponds to the causes of the 2007-2009 crisis analyzed in the relevant literature. Second, the regulatory capital adequacy ratio (*Bank Regulatory Capital to Risk-Weighted Assets*) has a negative estimated coefficient and is statistically significant at the 10% level. This outcome implies that more regulatory capital requirements in fact reduce propensity to financial distress, which is in line with Beltratti and Stulz’s conclusions (2009) that there is a significant positive relation between bank performance

and Tier 1 capital. Moreover, these results advocate in favor of setting minimum capital requirements in the banking industry, as a tool for prudential regulation. Lastly, as expected, the annual growth rate of private credit also has a positive and statistically significant coefficient at 1% level, confirming the large body of literature that links credit overexpansion and banking crises (Inci, Gudrun et al. 2005).

Usual indicators of credit asset quality (*Nonperforming Loans to Total Loans* and *Bank Provisions to Nonperforming Loans*) do not have statistically significant coefficients. More importantly, the leverage ratio (*Total Leverage Banks Bank*) and the “z-score” indicator were not statistically significant at any conventional level of significance, contrary to expectations. The former stands in opposition to the current financial reform trends, which support the adoption of a non-risk-based capital measure (leverage ratio) as an additional prudential tool to complement minimum capital adequacy requirements (D’Hulster 2009). The latter stands in agreement with Caprio, D’Apice et al.’s predictions (2010). It should be noted that the leverage ratio used in this analysis was calculated in accordance with the Compilation Guide of the Financial Soundness Indicators (FSI) collected by the IMF, which does not take into consideration the regulatory adjustments proposed by the Basel Committee (BCBS 2010). Moreover, the IMF disclaims that the FSI data is not strictly comparable across countries given the differences in national accounting, taxation, and supervisory regimes. Hence, due to potential flaws in proxy design and/or data collection, prudence is advisable in interpreting this outcome, especially in regard to policy implications.

It is worth mentioning that none of the non-selected variables have statistically significant coefficients, even when individually added to a multivariate base model, in which the three

selected variables are jointly considered as independent variables for the binary banking crisis dummy.

Based on these preprocessing procedures, selected variables were subjected to a Principal Component Analysis for the construct “Propensity to Financial Distress”. The results are shown in Table 3.

Table 3: Principal Component Analysis – Propensity to Financial Distress

Variable		Eigenvectors		
Label	Code	Component 1 (pc_pfd1)	Component 2 (pc_pfd2)	Component 3 (pc_pfd3)
Aggregate Foreign Financial Exposure	zaffe_a_bofi	0.5744	-0.5819	0.5757
Bank Regulatory Capital to Risk-Weighted Assets	zcar	0.3564	0.8109	0.4641
(Private Credit By Deposit Money Banks And Other Financial Institutions / GDP) - Annual Rate Of Growth	zcred_boi_grow	0.7369	0.0614	-0.6732
Eigenvalues		1.10383	1.02073	0.875441
Proportion of variance		36.8%	34.0%	29.2%

Then, I applied the aforementioned procedures. I generated principal component scores labeled as the new variables “pc_pfd1”, “pc_pfd2”, and “pc_pfd3”, which were included as independent variables in the multivariate logistic model, using a stepwise method (backward elimination, with a 5% significance level for removal from the model) based on the conditional likelihood ratio test. Results are shown in Table 4.

Table 4: Principal Component Logistic Model – Propensity to Financial Distress

Dependent variable: “crisis_bin” (dummy)

Variable	Coefficients		Odds Ratio		Wald test (P> z)	Likelihood ratio test (Prob > chi2)	Pseudo R2
	Estimated	Std. Err.	Estimated	Std. Err.			
pc_pfd1	1.88387	0.60619	6.57894	3.98808	0.002	0.0000	0.4236
pc_pfd2	-1.94253	0.63163	0.14334	0.09054	0.002		
Intercept	-0.27689	0.39094	-	-	0.479		
pc_pfd3	-1.16299*	0.66925*	0.31255*	0.20917*	0.0823**	<i>Removed from the full model</i>	

* information estimated in the full model

** p-value considered for removing the variable from the model

Measures of goodness-of-fit indicate that this model provides a better fit than the PCLR model estimated for the construct “Efficiency”, suggesting that the construct of “Propensity to Financial Distress” *per se* appears to be a better predictor for the crisis. Its correct classification rate is 82,69% (cut-off = 0.5), and the area under ROC Curve (0.9197) denotes a model with outstanding discrimination, consistent with the thresholds suggested in Hosmer and Lemeshow (2000). All measures of goodness-of-fit are shown Annex 5. Furthermore, when compared to a model that includes the three selected variables instead of pc-scores, this PCLR has superior measures of goodness-of-fit such as the area under the ROC Curve, and the Bayesian Information Criterion (BIC), comparable with the thresholds proposed by Raftery (1995). Finally, the dimensionality reduction is another advantage of this model.

This specific PCLR model is quite different from the one fitted for “Efficiency”: two principal components (pc’s) were selected, both statistically significant at the 1% level. Conceptually, each estimated coefficient is the expected change in the log odds of experiencing a banking crisis for a one-unit increase in the corresponding pc, holding the other predictor pc constant at a certain value. Each odds ratio represents the change in odds on a multiplicative scale for a one-unit increase in the corresponding pc predictor, holding the other pc predictor constant at a certain value. Moreover, both pc’s have opposite signs, indicating that while the one-unit increase in the first pc (*pc_pfd1*) increases the odds of experiencing a banking crisis, the one-unit increase in the second pc (*pc_pfd2*) decreases them.

In order to understand the main statistical relations in this model, it is necessary to interpret the corresponding eigenvectors for each pc’s coefficients. From Table 3, the coefficients’ eigenvectors lead to the following eigenfunctions:

$$pc_pfd1 = 0.5744 zaffe_a_bofi + 0.3564 zcar + 0.7369 zcred_boi_grow$$

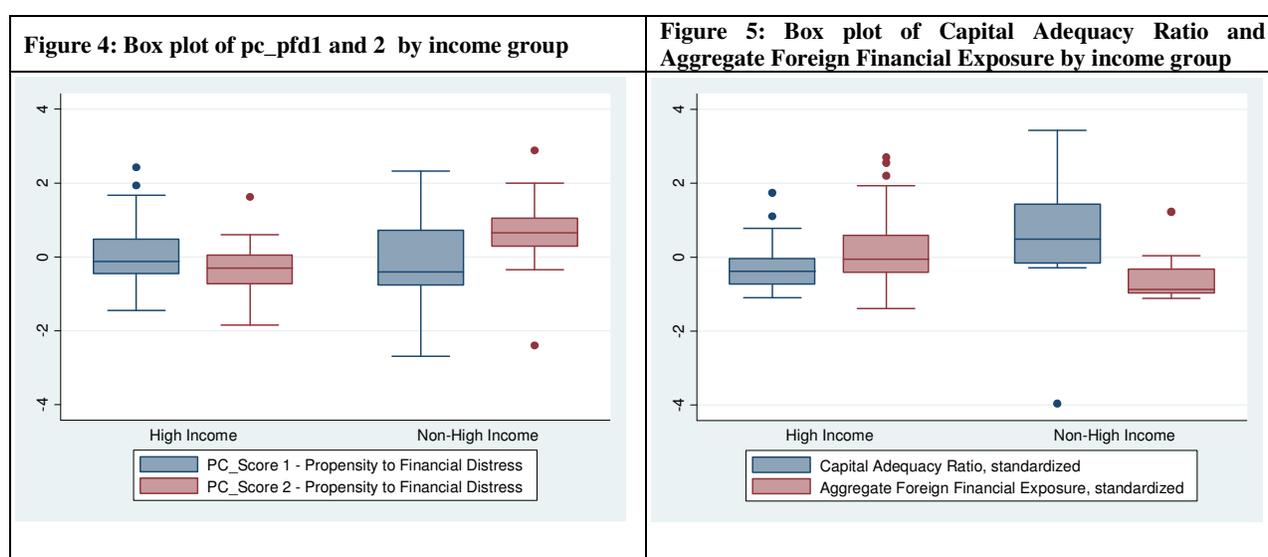
$$pc_pfd2 = -0.5819 zaffe_a_bofi + 0.8109 zcar + 0.0614 zcred_boi_grow$$

The annual growth rate of credit loads appears in the first principal component, followed by the aggregate foreign exposure and the capital adequacy ratio. Therefore, *pc_pfd1* assumes higher values in financial systems with relevant credit growth and foreign exposures prior to the crisis. The odds ratio estimated for this pc indicates that, holding the other pc predictor constant, a one-unit increase in *pc_pfd1* represents 6.578 chances of experiencing a banking crisis. These findings, to a certain extent, correspond to Llaudes, Salman et al.'s findings (2010) that emerging markets with strong external linkages (higher dependence on demand from advanced economies or larger exposure to foreign bank claims) experienced sharper falls in output during the 2007-2009 crisis. Also, their analysis indicates that countries with pre-crisis credit booms bore sharper output falls during the crisis, given that their credit booms were typically foreign-financed.

In the second principal component (*pc_pfd2*), capital adequacy ratio is by far the variable with the largest loading, while credit growth has a small one. The aggregate foreign exposure shows a relevant negative coefficient in the abovementioned eigenfunction, meaning that this pc-score assumes higher values for financial systems that are sufficiently capitalized in relation to their risk exposures, yet less globally integrated. The odds ratio estimated for this pc indicates that, holding *pc_pfd1* constant, a one-unit increase in *pc_pfd2* represents 0.14334 chances of experiencing a banking crisis compared to not having a crisis. In other words, it represents a decrease in the odds of crisis by approximately 85%.

In summary, the interpretation of this PCLR is quite simple. It clearly states that more globally integrated and less capitalized financial systems with rapid credit growth were more susceptible to this recent episode of crisis.

As in the “Efficiency” analysis, I examined the relation between the components of “Propensity to Financial Distress” and the sample countries’ income level, although a deep kind of analysis is beyond the scope of this study. Figures 4 and 5 provide some preliminary insights on the concentration of crisis episodes in advanced economies (Laeven and Valencia 2010). In fact, these Figures illustrate that the *pc_pfd2* differentiates the groups of high and non-high income countries; mostly because non-high-income countries had comparatively less globally integrated financial systems and better levels of aggregate capital adequacy ratio.



5.4 Statistical Association between Efficiency and Propensity to Financial Distress

The analysis of the construct “Efficiency” suggests that more efficient financial systems are more susceptible to banking crises. This outcome supports the hypothesis that there is a trade-off between financial stability and aggregate efficiency in financial intermediation. In a complementary analysis, I examined the statistical association between the principal components obtained from the PCA conducted for the two different constructs.

Firstly, as shown in Table 5, I examined the pairwise correlation between the pc-scores derived from the abovementioned PCA. Interestingly, the only relevant correlation exists

between the first pc of Efficiency (*pc-effic1*) and the second pc of Propensity to Financial Distress (*pc-pdf2*), both statistically significant as predictors of the dependent variable (binary banking crisis dummy). In fact, *pc-effic1* and *pc-pdf2* are negatively correlated, implying that more capitalized and less internationally active financial systems (*pc-pdf2*) are associated with less efficient financial systems (*pc-effic1*).

Table 5: Pairwise correlation between pc-scores

<i>Construct</i>	pc-score	<i>Efficiency</i>		
		<i>pc_effic1</i>	<i>pc_effic2</i>	<i>pc_effic3</i>
<i>Propensity to Financial Distress</i>	<i>pc_pfd1</i>	-0.0214	0.219	-0.1171
	<i>pc_pfd2</i>	-0.6802*	0.0595	0.0822
	<i>pc_pfd3</i>	-0.0054	-0.2741	0.029

* indicates statistical significance at the 1 per cent level.

Secondly, I fit an OLS regression model in which the *pc-effic1* was the response variable, and the pc-scores for the construct “Propensity to Financial Distress” were defined as explanatory variables. In addition, I fit an OLS regression model using the standardized variables for the construct “Propensity to Financial Distress” as regressors. In both models, the variables underwent a backward selection routine for stepwise multiple regression, with a 5% significance level for removal from the model. Results are presented in Tables 6 and 7.

By doing so, I tested the hypothesis that lower efficiency in a financial system may be a by-product of a regulatory environment over-focused on financial stability, especially with regard to capital adequacy regulation. Specifically, I focused on Kashyap, Rajan & Stein’s observation (2008) that it is nearly impossible to design regulations that reduce the probability of financial crises to zero without imposing large costs to financial intermediation. This is the case because when banks are forced to hold very large buffer stocks of capital in good times, this has

the potential to sharply curtail intermediation activity, as well as to lead to increased distortions in the form of regulatory arbitrage.

Table 6: OLS regression model 1

- Dependent variable: *pc_effic1*

- Regressors: Principal components of "Propensity to Financial Distress"

Variable	Coefficients		p-value	# of Observations	R-squared	Adj R-squared
	Estimated	Std. Err.				
<i>pc_pfd2</i>	-0.9008	0.1387	0.0000	51	0.4627	0.4517
Intercept	0.0139	0.1401	0.9210			
<i>pc_pfd1</i>	-0.0346*	0.1413*	0.8063**	<i>Removed from the full model</i>		
<i>pc_pfd3</i>	0.0030*	0.1602*	0.9852**			

* information estimated in the full model

** p-value considered for removing the variable from the model

Table 7: OLS regression model 2

- Dependent variable: *pc_effic1*

- Regressors: standardized variables of "Propensity to Financial Distress"

Variable	Coefficients		p-value	# of Observations	R-squared	Adj R-squared
	Estimated	Std. Err.				
<i>zcar</i>	-0.6610	0.1297	0.0000	48	0.5173	0.4844
<i>znpl</i>	-0.2772	0.1334	0.0440			
<i>zaffe_bofi</i>	0.4202	0.1548	0.0090			
Intercept	0.1179	0.1451	0.4210			
<i>zprov_npl</i>	-0.3086*	0.1784*	0.0910**	<i>Removed from the full model</i>		
<i>zleverage</i>	-0.0307*	0.1646*	0.8530**			
<i>zzscore</i>	0.1352*	0.1392*	0.3370**			
<i>zcred_boi_grow</i>	-0.1031*	0.1765*	0.5620**			

* information estimated in the full model

** p-value considered for removing the variable from the model

The results from the second procedure reiterate the negative association between the level of aggregate capitalization and the level of efficiency, measured by the *pc_effic1*, and the positive association between this measure and the level of aggregate foreign financial exposure. Strictly speaking, I found evidence that less internationally integrated financial systems with higher aggregate capital adequacy ratios tend to be less efficient, i.e., face inferior financial depth and/or higher interest margins.

5.5 Full PCLR

To check for robustness, I subjected the same variables to PCA in each construct (see Sections 5.2 and 5.3), and put them together in a single PCA procedure. The results are presented in Table 8.

I generated principal component scores labeled as the new variables “pc_all_1” to “pc_all_6”, and used them as explanatory variables in the PCLR model fit with a stepwise selection procedure (backward elimination, with a 5% significance level for removal from the model). Results are in Table 9.

Table 8: Principal Component Analysis – Both constructs

Variable		Eigenvectors					
Label	Code	Component 1 (pc_all_1)	Component 2 (pc_all_2)	Component 3 (pc_all_3)	Component 4 (pc_all_4)	Component 5 (pc_all_5)	Component 6 (pc_all_6)
Net Interest Margin	zint_margin	-0.515	0.1855	-0.2053	0.4168	0.0458	0.6946
Private Credit By Deposit Money Banks and OFI / GDP	zcred_bofi_aver	0.5295	-0.1308	0.0125	0.1879	0.7717	0.2675
Bank Credit To Bank Deposits	zcred_dep	0.3865	0.4577	-0.3195	0.631	-0.2344	-0.2933
Aggregate Foreign Financial Exposure	zaffe_a_bofi	0.3078	0.3044	0.7602	0.0337	-0.309	0.3718
Bank Regulatory Capital to Risk-Weighted Assets	zcar	-0.4556	0.1397	0.5062	0.3647	0.4025	-0.4709
(Private Credit By Deposit Money Banks and OFI / GDP) - Annual Rate Of Growth	zcred_boi_grow	-0.0532	0.7917	-0.1467	-0.5086	0.3	-0.0088
Eigenvalues		2.41858	1.26132	0.972393	0.553071	0.427232	0.367398
Proportion of variance		40.31%	21.02%	16.21%	9.22%	7.12%	6.12%

Table 9: Principal Component Logistic Model – Entire set of variables

Dependent variable: “crisis_bin” (dummy)

Variable	Coefficients		Odds Ratio		Wald test (P> z)	# of Observations	Likelihood ratio test (Prob > chi2)	Pseudo R2
	Estimated	Std. Err.	Estimated	Std. Err.				
pc_all_1	1.3999	0.4684	4.0549	1.8993	0.0030	51	0.0000	0.4617
pc_all_2	1.9096	0.6169	6.7506	4.1644	0.0020			
Intercept	-0.5674	0.4199	-	-	0.1770			
pc_all_3	0.0109*	0.5041*	1.0109*	0.5096*	0.9828**	Removed from the full model		
pc_all_5	-1.1334*	0.7750*	0.3219*	0.2495*	0.5379**			
pc_all_4	0.3925*	0.6588*	1.4807*	0.9755*	0.1380**			
pc_all_6	1.2641*	0.8742*	3.5398*	3.0946*	0.1251**			

* information estimated in the full model

** p-value considered for removing the variable from the model

As previously found, measures of goodness-of-fit also indicate that this model provides a good fit, though slightly inferior to the one observed for the Partial PCLR model of “Propensity to Financial Distress”. All relevant measures of goodness-of-fit are shown Annex 5.

This model confirms the findings of both Partial PCLR models discussed before. In fact, the two principal components (pc’s) have statistically significant coefficients at the 1% level, and the corresponding eigenfunctions are:

$$pc_all_1 = -0.515 \ zint_margin + 0.5295 \ zcred_bofi_averg + 0.3865 \ zcred_dep + 0.3078 \ zaffe_a_bofi - 0.4556 \ zcar - 0.0532 \ zcred_boi_grow$$

$$pc_all_2 = 0.1855 \ zint_margin - 0.1308 \ zcred_bofi_averg + 0.4577 \ zcred_dep + 0.3044 \ zaffe_a_bofi + 0.1397 \ zcar + 0.7917 \ zcred_boi_grow$$

According to these eigenfunctions, *pc_all_1* assumes higher values for more efficient and less capitalized financial systems (lower net interest margin and higher financial depth and rate of intermediation). The aggregate foreign financial exposure loads at the same level in both pc-scores, while the credit growth loading appears irrelevant. On the other hand, in *pc_all_2*, the annual credit growth rate loads strongly, with higher loads for the aggregate capital adequacy ratio and less efficient financial systems (higher financial margins and inferior financial depth). Both exhibit positive odds ratios, which indicates higher chances of a banking crisis for a one-unit of increase in each separate pc.

This model does not support the hypothesis of a trade-off between stability vs. efficiency as clearly as the previous one, but it generally confirms its most relevant findings, especially the negative correlation between efficiency and level of capitalization, which is outlined in the derived variable *pc_all_1*.

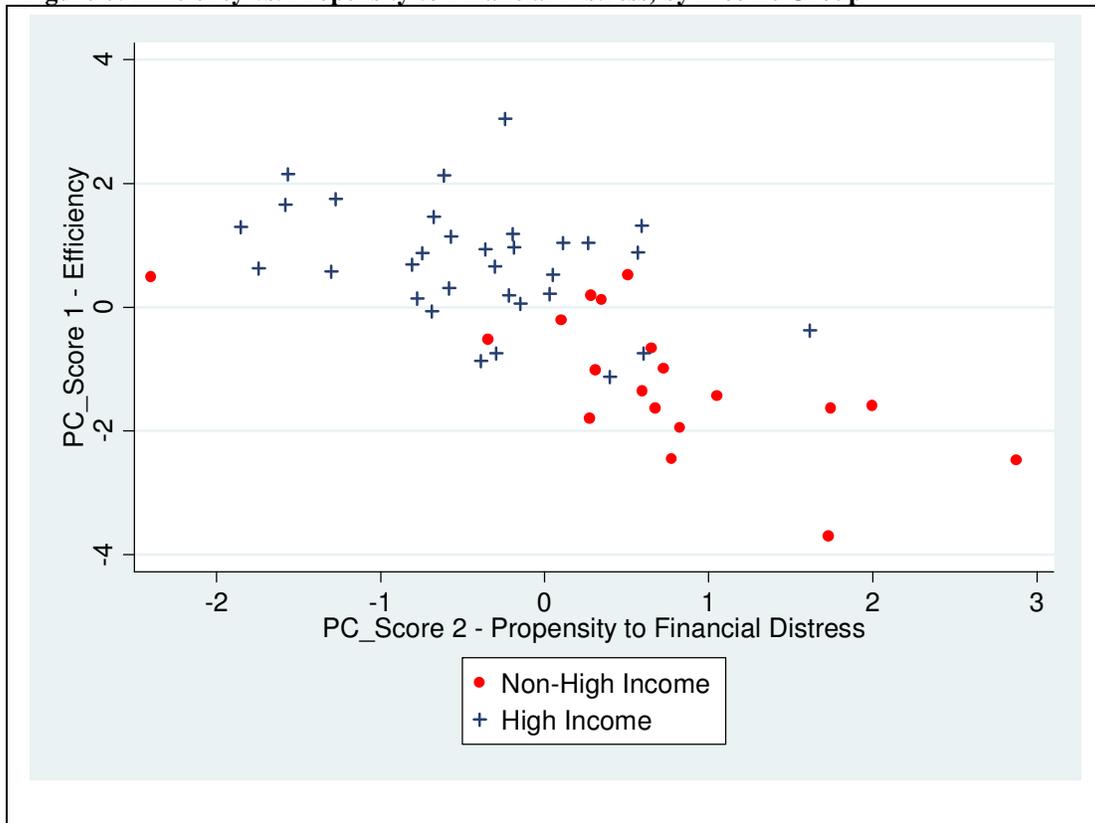
6. Complementary Analysis

By obtaining summary measures of efficiency and propensity to financial distress through Principal Component Analysis, and fitting the previously discussed PCLR models, this paper shows that efficiency is statistically associated with the crisis events of 2007-2009, especially when combined with lower levels of capital adequacy ratio. In this vein, the level of regulatory capital requirement appears to be an effective policy tool in preventing banking crisis, while greater foreign exposure and rapid expansion of domestic credit increases its likelihood.

These findings suggest that the G20's policy guidelines, which are mostly focused on strengthening the capitalization of domestic financial systems and increasing international cooperation, could be appropriate. In this regard, Davies and Green (2008) argue that International Financial Institutions, namely the IMF and the World Bank, should pressure countries to implement financial regulation standards created by the regulatory groupings, and to which in theory they were already committed.

Nonetheless, this research shows that there is a cleavage between high- and low-income countries, which stand on different points along the spectrum of stability vs. efficiency trade-off. Specifically, low-income countries with less efficient, less globally integrated, and more capitalized financial systems, are therefore less susceptible to banking crises like the 2007-2009 one. Figure 6 shows the plot of pc-scores related to efficiency (*pc-effic1*), and propensity to financial distress (*pc-pdf2*). It is important to remember that *pc-effic1* is higher for more efficient financial systems, which increases the odds of crisis (PCLR model presented in section 5.2), while *pc-pdf2* is higher for more capitalized and less internationally active financial systems, which decreases the odds of crisis (PCLR model presented in section 5.3). Different markers are used to distinguish between high- and low-income countries.

Figure 6: Efficiency vs. Propensity to Financial Distress, by Income Group



The different position on the stability vs. efficiency spectrum speaks against the adoption of any kind of one-size-fits-all regulatory standards, especially in less efficient and more capitalized low-income countries. In fact, as Mirow (2010) remarks, a one-size-fits-all approach in regulatory reform may not be optimal, and a possible solution would be a mixture of broad principles and regional/national regulations, in which the coordination between supervisors avoided ‘jurisdiction shopping’. Along the same lines, Malan (2010) notes that, although we live in a complex global economy, key political decisions are made nationally. Therefore, the G-20 could incentivize its members to identify the structural and institutional reforms that are deemed to be essential for each of them and inevitably context-specific.

This section focuses on some of those “structural and institutional reforms” by examining selected issues that increase financial efficiency: 1) the crowding-out effect of credit to

government, hereafter called a ‘government factor’, and 2) the institutional factor, which is related to legal framework and financial infrastructure supporting the financial system, by establishing clear rights, responsibilities and liabilities of parties in a transaction; maintaining appropriate incentives and adequate information to facilitate market forces; and providing the means to enforce legal obligations and claims effectively (Norton 2007).

With regard to the first issue, the IMF (2010) claimed that the desirability of increasing financial depth cannot justify unsound credit growth because it places the financial sector in a vulnerable position. Hence, one way to increase credit availability, even with the existing deposit base, would be reducing the bank’s credit share going to the government and the central bank. Hauner (2008), more specifically, examines the impact of credit to the government on three aspects of the banking sector’s performance: its deepening over time, profitability, and productive efficiency. Particularly in developing countries, his findings suggest a sizeable negative effect on bank deepening and productive efficiency, and a positive effect on profitability. The former indicates that higher income levels could more than compensate the higher costs of productive *inefficiency*.

With respect to the institutional factor, Levine, Loayza, and Beck’s findings (2000) show that there are three relevant factors to determine the development of banking systems: better laws that favor creditor protection in case of default, better contract enforcement mechanisms, and better financial information disclosure requirements. Knoop (2008) claims that governments pursuing those three financial regulation goals are more likely to have large and efficient financial systems and, as a result, growing economies.

6.1 Data and Methods

To test the statistical association of the government and institutional factors with the summary measure of efficiency (*pc_effic1*), I fit a cross-section OLS regression model, in which *pc_effic1* is the dependent variable, and the regressors are the following:

1) Government factor: a new variable was defined as the credit to the government divided by the total credit to the private sector, both provided by deposit money banks and other financial institutions. This new variable, “*gov_priv_bofi*”, was calculated from raw data from International Financial Statistics (IFS), made available by the Statistics Department of the International Monetary Fund.

2) Institutional factor: to capture the dimensions of creditor protection, better financial information, and disclosure requirements, I selected the indicators related to the following areas from the Doing Business Database of the World Bank: a) getting credit, which measures the legal rights of borrowers and lenders with respect to secured transactions through one set of indicators and the sharing of credit information through another set; b) protecting investors, which measures the strength of minority shareholder protections against directors’ misuse of corporate assets for personal gain; and c) enforcing contracts, which measures the efficiency of the judicial system in resolving a commercial dispute. All indicators are described in Annex 6.

Concerning data transformation, I used the natural log of the variable *gov_priv_bofi*, instead of the original raw values. The indicators related to the institutional factor were standardized so that they were mean-centered and had unit variances. This procedure was necessary because I also submitted these indicators to a Principal Component Analysis, in which I worked with correlation matrices rather than covariance matrices.

In the analysis of the institutional factor, I applied an empirical method similar to the one described in Section 3 that followed these specifications: a) all variables were standardized

and for each one I estimated a univariable OLS regression model; b) those variables whose coefficients had a p-value less than 0.10 were selected for Principal Component Analysis; c) principal component scores were included as independent variables in the OLS model by a stepwise method (backward elimination, with a 5% significance level for removal from the model).

The results of all univariable OLS regression models are shown in Annex 7. Based on these models, the selected variables for the institutional factor were subjected to a Principal Component Analysis (PCA), and the corresponding pc-scores were generated and labeled as the news variables *pcdb1* to *pcdb4*. The variables considered and the outcomes of PCA are presented in Table 10.

Table 10: Principal Component Analysis – Institutional Factor

Variable		Eigenvectors			
Label	Code	Component 1 (pcdb1)	Component 2 (pcdb2)	Component 3 (pcdb3)	Component 4 (pcdb4)
Strength of legal rights index	zleg_right	0.5707	-0.3457	0.1102	0.7366
Private bureau coverage	zcred_prireg	0.4289	0.6189	-0.6556	0.0563
Strength of investor protection index	zpinv_stren	0.4614	0.4613	0.7161	-0.2481
Procedures (number)	zenforc_proc	-0.5267	0.5335	0.2129	0.6266
Eigenvalues		2.1765	0.8128	0.6682	0.3426
Proportion of variance		54.4%	20.3%	16.7%	8.6%

The variable used as proxy for the government factor (*ln_gov_priv_bofi*) was also regressed against *pc_effic1*, showing a negative coefficient statistically significant at 1% level of significance. Consequently, this variable was included, along with the above-mentioned pc-scores (*pcdb1* to *pcdb4*), as an independent variable in a multivariate OLS regression model that used a stepwise method. Table 11 shows the main parameters from the estimated model.

Table 11: Multivariate OLS Regression Model - Government and Institutional FactorsDependent variable: "*pc_effic1*"

Variable	Coefficients		t-statistic	p-value	# of Observations	R-squared	Adjusted R-squared
	Estimated	Std. Err.					
ln_gov_priv_bofi	-0.5140	0.1251	-4.1100	0.0000	50	0.4461	0.4225
pcdb1	0.3421	0.1044	3.2800	0.0020			
Intercept	-0.9553	0.2732	-3.5000	0.0010			
pcdb2	-0.0603	0.1614	-0.3700	0.7100	Removed from the full model		
pcdb3	-0.2246	0.1844	-1.2200	0.2300			
pcdb4	-0.4511	0.2491	-1.8100	0.0770			

* information estimated in the full model

The reported outcomes of this multivariate OLS regression model show that: a) the proxy for the so-called government factor has a negative coefficient, statistically relevant at the 1% significance level, in agreement with Hauner (2008), and which provides evidence that credit to government has a crowding-out effect that reduces the overall efficiency of financial intermediation; and b) the pc-score *pcdb1*, here used as a summary measure of the institutional factor, has a significant positive coefficient at 1% significance level, which also concurs with the vast body of literature linking institutions and financial deepening. The loadings of *pcdb1*, combined with its positive coefficient, mean that higher levels of Strength of legal rights, Private bureau coverage, and Strength of investor protection index, associated with lower numbers of Procedures of Enforcing Contracts, are statistically related to higher levels of financial efficiency as measured by *pc_effic1*.

These findings suggest that, while new financial stability challenges call for innovative solutions in the field of macroprudential regulation and surveillance, country-specific financial efficiency needs may still be addressed by the old methods of reducing the crowding-out caused by government borrowing, and promoting institutional reforms that have been part of the international agenda since the 1990's.

Furthermore, these findings refute a one-size-fits-all regulatory financial reform orientation, which can occasionally be deemed to be excessively focused on prudential regulations based on capital requirements. Specifically, non-high-income countries with highly-capitalized and less-efficient financial systems would probably be better off focusing their efforts on the aforementioned context-specific structural and institutional reforms, which involve, as Norton (2007) suggests, the creation of a viable and coherent financial legal infrastructure suitable for the development of well-functioning financial markets and a sound business environment.

7. Wrap-up and Conclusion

Despite the limitations associated with a small sample size (22 countries identified as banking crisis events from 2007 to 2009), this study sheds some light on the regulatory conundrum related to the trade-off between financial stability and the allocative efficiency of financial intermediation.

Firstly, after deriving summary measures of efficiency and propensity to financial distress through Principal Component Analysis, this work found significant statistical association between the two metrics and the global financial crisis from 2007 to 2009, although the measure of propensity for financial distress was found to be a better predictor of crisis than the efficiency one. This suggests that the current focus on improved prudential regulation must be maintained, especially when one considers that the capital adequacy ratio measures showed statistically significant coefficients that were negatively correlated with the banking crisis.

Secondly, this study presented evidence in favor of a trade-off between financial stability and efficiency of financial intermediation, and which supported the hypothesis that larger buffer stocks of capital may actually curtail intermediation activity. This aspect should be

taken into consideration by policy makers, especially since the increased efficiency of intermediation, as defined here, may have positive impacts on economic growth.

Thirdly, in the countries examined in this study, there was a clear indication that high-income countries and non-high-income have very different positions in relation to the aforementioned trade-off. High-income countries tend to present more efficient, more globally integrated and more capitalized financial systems, and thus were found to be more prone to have a banking crisis in the 3-year period prior to the actual crisis of 2007. On the other hand, low-income countries tend to be on the opposite end of this spectrum, with less efficient, less globally integrated and more capitalized financial systems, and therefore more protected against the global crisis.

This outcome confirms that there is not much room for one-size-fits-all regulatory reform proposals, even if these proposals come on behalf of the necessary global governance. Instead, domestic regulators in non-high-income countries must also consider other context-specific structural and institutional reforms in order to improve the efficiency of their financial systems. In this regard, this study reexamines selected factors that, according to the literature, can have an impact on improving financial efficiency. The outcomes confirm that reducing the crowding-out caused by government borrowing, and promoting microeconomic reforms focused on strengthening the legal rights of borrowers and lenders, sharing credit information, protecting investors, and facilitating contract enforcement, have a positive effect on increasing the summary measure of efficient adopted in this research.

Finally, this work leads us to reflect on the words of the Greek philosopher Socrates (Athens, 469 BC - 399 BC), who wisely said that if a man is proud of his wealth, he should not be praised until it is known how he employs it. Likewise, a national financial system that is

proud of its stability and of its resilience to crisis should not be praised until it is known whether that system efficiently provides financial intermediation that contributes to economic growth and the greater welfare of the nation.

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Annex 1: List of countries

Country Code	Country	Crisis =1, Non-Crisis=0	Income Group (World Bank)	Region
ARG	Argentina	0	Upper middle income	Latin America & Caribbean
AUS	Australia	0	High income: OECD	East Asia & Pacific
AUT	Austria	1	High income: OECD	Europe & Central Asia
BEL	Belgium	1	High income: OECD	Europe & Central Asia
BRA	Brazil	0	Upper middle income	Latin America & Caribbean
BGR	Bulgaria	0	Upper middle income	Europe & Central Asia
CAN	Canada	0	High income: OECD	North America
CHL	Chile	0	Upper middle income	Latin America & Caribbean
CHN	China	0	Lower Middle Income	East Asia & Pacific
COL	Colombia	0	Upper middle income	Latin America & Caribbean
CZE	Czech Republic	0	High income: OECD	Europe & Central Asia
DNK	Denmark	1	High income: OECD	Europe & Central Asia
FIN	Finland	0	High Income	Europe & Central Asia
FRA	France	1	High income: OECD	Europe & Central Asia
DEU	Germany	1	High income: OECD	Europe & Central Asia
GRC	Greece	1	High income: OECD	Europe & Central Asia
HKG	Hong Kong, China	0	High Income	East Asia & Pacific
HUN	Hungary	1	High income: OECD	Europe & Central Asia
ISL	Iceland	1	High Income	Europe & Central Asia
IND	India	0	Lower middle income	South Asia
IDN	Indonesia	0	Lower middle income	East Asia & Pacific
IRL	Ireland	1	High income: OECD	Europe & Central Asia
ISR	Israel	0	High Income	Middle East & North Africa
ITA	Italy	0	High income: OECD	Europe & Central Asia
JPN	Japan	0	High income: OECD	East Asia & Pacific
KAZ	Kazakhstan	1	Upper middle income	Europe & Central Asia
KOR	Korea, Rep.	0	High income: OECD	East Asia & Pacific
LVA	Latvia	1	High income: nonOECD	Europe & Central Asia
LUX	Luxembourg	1	High income: OECD	Europe & Central Asia
MYS	Malaysia	0	Upper middle income	East Asia & Pacific
MEX	Mexico	0	Upper middle income	Latin America & Caribbean
NLD	Netherlands	1	High income: OECD	Europe & Central Asia
NOR	Norway	0	High income: OECD	Europe & Central Asia
PER	Peru	0	Upper middle income	Latin America & Caribbean
PHL	Philippines	0	Lower middle income	East Asia & Pacific
POL	Poland	0	High income: OECD	Europe & Central Asia
PRT	Portugal	1	High income: OECD	Europe & Central Asia

Country Code	Country	Crisis =1, Non-Crisis=0	Income Group (World Bank)	Region
ROM	Romania	0	Upper middle income	Europe & Central Asia
RUS	Russian Federation	1	Upper middle income	Europe & Central Asia
SAU	Saudi Arabia	0	High income: nonOECD	Middle East & North Africa
SGP	Singapore	0	High income: nonOECD	East Asia & Pacific
SVK	Slovak Republic	0	High income: OECD	Europe & Central Asia
SVN	Slovenia	1	High income: OECD	Europe & Central Asia
ZAF	South Africa	0	Upper middle income	Sub-Saharan Africa
ESP	Spain	1	High income: OECD	Europe & Central Asia
SWE	Sweden	1	High income: OECD	Europe & Central Asia
CHE	Switzerland	1	High income: OECD	Europe & Central Asia
THA	Thailand	0	Lower middle income	East Asia & Pacific
TUR	Turkey	0	Upper middle income	Europe & Central Asia
UKR	Ukraine	1	Lower Middle Income	Europe & Central Asia
GBR	United Kingdom	1	High income: OECD	Europe & Central Asia
USA	United States	1	High income: OECD	North America
URY	Uruguay	0	Upper middle income	Latin America & Caribbean

Annex 2: List of independent variables

Variable	Description	Source
Private Credit By Deposit Money Banks and Other Financial Institutions / GDP	Defined as claims on the private sector by deposit money banks and other financial institutions divided by GDP. It is a narrow indicator of financial depth, used as a proxy for the credit allocation done by credit institutions.	Beck, Demirgüç-Kunt et al. (2010).
Bank Credit To Bank Deposits	Ratio of claims on the private sector to deposits in deposit money banks. It thus gauges the extent to which banks intermediate society's savings into private sector credits.	Beck, Demirgüç-Kunt et al. (2010).
Net Interest Margin	Accounting value of a bank's net interest revenue as a share of its total earning assets	Beck, Demirgüç-Kunt et al. (2010).
Overhead Cost	Accounting value of a bank's overhead costs as share of its total assets	Beck, Demirgüç-Kunt et al. (2010).
Cost-Income Ratio	Accounting value of a bank's overhead costs relative to gross revenues	Beck, Demirgüç-Kunt et al. (2010).
(Private Credit By Deposit Money Banks And Other Financial Institutions / GDP) - Annual Rate Of Growth	Annual rate of growth of the previously defined variable "Private Credit By Deposit Money Banks and Other Financial Institutions / GDP"	Beck, Demirgüç-Kunt et al. (2010).
Bank Regulatory Capital to Risk-Weighted Assets	Financial Soundness Indicator (FSI) compiled in accordance with the guidelines of either Basel I or Basel II. It measures the capital adequacy of deposit takers based on the capital concept of the Basle Committee on Banking Supervision.	Table 22 of the Global Financial Stability Report – IMF, issue of April/2010
Bank Nonperforming Loans to Total Loans	FSI calculated by using the value of NPLs as the numerator and the total value of the loan portfolio (including NPLs, and before the deduction of specific loan loss provisions) as the denominator. .	Table 24 of the Global Financial Stability Report – IMF, issue of April/2010
Bank Provisions to Nonperforming Loans	Accounting value of a bank's provisions as a share of its total NPL. This FSI is used as a proxy for asset quality and is intended to identify problems in the loan portfolio.	Table 25 of the Global Financial Stability Report – IMF, issue of April/2010

Variable	Description	Source
Total Leverage Banks	Bank capital to assets is the ratio of bank capital and reserves to total assets. Capital and reserves include funds contributed by owners, retained earnings, general and special reserves, provisions, and valuation adjustments. Capital includes tier 1 capital (paid-up shares and common stock), which is a common feature in all countries' banking systems, and total regulatory capital, which includes several specified types of subordinated debt instruments that need not be repaid if the funds are required to maintain minimum capital levels (these comprise tier 2 and tier 3 capital). Total assets include all nonfinancial and financial assets.	FB.BNK.CAPA.ZS - Bank capital to assets ratio (%) – World Development Indicators – World Bank
Z-Score	The z-score is the ratio of return on assets plus capital-asset-ratio to the standard deviation of return on assets. If profits are assumed to follow a normal distribution, it can be shown that the z-score is the inverse of the probability of insolvency. Specifically, z indicates the number of standard deviations that a bank's return on assets has to drop below its expected value before equity is depleted and the bank is insolvent (see Roy, 1952, Hannan and Henwick, 1988, Boyd, Graham and Hewitt, 1993 and De Nicolo, 2000).	Beck, Demirgüç-Kunt et al.(2010)
Aggregate Foreign Financial Exposure	Foreign Assets + Foreign Liabilities / Total Assets - Banks+OFI	International Financial Statistics (IFS) - IMF.

Annex 3a: Summary Statistics

Variable label	Variable code	N	Mean	SD	Min	Max	Median
Overhead Cost	overhead	52	0.038	0.020	0.012	0.096	0.034
Net Interest Margin	int_margin	52	0.037	0.022	0.008	0.134	0.029
Cost-Income Ratio	cost_inc	52	0.672	0.152	0.289	1.089	0.689
Private Credit By Deposit Money Banks and Other Financial Institutions / GDP	cred_bofi_aver	53	0.828	0.524	0.104	2.027	0.854
Bank Credit To Bank Deposits	cred_dep	53	1.145	0.576	0.363	3.273	1.001
Aggregate Foreign Financial Exposure	affe_bofi	52	0.357	0.256	0.002	1.073	0.308
Bank Regulatory Capital to Risk-Weighted Assets	car	53	13.763	3.481	0.900	24.600	12.900
Total Leverage Banks	leverage	53	7.798	2.776	3.030	13.170	7.730
Private Credit By Deposit Money Banks And Other Financial Institutions / GDP - Annual Rate Of Growth	cred_boi_grow	53	0.052	0.100	-0.248	0.326	0.040
Bank Nonperforming Loans to Total Loans	npl	52	3.623	3.932	0.200	22.470	2.230
Bank Provisions to Nonperforming Loans	prov_npl	50	102.330	62.296	23.067	315.700	81.317
Z-Score	zscore	52	10.527	6.963	3.120	42.971	8.822

Annex 3b: Pairwise correlations

Variable	overhead	int_margin	cost_inc	cred_bofi_aver	cred_dep	affe_bofi	car	leverage	cred_boi_grow	npl	prov_npl	zscore
overhead	1											
int_margin	0.6943*	1										
cost_inc	0.5980*	0.3174	1									
cred_bofi_aver	-0.4312*	-0.5595*	-0.3570*	1								
cred_dep	-0.1118	-0.2414	-0.2385	0.4765*	1							
affe_bofi	-0.1249	-0.3673*	-0.2357	0.2710	0.1885	1						
car	0.3866*	0.4710*	0.2106	-0.4442*	-0.3099	-0.0218	1					
leverage	0.0002	0.1210	-0.0195	-0.1844	-0.2888	-0.0967	0.2314	1				
cred_boi_grow	-0.0338	0.1658	-0.1350	-0.0187	0.3863*	0.0915	0.0647	0.1699	1			
npl	0.0869	0.2048	0.0643	-0.4160*	-0.2996	-0.3279*	0.0924	0.2465	-0.0077	1		
prov_npl	0.3791*	0.3012	0.2191	-0.1524	-0.0533	-0.062	0.2402	-0.1539	-0.2282	-0.3322	1	
zscore	-0.4713*	-0.3083	-0.3128	0.1794	0.1221	0.3092*	-0.0331	-0.2168	-0.0040	-0.1028	-0.1601	1

* indicates statistical significance at the 1 per cent level.

Annex 4: Results of univariable logistic regression models

(Dependent variable: binary banking crisis dummy, and with all independent variables standardized)

Variable		Estimated Coefficient	Estimated Std. Err.	Wald test (P> z)	Likelihood ratio test (Prob > chi2)	Pseudo R2
Label	Code					
Overhead Cost	zoverhead	-0.038973	0.291155	0.894	0.8934	0.0003
Net Interest Margin	zint_margin	-0.731978	0.404803	0.071	0.0397	0.0603
Cost-Income Ratio	zcost_inc	-0.368478	0.304689	0.227	0.2138	0.0220
Private Credit By Deposit Money Banks and Other Financial Institutions / GDP	zcred_bofi_aver	0.909181	0.335643	0.007	0.0033	0.1199
Bank Credit To Bank Deposits	zcred_dep	1.400765	0.487915	0.004	0.0003	0.1821
Aggregate Foreign Financial Exposure (Banks+OFI)	zaffe_a_bofi	1.222291	.4300002	0.004	0.0005	0.1712
Bank Regulatory Capital to Risk-Weighted Assets	zcar	-0.609957	0.337575	0.071	0.0404	0.0584
Total Leverage Banks	zleverage	-0.102740	0.283798	0.717	0.7166	0.0018
Private Credit By Deposit Money Banks And Other Financial Institutions / GDP - Annual Rate Of Growth	zcred_boi_grow	1.225864	0.446005	0.006	0.0008	0.1557
Bank Nonperforming Loans to Total Loans	znpl	-0.392797	0.328227	0.231	0.1838	0.0252
Bank Provisions to Nonperforming Loans	zprov_npl	-0.214655	0.324202	0.508	0.4985	0.0068
Z-Score	zzscore	-0.044538	0.266168	0.867	0.8663	0.0004

Annex 5: Comparative measures of goodness-of-fit

PCLR Model	Area under ROC	Correct classification rate *	Likelihood-ratio test (G2) **		Hosmer & Lemeshow		Bayesian Information Criterion - BIC
			Value (df)	p	Value (df)	p	
Partial PCLR							
- Efficiency	0.7619	73.08%	2.43 (2)	0.2964	6.99 (8)	0.5381	65.968
- Propensity to Financial Distress	0.9197	82.69%	3.62 (1)	0.0570	4.02 (8)	0.8556	52.692
Full PCLR	0.9079	78.43%	5.27 (4)	0.2611	12.26 (8)	0.1401	48.997

* Cut-off = 0.5

** Reduced model compared to the full model containing all pc's of each case

Annex 6 – Independent variables for Complementary Analysis

<i>Variable</i> <i>(Code of standardized)</i>	<i>Description</i>
Getting Credit: it measures the legal rights of borrowers and lenders with respect to secured transactions through one set of indicators and the sharing of credit information through another.	
Strength of legal rights index (0-10) <i>(zleg_right)</i>	Strength of legal rights index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The index ranges from 0 to 10, with higher scores indicating that these laws are better designed to expand access to credit.
Depth of credit information index (0-6) <i>(zcredinfo)</i>	Depth of credit information index measures rules and practices affecting the coverage, scope and accessibility of credit information available through either a public credit registry or a private credit bureau.
Public registry coverage (% of adults) <i>(zcred_pureg)</i>	The public credit registry coverage indicator reports the number of individuals and firms listed in a public credit registry with information on their borrowing history from the past 5 years. The number is expressed as a percentage of the adult population (the population age 15 and above in 2009 according to the World Bank's World Development Indicators).
Private bureau coverage (% of adults) <i>(zcred_prireg)</i>	The private credit bureau coverage indicator reports the number of individuals and firms listed by a private credit bureau with information on their borrowing history from the past 5 years. The number is expressed as a percentage of the adult population (the population age 15 and above in 2009 according to the World Bank's World Development Indicators).
Protecting Investors: it measures the strength of minority shareholder protections against directors' misuse of corporate assets for personal gain. The indicators distinguish 3 dimensions of investor protections: transparency of related-party transactions (extent of disclosure index), liability for self-dealing (extent of director liability index) and shareholders' ability to sue officers and directors for misconduct (ease of shareholder suits index).	
Extent of disclosure index (0-10) <i>(zpinv_disc)</i>	The extent of disclosure index has 5 components: <ul style="list-style-type: none"> ▪ What corporate body can provide legally sufficient approval for the transaction. ▪ Whether immediate disclosure of the transaction to the public, the regulator or the shareholders is required. ▪ Whether disclosure in the annual report is required. ▪ Whether disclosure to the board of directors is required. ▪ Whether it is required that an external body, for example, an external auditor, review the transaction before it takes place.
Strength of investor protection index (0-10) <i>(zpinv_stren)</i>	The strength of investor protection index is the average of the extent of disclosure index, the extent of director liability index and the ease of shareholder suits index.
Enforcing Contracts: Indicators on enforcing contracts measure the efficiency of the judicial system in resolving a commercial dispute.	
Procedures (number) <i>(zenforc_proc)</i>	The list of procedural steps compiled for each economy traces the chronology of a commercial dispute before the relevant court. A procedure is defined as any interaction, required by law or commonly used in practice, between the parties or between them and the judge or court officer. This includes steps to file and serve the case, steps for trial and judgment and steps necessary to enforce the judgment.
Time (days) <i>(zenforc_time)</i>	Time is recorded in calendar days, counted from the moment the plaintiff decides to file the lawsuit in court until payment. This includes both the days when actions take place and the waiting periods between.
Cost (% of claim) <i>(zenforc_cost)</i>	Cost is recorded as a percentage of the claim, assumed to be equivalent to 200% of income per capita. No bribes are recorded. Three types of costs are recorded: court costs, enforcement costs and average attorney fees.

Source: Doing Business 2011 (The International Bank for Reconstruction and Development / The World Bank 2010)

Annex 7: Results of univariable OLS regression models

Dependent variable: pc-score “Efficiency” (*pc_effic1*)

Variable		Estimated Coefficient	Estimated Std. Err.	t-statistic	p-value	R-squared	Adjusted R-squared
Label	Code						
Credit to Government/Credit to Private Sector	ln_gov_priv_bofi	-0.60929	0.12920	-4.72000	0.00000	0.30790	0.29400
Strength of legal rights index	zleg_right	0.51550	0.17138	3.01000	0.00400	0.15320	0.13630
Depth of credit information index	zcredinfo	0.23680	0.17798	1.33000	0.18900	0.03420	0.01490
Public registry coverage	zcred_pureg	0.06539	0.19453	0.34000	0.73800	0.00230	-0.01810
Private bureau coverage	zcred_prire	0.42259	0.19025	2.22000	0.03100	0.09320	0.07430
Extent of disclosure index	zpinv_disc	0.07959	0.18698	0.43000	0.67200	0.00360	-0.01630
Strength of investor protection index	zpinv_stren	0.32996	0.17979	1.84000	0.07200	0.06310	0.04440
Procedures (number)	zenfore_proc	-0.67820	0.16391	-4.14000	0.00000	0.25510	0.24020
Time (days)	zenfore_time	-0.25721	0.18138	-1.42000	0.16200	0.03870	0.01940
Cost (% of claim)	zenfore_cost	-0.29557	0.18430	-1.60000	0.11500	0.04890	0.02990