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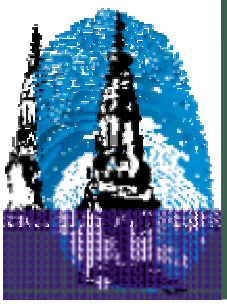

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Deposit Insurance Coverage, Credibility of Non-insurance, and Banking Crises

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Deposit Insurance Coverage, Credibility of Non-insurance, and Banking Crises

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Abstract:
The ambiguity in existing empirical work with respect to effects of deposit insurance schemes on banks' risk-taking can be resolved if it is recognized that absence of deposit insurance is rarely credible and that the credibility of non-insurance can be enhanced by explicit deposit insurance schemes. We show that under reasonable conditions for effects on risk-taking of creditor protection in banking, and for effects on credibility of non-insurance of explicit coverage of deposit insurance schemes, there exists a partial level of coverage that maximizes market discipline and minimizes moral hazard incentives for risk-taking in banking. Using both the occurrence of banking crises and non-performing loans in the banking sector as proxies for excessive risk-taking the results strongly support this hypothesis in industrial and emerging market economies. . Policy recommendations on the country level require analyses of institutional factors affecting the credibility of non-insurance. In particular, the implementation of effective distress resolution procedures for banks would allow governments to reduce explicit deposit insurance coverage and, thereby, to strengthen market discipline.

JEL Classification: G21; G28; F43

Keywords: Deposit Insurance; Banking Crisis; Insolvency Procedures, Market Discipline

Deposit Insurance Coverage, Credibility of Non-insurance, and Banking Crisis

1. Introduction

There is widespread consensus among economists that explicit and implicit guarantees of depositors, other creditors and shareholders of banks induce banks to take on excessive risk. The strongest indication of this so-called moral hazard behavior is the prevalence of banking crises across the globe as documented in Caprio and Klingebiel (2003). Neither developed nor developing countries have been spared, and countries with weak, as well as countries with seemingly strong and able banking supervisors have been hit. Supervisors and policy makers also seem to consider excessive risk-taking as a result of safety nets for banks a real problem as demonstrated by the international efforts since 1988 to create global standards for bank capital within the Basel Capital Adequacy framework. This framework has the explicit objective of reducing banks' risk-taking in the presence of strong explicit and implicit deposit insurance schemes.

The empirical evidence on the relationship between the coverage of deposit insurance schemes and risk-taking is ambiguous, as shown in the next section. There are several problems facing the researcher analyzing this relationship. Data on risktaking behavior as well as on coverage of implicit and explicit guarantees are needed. Behavior cannot be directly observed and the riskiness of banks' portfolios is not easily measured by outside observers. Most researchers use indirect measures of banks' risktaking, such as the occurrence of banking crisis, as indicators of excessive risk taking while controlling for a variety of non-behavioral factors that contribute to banking crises. Data on explicit insurance coverage often take the form of

dummies for characteristics of the deposit insurance system. Implicit guarantees obviously cannot be measured directly.

The approach taken in this paper is that the degree of moral hazard behavior in banking depends on the credibility of non-insurance of groups of depositors and other creditors, who are not covered by explicit deposit insurance schemes. We argue that the credibility of non-insurance determines the degree to which market discipline affects banks' risk-taking behavior. Thus, it is not necessarily the extent of explicit insurance that determines creditors' and, indirectly, banks' behavior. Absence of explicit insurance is not credible if political realities require supervisors and governments to rapidly intervene in banking crises to protect creditors and perhaps even shareholders of banks.

We argue that the credibility of non-insurance of groups of creditors increases with the coverage of explicit insurance. Furthermore, the credibility of non-insurance depends on institutional factors affecting cost- and contagion effects of having non-insured creditors in case there is a major bank failure in a country. The existence of explicit ex ante procedures for dealing with a bank in distress in such a way that the risk of contagion effects becomes low is one example of institutional factors enhancing the credibility of non-insurance.[1]

The approach outlined above leads to the conclusion that the impact of market discipline on banks' risk taking is maximized at a positive level of explicit deposit insurance coverage where the non-insurance has a high degree of credibility. At this level excessive risk-taking due to moral hazard behavior is minimized. Thus, we argue that there is a U-shaped relationship between explicit deposit insurance coverage and excess risk-taking caused by lack of market discipline. As mentioned, the level of explicit coverage that minimizes excess risk-taking depends on a number of institutional factors.

[1] See, for example, Wihlborg (2005).

To establish the relationship between explicit deposit insurance coverage and risk-taking we employ two proxies for excessive risk-taking by banks. First, we take the occurrence of banking crisis as an indication of moral hazard behavior after controlling for a number of factors that could cause a banking crisis even if conditions for effective market discipline are satisfied. There is an existing literature, emanating from the World Bank in particular, using the occurrence of banking crisis as a proxy for excessive risk taking. We use the data employed in this literature to be able to compare our results with those in the existing literature.[2] Second, we take the share of non-performing loans in banks' loan portfolio as a proxy for excessive for risk taking controlling again for a number of non-behavioral factors. The use of two very different proxies for excessive risk-taking allows us to check how robust the observed relationship between explicit deposit insurance coverage and risk-taking is.

We test for the hypothesized U-shaped relationship between deposit insurance coverage and banks risk-taking, and the hypothesized effects of institutional factors on this relationship using country level data for 140 countries for the years 1985-2003. The countries are divided into three groups, developed, developing and emerging market countries. Alternative proxies for deposit insurance coverage are used to check for robustness of results.

The next section reviews the existing empirical literature on deposit insurance, market discipline and banks' risk-taking. Thereafter in Section 3 the concept of credibility of non-insurance of banks' creditors, and the relationship between explicit deposit insurance, credibility of non-insurance and risk-taking is discussed. The non-linear, possibly U-shaped, relationship between explicit deposit insurance and risk-taking is explained. The impact of countries' institutional characteristics on credibility of non-insurance and thereby on risk-taking is analyzed

[2] The data set on banking crises compiled by the World Bank is described in Caprio and Klingebiel (2003). This data set has been used in much of the literature reviewed below.

in Section 4 leading to explicit hypotheses. Methodology and data are described in Section 5. Results of the empirical tests are presented in Section 6. The concluding Section 7 summarizes the results and possible extensions of the research are discussed.

2. Empirical evidence on deposit insurance, risk taking, and financial crises.

From a financial stability point of view the objectives of an explicit deposit insurance system are to prevent a run on a bank in a situation when depositors are uncertain about the bank's ability to survive, and to prevent contagious runs on other banks by depositors knowing little about the banks' portfolios. In times of crises it is common that explicit guarantees are extended to other creditors as well (blanket guarantees) by governments fearing interbank contagion through, for example, settlement systems. Explicit depositor protection can also serve a consumer protection purpose, and broader creditor protection prevents weak domestic banks from losing competitiveness relative to foreign banks by keeping funding costs low. Thereby, shareholders are also protected to some extent by blanket guarantees.

The drawbacks with protection of banks' creditors are also well known. Creditor protection in combination with limited liability of shareholders provides the latter with incentives to take excessive risk relative to the risk they would take if creditors would monitor banks' risk-taking and require banks to compensate them for their perceived risk.[3] This moral hazard problem can be alleviated through market discipline imposed by creditors. To be effective, market discipline of banks' risk-taking requires that creditors are informed about the riskiness of banks' asset portfolios and that banks' funding costs thereby come to reflect this riskiness. The severity of the moral hazard problem increases as a bank's Net Worth decreases.

[3] See, for example, Bhattacharya et al (1993)

Adverse risk-taking incentives can be the cause of banking crises and are likely to be present in countries with extensive protection of depositors and other creditors. This protection can be explicit or implicit. The design of the system protecting banks' creditors in terms of coverage, credibility and speed of compensation influences the incentives of creditors to monitor banks' risk-taking. The weaker these incentives are the greater is the burden on regulation and supervisors to control and monitor banks' risk-taking in order to reduce the likelihood of banking crisis. These issues have been discussed by, for example, Cooper and Ross (2002), Demirgüç-Kunt and Detragiache (2002), Demirgüç-Kunt and Huizinga (2004), and Cull, et al. (2005). These authors also note that the design of explicit deposit insurance systems influences the degree to which implicit insurance exists. We return to this issue in the next section.

There is a closely related literature discussing the relation between explicit deposit insurance and costs of banking crises. Hoggarth et al. (2002) summarize potential channels for this linkage and the empirical literature is summarized in Angkinand (2005). In this paper we focus entirely on banks' risk-taking incentives as manifested in, for example, banking crises.

A number of empirical studies address the questions whether the existence and coverage of explicit deposit insurance schemes increase the probability of banking crises. In cross country analyses Demirguc-Kunt and Detragiache (1997) and Hutchison and McDill (1999) use a dummy variable for explicit deposit insurance along with a number of variables capturing the state of economies to explain the occurrence of banking crises in countries. In the latter paper the authors find that the existence of an explicit deposit insurance scheme increases the probability of banking crises by approximately 50 percent within a sample of 65 crisis episodes during the period 1975-1997. On the other hand, within a sample of 29 developed and developing countries during the period 1994-2001, Hoggarth, et al. (2005) do not find a significant general

relationship between an explicit deposit insurance dummy and the probability of crises. However, when distinguishing between limited and unlimited deposit insurance coverage, they find that systems with limited coverage are strongly associated with smaller probability of crises. In a larger and updated cross country and time series sample relative to their 1997 paper, Demirgüç-Kunt and Detragiache (2002) find that explicit deposit insurance with large coverage protection significantly increase the likelihood of crises. The coverage features include covering foreign currency and interbank deposits, no-coinsurance, where depositors are not required to bear risk from their losses due to their banks' failure, and/or when a deposit insurance system is funded ex-post or the source of funding comes from a government[4].

Eichengreen and Arteta (2002) find that an explicit deposit insurance scheme reduces the likelihood of banking crises in a sample of developing countries alone. They note that differences in result may be explained by differences in the samples of countries and periods. When including both developed and developing countries, their findings support Demirgüç-Kunt and Detragiache (2002). The results nevertheless indicate that the observed positive relationship between deposit insurance and banking crisis may not be general.

Chu (2003) uses contingency table analysis to test whether there is an association between the system of deposit insurance and banking crises. He finds that an explicit system promotes short-run banking stability, but damages the stability in the long run. Of the 36 countries in the sample, 15 experience systemic banking crises before adopting explicit deposit insurance, but successfully avert crises after they introduce the explicit system. However, the

[4] They also construct the variable called the moral hazard index, which is found to increase the probability of banking crises. This index is built from the first principal component of deposit insurance features for no-coinsurance, foreign currency deposits covered, interbank deposits covered, type of funding, source of funding, management, membership and the level of explicit coverage. The higher value of this index reflects higher extent of moral hazard.

frequency of banking crises among countries with explicit deposit insurance tends to rise in the long-run due to the increased moral hazard associated with deposit insurance.

Differences in results across countries suggest that implicit insurance of banks' creditors vary across countries and that cross country analyses should be refined by taking institutional differences into account. For example, the quality of banking supervision, the credibility of explicit insurance schemes, and political factors affecting implicit protection differ greatly across countries.

Demirguc-Kunt and Detragiache (2002) consider the effectiveness of prudential regulation and supervision, as well as the strength of the legal system, by allowing measures of institutional quality to interact with the deposit insurance variable. They find that the positive effect of explicit deposit insurance on the probability of banking crisis is reduced in countries with a high level of institutional quality in the mentioned respects. Barth et al (2004) and Cull et al (2004) support this view with respect to rule of law but not with respect to prudential regulation and supervision.[5] Angkinand (2005) analyses the impact of institutional variables such as Law and Order, Supervisory Power, and Corruption on the relationship between probability of banking crisis and deposit insurance. The variables are included separately as well as interactively with explicit deposit insurance coverage. She finds a limited but significant impact of some institutional variables standing alone. For example, corruption tends to be positively associated with banking crisis.

The above studies define banking crisis on the country level. The data on banking crises by country and year emanates from the World Bank. The criteria for banking crises in this data set is described in Caprio and Klingebiel (2003), who compiled the data from published financial sources and interviews with experts.

[5] Barth et al employ a new database on bank regulation and supervision described in Barth et al (2001)

Banking crises can also be defined on the bank level. There are a number of studies analyzing the relationships discussed here on this level. Gropp and Vesala (2001) analyze European banks finding that an explicit deposit insurance system is associated with a decline in banks' risk-taking incentives. This result contradicts the evidence reviewed above but since only European countries are studied and the EU imposed a requirement for minimum deposit insurance in the mid 90s, the results cannot be considered robust. Demirguc-Kunt and Huizinga (2004) take a different approach analyzing bank level interest rates in 30 countries. Deposit insurance and bank risk factors independently and interactively are introduced as explanatory variables. Explicit deposit insurance reduces interest rates as one would expect. The interaction term with banks' riskiness is positive and significant indicating that bank risk has a stronger impact on interest rates when there is explicit deposit insurance. This result can be interpreted to mean that explicit deposit insurance contributes to market discipline contradicting much of the analysis on the country level.

Nier and Baumann (2002) set out to test for the impact of market discipline on banks' risk taking developing three hypotheses with respect to factors reducing market discipline and increasing risk-taking. The three factors are the extent of the government safety net, lack of financing by uninsured creditors, and lack of observability of banks' risk choices. Using data for 729 banks in 32 countries during the period 1993-2000 they analyze banks' risk taking as a function of bank capital, market discipline variables, transparency measures and a number of country and bank specific control variables. They also consider that banks determine their capital ratios and risk taking simultaneously. Risk-taking is measured by the share of non-performing loans relative to total loans and provisions for non-performing loans. Market discipline is measured by the extent of deposit protection on the country level, the amount of uninsured

funding, and the extent of government support on the bank level. The extent of deposit protection is captured by the summation of dummies from Demirguc-Kunt and Sobaci (2000). The extent of uninsured funding is captured by the ratio between Deposits Due and Total Deposits including, for example, Certificates of Deposits. Government support is related to the size of a bank based on the Too Big To Fail argument. The results indicate strongly that bank capital is decreasing in deposit insurance coverage, increasing in uninsured deposits and decreasing in government support. The effects of the same market discipline variables on risk-taking are more ambiguous when controlling for effects on capital. Both the variable for deposit insurance coverage and the variable for extent of uninsured deposits have effects contradicting the hypotheses. The banks that are likely to obtain support because they are To Big to Fail seem be inclined to take more risk, however. Thus, lack of explicit deposit insurance and extent of uninsured deposits seem to affect risk-taking negatively only through the impact on desired capital while the likelihood of government support reduces market discipline both directly and through the effect on desired capital.

The analysis in Nier and Baummann puts the emphasis on the implicit guarantees by considering the Too Big to Fail argument and by distinguishing between deposits that have a high likelihood of remaining uninsured even in comprehensive deposit insurance systems. Although we work with country level data below, we will emphasize implicit guarantees and uninsured deposits while also considering that explicit and implicit insurance are not likely to be independent.[6]

[6] There is a strand of literature using bank level data focusing on market discipline effects on of uninsured creditors of banks. The uninsured creditors are holders of subordinated debt issued by banks. Market discipline is captured by the sensitivity of yields to changes in banks' risktaking, as well as by the effects of changes in yield on bank behavior.. For example, Jagtiani et al (2002) have analyzed this issue using American bank data while Sironi (2000) studies European bank data. In both cases there is evidence that subordinated debt yields are sensitive to banks risktaking while the impact of changes in yield on bank behavior is less clear. Distinguin et al (2005) use banks' stock returns to evaluate whether these data are superior to ratings in predicting distress.

3. Credibility of non-insurance and market discipline in banking

The literature reviewed in the previous section aim at discovering whether risk-taking incentives in banks stronger or weaker with expanded explicit deposit insurance coverage. We argue in this section that the relationship is likely to be U-shaped such that (excess) risk-taking is minimized at positive but partial deposit insurance coverage, and we analyze the conditions for positive and negative effects on risk-taking of expanded explicit coverage.

Policy makers recognize that banks' creditors are implicitly guaranteed to some extent. They also argue that as long as the guarantees are not explicit there is "constructive ambiguity" about the degree to which different creditors of banks will be bailed out in times of crisis. It is argued that this "constructive ambiguity" contributes to market discipline. It is possible, however, that absence of explicit guarantees leads to strong expectations that governments and regulators in times of crises will respond by issuing blanket guarantees of all creditors of banks or by bailing them out in other ways. If so, there is no ambiguity and the lack of insurance is not credible.

Banking crises tend to occur without much warning and, as a result, policy makers must react very quickly to stave off any threat to the financial system as a whole and to the payment system in particular. Many economists argue that the fear of contagion from one bank's distress to crisis for the banking system as a whole is exaggerated even if the bank has a substantial market share.[7] However, no government can allow itself to bide the time to see whether this hypotheis is correct. If the economists are wrong the costs of a systemic crisis will be politically unacceptable. The government and supervisors cannot wait to see whether a large bank is truly insolvent or only has a liquidity problem and, in case of insolvency, they cannot allow normal corporate insolvency procedures to work themselves out before creditors' claims are honored

[7] See, for example, Benston et al (1986)

fully or partially. An important function of the banking system is to supply liquidity and lack of trust in the banking system as a whole can rapidly become very costly. Central banks can provide liquidity assistance to banks in distress but the difficulty of distinguishing between liquidity-and insolvency crises in combination with the fear of contagion tends to compel governments to issue blanket guarantees of all creditors or to bail-out the bank through, for example, rapid recapitalization.

Empirical evidence in Angkinand (2005) indicating that costs of crises are relatively high in countries with low explicit deposit insurance coverage indicates that there are strong incentives for governments and regulators to react very quickly in times of crises in order to reduce crisis-costs.

One piece of evidence that governments tend to behave as described is that bank insolvencies rarely are resolved through formal bankruptcy procedures although corporate bankruptcy law applies to banks in most countries. Few countries have a separate insolvency law for banks and even if they do, the formal procedures are applied only when the distressed bank is very small and the risk of contagion is negligible.[8]

The argument so far implies that absence of explicit deposit insurance is equivalent to a strong implicit guarantee of banks creditors and sometimes even of shareholders. Many countries have introduced partial deposit guarantee schemes in order to reduce the risk of runs of such magnitude that banks must be closed while retaining an element of market discipline. There is little empirical evidence, however, with respect to the relation between the coverage of explicit deposit insurance and the strength of implicit guarantees of uninsured creditors and the uninsured parts of deposits.

[8] Caprio and Klingebiel (2003) and (1996) review a large number of banking crises and governments responses.

The fundamental arguments of this paper can now be developed more explicitly. These arguments are that market discipline requires that the non-insurance of groups of creditors and parts of deposits is credible, and that the credibility of non-insurance of those not covered by deposit insurance schemes increases as the coverage of explicit insurance schemes expands. The greater the coverage of explicit schemes the lower is the probability that governments and supervisors must intervene rapidly in distress situations to guarantee the claims of non-insured creditors. This reasoning implies that the effect of explicit insurance schemes on the degree of market discipline discouraging excessive risk-taking depends on three factors: the coverage of explicit deposit insurance schemes, the credibility of non-insurance of those not covered by explicit schemes, and the relation between the coverage of explicit insurance and the credibility of non-insurance. We argue that the latter relation depends on institutional and political factors affecting the costs of having groups of credibly non-insured creditors.

The arguments above are illustrated in Figure 1. On the horizontal axis we have the extent of explicit insurance coverage (EC) of deposits and other claims on banks. On the vertical axis we have the incentives of banks to take excessive risk (RT). We interpret risk-taking (RT) as the probability of a bank's capital buffer being exhausted within a certain timeframe. In other words, market discipline is declining and moral hazard incentives are becoming stronger along the vertical axis. We distinguish between excessive risk-taking caused by explicit deposit insurance (RT_{Expl}) and excessive risk-taking caused by lack of credibility of non-insurance (RT_{Impl}). Taking into consideration that credibility of non-insurance depends on the explicit coverage it follows that:

(1) $$\frac{\delta RT}{\delta EC} = \frac{\delta RT_{Expl}}{\delta EC} + \frac{\delta RT_{Impl}}{\delta EC}$$, where.

The line denoted "Explicit" shows how market discipline declines and risk-taking (RT) increases as explicit insurance coverage (EC) expands at a constant degree of credibility of non-insurance. We postulate the following relationship holding the credibility of non-insurance constant:

$$(2) \quad \frac{\delta RT_{Expl}}{\delta EC} > 0 \quad \text{and} \quad \frac{\delta RT^2_{Expl}}{\delta^2 EC} > 0$$

The second derivative implies that reducing explicit insurance has a relatively strong impact on risk taking if the explicit coverage is large, and a weak impact if explicit coverage is small as shown in Figure 1. In essence, there are "diminishing returns" in terms of market discipline when explicit coverage is reduced. In other words, it is sufficient to have a relatively small group uninsured of uninsured creditors to obtain substantial market discipline effects.

Turning to the credibility of non-insurance (CNI), this variable is defined as the credibility of non-insurance per non-insured dollar. The impact of non-insurance on risk-taking depends on CNI as well as the size of the non-insured group (1-EC). In the following no distinction will be made between effects of CNI and CNI(1-EC). Their properties are similar[9] and it can be assumed that market discipline effects depend primarily on the existence of a group of risk sensitive creditors. The size of this group is likely to be less important.[10]

The relationship between explicit coverage (EC) and risk-taking effects of credible non-insurance is described by the line "Implicit" in Figure 1. This line is drawn under the assumption that risk-taking effects of explicit insurance are constant. It is assumed to have the following properties taking into consideration that CNI depends indirectly on the effect of the explicit coverage on the credibility of non-insurance:

[9] It can be shown that the results below with respect to market discipline effects on credibility of non-insurance are further strengthened if the since of the groups were taken into account.
[10] Proposals to require banks to issue subordinated debt as part of their capital requirement rely on the same assumption. Subordinated debt issues would amount to around two percent of risk-weighted assets.

(3a) $\frac{\delta RT_{Impl}}{\delta EC} = \frac{\delta RT_{Impl}}{\delta CNI}\frac{\delta CNI}{\delta EC}$, where

(3b) $\frac{\delta RT_{Impl}}{\delta CNI} < 0$ and $\frac{\delta RT^2_{Impl}}{\delta^2 CNI} > 0$, and

(3c) $\frac{\delta CNI}{\delta EC} > 0$ and $\frac{\delta CNI^2}{\delta^2 EC} < 0$

The expressions in (3b) state that risk-taking incentives are declining in credibility of non-insurance, and that increasing credibility has "diminishing returns" in terms of effect on risk-taking. The expressions in (3c) state that the credibility of non-insurance is increasing in explicit insurance coverage, and that increasing the explicit coverage has "diminishing returns" in terms of increased credibility on non-insurance. It follows that:

(4) $\frac{\delta RT_{Impl}}{\delta EC} < 0$ and that $\frac{\delta RT^2_{Impl}}{\delta^2 EC} > 0$

The derivative in (4) can be derived diagrammatically as well. Figure (2a) shows in the first quadrant how CNI increases as EC increases under assumption (3c). The Second quadrant describes how risk-taking (RT) is affected by credibility of non-insurance (CNI) under assumption (3b). The third quadrant is a 45 degree line transporting RT to the fourth quadrant, where the relation (4) between risk-taking incentives and credibility of non-insurance is illustrated.

Expression (4) is described by the negatively sloping curve denoted Implicit in Figure 1. The total effect on risk-taking from increasing explicit insurance coverage (EC) as expressed in expression (1) is described by the vertical summation of the curves Explicit and Implicit in Figure 1. This summation is shown as the U-shaped curve RT.

Although the U shaped relationship described in Figure 1 constitutes the main hypothesis to be tested below, it follows from the above discussion that the U-shape as a mathematical

necessity requires specific depends assumptions about the second derivatives in particular. If the second derivatives for both Implicit and Explicit had the opposite sign the RT-curve would have a maximum instead of a minimum. In this case the risk-minimizing deposit insurance system would be either no explicit insurance or a blanket guarantee. This would happen, if for low EC-coverage, the effect of increased credibility of non-insurance would be smaller than the effect of increased explicit insurance, and for high EC-coverage if the relative effects were reversed. Figure 2a shows two examples of alternative assumptions about the relation between EC and CNI. In one case EC does not affect the credibility of non-insurance and, as a result, changes in EC will not influence risk-taking through the implicit protection channel. In another case, CNI actually falls when EC rises. This case would occur, for example, if political circumstances cause explicit as well as implicit protection of banks creditors to strengthen. Risk-taking is unambiguously increasing in EC in this case.

The impact of specific institutional factors on the relationships described above is analysed in the next section. We conclude this section by stating the first hypothesis based on Figure 1 to be tested below:

Hypothesis 1: *Banks' risk-taking (reflecting strength of moral hazard incentives) depends on the coverage of explicit deposit insurance schemes in such a way that risk-taking is relatively high for very low and very high levels of coverage, and minimized when there is positive but partial coverage.*

This hypothesis will be tested in Section 6 using two proxies for risk-taking; the occurrence of banking crisis in countries, and the share of non-performing loans in loan portfolios of countries' banks.

4. Institutional characteristics, the credibility of non-insurance and risk-taking.

In his section we analyze how institutional factors affect the analysis if credibility of non-insurance and risk-taking incentives in the framework of Figures 1 and 2. The institutional factors included in the empirical analysis below are Powers of Supervisors, Powers and Procedures for Prompt Corrective Action, Rule of Law, Bureaucratic Quality and Corruption.

The role of regulation and supervision in coping with the moral hazard incentives induced by explicit and implicit guarantees of banks' creditors has been emphasized by policy-makers as well as many economists.[11] In Figure 2 supervisory control of banks' risk-taking affects the relationship between CNI and RT in the second quadrant. Complete control would render market discipline superfluous and the relationship in the second quadrant would be a straight vertical line. We rather expect that supervisors have only marginal control over risk-taking. In this case, curve I in the second quadrant in Figure 2b shifts to the right and becomes steeper resulting in curve II. This shift leads to a corresponding shift in the fourth quadrant from curve I to curve II. In Figure 1 the U shaped curve becomes flatter and possibly lower, since strong supervision reduces the sensitivity of risk-taking to market discipline whether induced by implicit or explicit insurance.

It was mentioned above that explicit, predetermined distress resolution procedures for banks could enhance the credibility of non-insurance, since such procedures alleviate the need of governments and supervisors to quickly guarantee large parts of the banking system out of fear of contagion and bank runs. Few countries have such procedures but the United States and a few other countries have implemented or discuss implementing Prompt Corrective Action procedures (PCA). These procedures reduce the likelihood of crises and allow supervisors to take action at

[11] See, for example, Demirgüc-Kunt and Huizinga (2004)

an early stage without having to issue far-reaching guarantees. In Figure 2b the implementation of PCA procedures would shift the curve in the first quadrant relating EC and CNI up and the shift would be larger at low levels of EC than on high levels. In other words, bank distress resolution procedures and PCA procedures are likely to contribute the most to CNI when explicit coverage and CNI are low to begin with. Thus, implementation of PCA procedures leads to a shift from I to III in the first quadrant and a shift in the fourth quadrant from I to III as well.

The impact of PCA procedures in Figure 1on total effects of explicit and implicit protection are captured can be derived from the shift in Figure 2b. The curve denoted Implicit in Figure 1 shifts down and relatively more at low levels of EC leading to a flatter total curve at low levels of EC, a lower amount of risk-taking at the minimum, and a minimum at a lower level of explicit coverage. This means that effective PCA procedures that enhance the credibility of non-insurance enable countries to lower the coverage of explicit deposit insurance schemes in order to minimize excess risk-taking.

Other institutional characteristics of countries that can enhance the credibility of non-insurance are the existence of an effective legal system with credible enforcement (Rule of Law), an effective and honest public sector bureaucracy and lack of corruption. These characteristics are often conceptually interwoven. Rule of law implies that laws and regulation have relatively high credibility as they stand; an effective and honest bureaucracy means that the agenda of, for example, supervisors do not differ much from a publicly stated agenda, and lack of corruption implies that the agenda is not captured by special interests. Thus, all these characteristics are expected to affect credibility of non-insurance the same way prompt corrective action does. This discussion leads to the second hypothesis:

Hypothesis 2.a. *Institutional characteristics, such as the existence of Prompt Corrective Action Procedures for banks in distress, ex ante insolvency procedures for banks, Rule of Law and other characteristic contributing to credibility of non-insurance of banks' creditors, cause improved market discipline, and therefore, a reduction in banks' risk-taking caused by moral hazard incentives.. This reduction in risk-taking is relatively large at low levels of explicit coverage of deposit insurance schemes. Furthermore, the minimum level of risk-taking occurs at a lower level of explicit coverage.*

Hypothesis 2b: *Strengthened supervision and control of banks' risk-taking caused by moral hazard incentives leads to reduced risk-taking and less sensitivity of risk-taking to changes in explicit deposit insurance coverage.*

The remainder of the paper is devoted to testing of Hypotheses 1 and 2 with respect to market discipline and risk-taking, and their relationship to explicit coverage of deposit insurance schemes and institutional characteristics of countries.

5. Methodology and Data

Two models are used to test the Hypothesis 1 stating that risk-taking caused by lack of market discipline has a U-shaped relationship with the degree of explicit protection of depositors and other creditors of banks. First, the occurrence of banking crises is used evidence of excessive risk-taking. In this case, a Logit model of banking crises is estimated. The specification is the following:

$$L_{i,t} = \ln\left[\frac{P_{i,t}}{1-P_{i,t}}\right] = \alpha + \beta_k x_{k,i,t-1} + \delta_1 EC_{i,t-1} + \delta_2 (EC_{i,t-1})^2 + \varepsilon_{i,t-1}$$

$$\text{, where } P_{i,t} = \text{prob}(BC_{i,t-1} = 1 \mid x_{i,t-1}, EC_{i,t-1}) = \frac{1}{1+e^{-(\alpha+\beta_k x_{i,t-1}+\delta_1 EC_{i,t-1}+\delta_2 EC_{i,t-1}^2)}}$$

where $BC_{i,t}$ is a banking crisis dummy variable, which takes a value of 1 in crisis years, and 0 if there is no crisis. $\ln[P_{i,t}/1\text{-}P_{i,t}]$ is the odd ratio of the Logit estimation, where $P_{i,t}$ is the probability that a banking crisis occurs, in which case $BC_{i,t}$ equals to 1. The subscript *i* refers to a country and *t* indicates time. A variable measuring the coverage of explicit deposit insurance, EC, enters in the quadratic functional form. Our hypothesis of a U-shaped relationship between banking crises and the degree of explicit protection is supported if the estimated coefficient for the squared term (δ_2) is positive and significant, and if the estimated coefficient for the linear term (δ_1) is negative and significant. The proxies for EC are described below. The proxy for EC enters with a lag to avoid a potential simultaneity problem caused by political decisions to adopt explicit deposit insurance schemes or alter the coverage limits as responses to banking crises. To further reduce potential simultaneity and to check for robustness, we run regressions including only the first crisis year within each crisis episode.

For control variables, *x* is a *k*-element vector of macroeconomic and financial variables, which comprises the real GDP per capita, the real GDP growth rate, the ratio of money supply to international reserves, the ratio of domestic credit provided by banking sector to GDP, the ratio of current account to GDP, the inflation rate, and the real interest rate. These are a standard set of control variables used in the reviewed literature. By using the same variables, our results become comparable to those in the literature where the quadratic relationship is not considered.

All control variables are lagged one period to avoid potential simultaneity. The pre-crisis current account surplus is expected to reduce the probability of crises. The pre-crisis rate of inflation, real interest rate, ratio of money supply to foreign reserves, and ratio of domestic credit to GDP are expected to increase the likelihood of crises. $\varepsilon_{i,t}$ is the error term.

Banking crises dates and definitions are taken from Caprio and Klingebiel (2003), who compile the data based on the published financial sources and interviews with experts. There are to kinds of banking crises; a systemic banking crisis is defined as the situation when much or all of bank capital is exhausted; a borderline banking crisis is identified when there is evidence of significant banking problems such as a government intervention in banks and financial institutions. We investigate the relationship between the credibility of non-insurance, CNI, and deposit insurance coverage, EC, using all crisis episodes, as well as, focusing on systemic crises alone. In addition, we divide the sample into three country groups; industrial, developing and emerging market countries allowing for different relationships between CNI and EC in within the three groups.

The ratio of bank non-performing loans to total loans (NPL) is used as an alternative proxy for excessive risk-taking. In this case, the ordinary least square (OLS) method is employed in regressions on the same set of proxies for explicit deposit insurance coverage and the same set of lagged control variables.

$$NPL_{i,t} = \alpha + \beta_k x_{k,i,t-1} + \delta_1 EC_{i,t-1} + \delta_2 (EC_{i,t-1})^2 + \varepsilon_{i,t-1}$$

A relatively reliable set of date for NPL is obtained from the IMF's Financial Stability Reports wherein the IMF has published own measures on the country level since 1997.

To test Hypothesis 2 referring to the impact of institutional variables on the relationship between each proxy for risk-taking and explicit deposit insurance, the following specification is used:

$$Y_{i,t} = \alpha + \beta_k x_{k,i,t-1} + \delta_1 EC_{i,t-1} + \delta_2 (EC^2_{i,t-1}) + \phi(Institution_{i,t-1} \times EC^2_{i,t-1}) + \theta(Institution_{i,t-1}) + \varepsilon_{i,t}$$

Logit estimation is used when the dependent variable, $Y_{i,t}$, is a crisis dummy, while OLS is used when the dependent variable is NPL. Regressions are run for each institutional variable

that enters as a separate variable and squared interacting with the variable EC capturing explicit coverage of deposit insurance. Institutional variables include proxies for prompt corrective action procedures, as well as for the quality of domestic institutions such as Rule of Law and (lack of) corruption. A significantly positive value of $\delta_2 + \phi$ indicates the positive quadratic relationship and the curvature is captured by the extent of δ_2, ϕ, and θ.

The estimation is based on a sample of 140 countries, 21 industrial, 35 emerging market, and 84 developing countries, during the period of 1985-2003 when the occurrence of banking crisis is used and 1997-2003 when NPL is used. The list of countries is shown in table (1) and descriptive statistics are reported in table (3).

Data for Deposit Insurance Coverage

Three variables of explicit deposit insurance coverage are constructed based on the Database of Deposit Insurance Around the World published by Demirgüç-Kunt, Karacaovali, and Laeven, (2005), at the World Bank. This database, which is updated from its previous version, provides the time-series data for the deposit insurance coverage in each country.

The first variable, called Covdep, is constructed by assigning a value of 0-3 scale in six steps to the variable defined as the ratio between Coverage per Deposit and Deposit-value Per Capita from Demirgüç-Kunt et al. (2005)'s database. This and other variables are described in Table 2. A value of 0 is assigned for a country without explicit deposit insurance, a value of 1 if a country has explicit deposit insurance with the coverage limit less than 5 times of deposits per capita.[12] It is assigned values of 1.5, 2, 2.5 when the coverage limit is between [5, 10), [10, 15), and greater than 15 times of deposits per capita. If the Coverage to Deposits Per Capital Ratio is

[12] Note that even if the coverage limit is several times the average deposit there will be a certain proportion of deposits that are not covered completely. The greater the limit the smaller is the share of deposits without full coverage.

defined as “Full”, the Covdep proxy is assigned a value of 3. The second variable, called Covgdp, is constructed in the similar way but it is based on data for the ratio between Coverage per deposit and GDP Per Capita (see Table 2).

The third variable is constructed based on the features of an explicit deposit insurance system. This index, called Comprehensive Deposit Insurance, is aggregated from four dummy variables as described in Table 2. These dummy variables tell whether foreign currency deposits are covered explicitly, whether interbank deposits are covered, whether the system lacks coinsurance, and whether there is full coverage dummy[13]. The value of the Comprehensive Deposit Insurance variable, therefore, varies from 0-4, where the higher value indicates an explicit system that is designed to comprehensively protect depositors and creditors.

Tables (4)-(5) explore the frequency of and correlation among these three deposit insurance coverage variables. The frequency table 4a suggests that 35.2% of the countries that have an explicit deposit insurance system limit the deposit insurance coverage to less than 5 times of deposits per capita (Covdep), and 67% for coverage limit per GDP per capita (Covgdp). Industrial countries are generally the countries with relatively low coverage limits. From tables 4b-4d, 52.3% of industrial countries limit the coverage to less than 5 times of deposit per capita, while only 22.3% and 25.5% of emerging markets and developing countries limit the coverage within this range when they have coverage.

The frequency tables (the far right tables) show that most explicit systems protect foreign deposits (68.9% of all observations) and have no-coinsurance (79% of all observations). Only few countries (about 19% of all observations) protect interbank deposits. 13.4% of the countries have a full deposit insurance coverage. Industrial, emerging market, and developing countries are

[13] The construction of the index by aggregating dummy variables of deposit insurance features follows Nier and Baumann (2002)

comparable with respect to these features of explicit deposit insurance systems. Considering the total score for the Comprehensive DI variable (the third tables from the left), it can be seen that all countries with explicit deposit insurance have at least one of the features described.

Table (5) shows that Covdep and Covgdp are highly correlated (the correlation coefficients vary from 0.71 to 0.86 depending on the group of countries). However, both variables are less correlated with the comprehensive deposit insurance (Comp DI) variable, suggesting that results of the analysis below may depend on the proxy employed.

Data for Institutional Characteristics

Testing of Hypothesis 2a require measures characterizing the institutional environment and its contribution to credibility of non-insurance. Prompt Corrective Action procedures for dealing with banks in distress were emphasized in Section 4 We use data for Prompt Corrective Action procedures from the survey database of Regulation and Supervision of Banks around the World, compiled by Barth, et al. (2004). The variable *Prompt Corrective Action Power (PCP)* described in Table 2 indicates the existence of a formally specified predetermined level of bank solvency for authorities' to intervene at (1/0), multiplied by the sum of six dummies indicating the power of supervisors to resolve the distressed bank's problems. We also construct an alternative index from the survey questions and call this variable *Corrective Action and Early Intervention (CAEI)*. As shown in Table 2, this variable is the sum of the dummies in *PCP* according to Barth et al without the multiplication by the dummy for the existence of a formal capital ratio for intervention. The reason for not using this multiplicative dummy is that we suspect that most countries abide by Basel Capital Requirements whether formally stated or not. Another reason is that even if a ratio for intervention is formally specified only the USA has clearly specified steps, as well as actions, and actions for increasingly severe intervention.

Two variables from the International Country Risk Guide (ICRG) are used as proxies for the quality of domestic institutions: *Rule of Law* and *Corruption*. For each variable, the higher value indicates a stronger institutional environment.

Hypothesis 2b referring to the effects of supervision on banks' risk-taking is tested using another survey variable from Barth et al (2004). *Official Supervisory Power (Ospower)* measures the extent of supervisory authority power in taking actions to influence banks' risk-taking.

The data for economic and financial control variables described in Table 2 are from the World Development Indicators, the World Bank

6. Empirical Results

Probability of banking crisis

The first empirical task is to compare results using the linear formulations in the previous literature for the relation between banking crisis as a proxy for excessive risk-taking and explicit deposit insurance coverage with the quadratic formulation based on Hypothesis 1. Table (6) reports Logit regression results for both linear and quadratic relationships for all countries between the occurrence of banking crises (BC) and explicit deposit insurance coverage (EC). In column (1) there is a simple dummy variable for the existence of an explicit deposit insurance scheme. Columns (2), (4), and (6) report results for linear formulations with respect to different proxies for deposit insurance coverage, while the latter proxies enter quadratically as well in columns (3), (5) and (7). In the linear models, the estimated coefficients for an explicit deposit insurance dummy and each proxy for explicit coverage of deposit insurance (Covdep, Covgdp, or CompDI) are positive and significant at the 1% level. These results confirm those in Demirgüç-Kunt and Detragiache (2002), Hutchison and McDill (1999), and Barth, et al. (2004).

Among the control variables, real GDP per capita and pre-crisis GDP growth have a statistically significantly negative relationship with the probability of banking crises. The pre-crisis ratios of money supply to reserves and domestic credit to GDP, as well as the pre-crisis inflation rate are statistically significant and increasing the likelihood of banking crises. The results for these variables are quite consistent across different formulations and will not be discussed further.

Introducing the squared explicit coverage variables we obtain strong support for a U-shaped relationship between probability of banking crisis and explicit deposit insurance coverage. In column (3) the coefficient for Covdep becomes negative while the coefficient for the squared Covdep is positive and significant at the 1% level. The results are similar for the CompDI proxy. The Wald Chi-square statistics, Pseudo R-square, and the likelihood ratio tests indicate that the quadratic estimations have a better fit than the linear ones for these two deposit insurance proxies but not for Covgdp.

The support for the U-shaped relationship is further strengthened when the sample is limited to industrial and emerging market economies in Table (7a). For these countries the coefficients for the linear terms are negative and the coefficients for the quadratic terms are highly significant and positive for all three proxies for explicit coverage (columns 2, 4 and 6 in table 7a).

The observation in Section 3 that the relationship need not be U-shaped under all institutional arrangements is confirmed within the sample of developing countries in Table (7b). The estimated coefficient for the squared proxies for deposit insurance coverage variable are negative, which is inconsistent with a U-shaped relationship but consistent with the existence of an intermediate level of explicit coverage maximizing the probability of banking crisis.

Before discussing reasons for the differences across country groups the results can be illustrated in graphs. Figure (3) shows graphs describing the relationship between the explicit coverage proxies and the probability of crisis within the three country groups. Average values for all other variables within the sample groups are used when constructing the graphs. The U-shaped relation is clearly shown for industrial countries and for emerging markets when the Covdep proxy is used. For the other proxies there is a positive relation within the emerging markets group. For developing countries the relationship has a maximum for the Covdep and the ComprehensiveDI proxies. In general the Covdep proxy reveals more curvature because it has a larger number of intervals than ComprehensiveDI. It is likely that the definition of Covdep resembles the share of deposits being explicitly insured more closely than Covgdp.

The curvature was explicitly related to assumptions about second derivatives expressing "diminishing returns" in terms of risktaking incentives and credibility of non-insurance to changes in explicit coverage. The institutional characteristics of developing countries do not seem to support the assumptions behind Hypothesis 1. In these countries the credibility of non-insurance may not be sensitve to changes in explicit coverage and risk-taking incentives may be insensitive to explicit coverage if this coverage is not very credible in the first place. Compensation to depositors in case of loss may be slow as well as uncertain. Under these circumstances it is possible that the explicit coverage that minimizes the probability of banking crisis lies on one of the extremes; no explicit coverage or full explicit coverage (with low credibility).

In the following we focus on developing and emerging market economies. Before turning to institutional characteristics and results for non-performing loans the robustness of the U-shape results can be established. For this purpose we consider only systemic banking crises in Table (8)

for all countries and for industrial and emerging market countries. The results are very similar to those presented above

In table (9) we check whether results so far may be affected by simultaneity bias between crisis and coverage. In this table only the first year of each crisis is included in the sample. Crisis observations for subsequent crisis years are excluded. The results indicate that the significance levels of the estimated coefficients for the quadratic terms are higher within the sample of industrial and emerging market countries. The lower significance for all countries is also consistent with the previous results for developing countries. Thus, Table (9) confirms previous results and indications that developing countries should be considered separately.

Additional robustness checks refer to the scaling of the Covdep and Covgdp proxies. We rescale these two variables to check whether our findings are sensitive to the scales and whether the optimal (minimum probability of crisis-) level can be narrowed. This robustness check gives similar results and confirms that the optimal level of partial deposit insurance is where the two ratios take values between 4 to 5 in the sample of All countries. If a country increases the coverage limit beyond this level, the probability of crises will increase at an increasing rate. The highest probability of crises occurs not surprisingly when full coverage is implemented but no coverage is also associated with a relatively high probability of crisis.

Distinguishing between Industrial and Emerging market economies the results suggest that in order to minimize the likelihood of banking crises, Industrial countries should maintain a slightly lower limit of explicit protection (regardless of whether partial deposit insurance coverage is measured by Covdep, Covgdp, or Comprehensive DI) than Emerging market economies. For industrial countries, the optimal level for Covdep is one. For Emerging markets the optimal level is only slightly higher as shown in Figure 3.

Non-performing loans and institutional characteristics

We turn now to testing of Hypothesis 2 considering the role of countries' institutional characteristics for the relationship between banks' risk-taking and deposit insurance coverage. Non-performing loans are introduced as an alternative proxy for risk-taking.

Tables 10a-10c presents results for regressions exploring the role of institutional factors in Industrial and Emerging Market Economies. The dependent variables are the occurrence of banking crises (BC) in 10a, the ratio of non-performing loans to total loans (NPL) in 10b, and the ratio of NPL to bank capital over risk-weighted assets in 10c.[14] Results for control variables are not included and the Covgdp proxy for deposit insurance coverage has been excluded.

A first observation is that the quadratic relationship between risk-taking and explicit deposit insurance coverage is confirmed when using NPL as a proxy.[15] The quadratic term is significant when interacting with institutional variables. The result is stronger for NPL alone in 10b than for NPL relative to the capital ratio in 10c.

The institutional variables are introduced one by one and each model in the Tables includes one proxy for explicit coverage (Covdep or Comp DI). The institutional variables (described in Table 2) are Prompt Corrective Action Power (PCP) from Barth et al (2004), Corrective Action and Early Intervention (CAEI) that excludes the multiplicative dummy for a formal intervention trigger, Official Supervisory Power (Ospower), a Rule of Law index (Law), and a Lack of Corruption index (Corruption). Each of these variables are standing alone in the regressions and they interact with the squared deposit insurance coverage proxy.

[14] The NPl data as well as bank capital data are taken from IMF's Financial Stability reports wherein the data are based on "National authorities and IMF staff estimates."
[15] In regressions with NPL as proxy for risk-taking and excluding institutional variables the quadratic relation appears but significant only on a level below 10 percent.

The results show that the estimated coefficients for the interaction between the coverage proxy and PCP, CAEI, and Ospower are significant in most regressions. The PCP variable is most significant in the banking crises regressions in 10a while CAEI is most significant in the NPL regressions. Rule of Law is generally not significant while Corruption has a significant effect on banking crises as well as non-performing loans.

The magnitude and direction of the effects of these institutional variables on risk-taking relative to Hypothesis 2 can be identified most easily in Figures 3a and 3b where predicted values from the regressions are plotted for average values of the control variables. The fully drawn lines show the relationships without institutional variables while the dotted lines show the impact of each of these variables on the two proxies for risk-taking.

The impact on the institutional variables on the probability of banking crises appears much smaller than the impact on NPL although the coefficients are significant in several cases in the banking crises regressions in Table 10a. The hypothesis 2a stating that institutional characteristics enhancing the credibility of non-insurance should flatten the slope at low levels of deposit insurance coverage and shift the minimum point downwards and to the left is supported for CAEI, Ospower, and (lack of) Corruption. The PCP variable flattens the relationship across the range of coverage. It was expected that the Ospower reflecting the power of supervisors would have this flattening effect according to Hypothesis 2b. However, it is possible that the power of supervisors proxied by Ospower captures the same ability to intervene in distress situations as the CAEI variable.

As a whole the results lend further credence to the argument that credibility of non-insurance of groups of creditors enhances market discipline on banks' risk-taking incentives, and

that this credibility is enhanced by institutions that reduce the costs associated with banks in distress.

7. Conclusions

The ambiguity in previous empirical work with respect to effects of deposit insurance schemes on banks' risk-taking and, in particular, on the probability of banking crises can be resolved if it is recognized that absence of deposit insurance is rarely credible and that the credibility of non-insurance can be enhanced by explicit deposit insurance schemes. We showed that under reasonable conditions for effects on risk-taking of creditor protection in banking, and for effects on credibility of non-insurance of explicit coverage of deposit insurance schemes, there exists a partial level of coverage that maximizes market discipline and minimizes moral hazard incentives for risk-taking in banking.

The empirical results presented here using both the occurrence of banking crises and non-performing loans in the banking sector as proxies for excessive risk-taking strongly support the existence of a partial level of deposit insurance coverage that maximizes market discipline effects on banks' incentives to take excessive risk in industrial and emerging market economies. It was also shown that institutional characteristics of countries that enhance the credibility of non-insurance reduce risk-taking and lower the "optimal" coverage of deposit insurance schemes. The most important institutional factors from this point of view are those that allow banks to become distressed and fail without creating serious contagion effects within a country's banking system.

The importance of institutional characteristics of countries was borne out by the results for developing countries. We found that these countries would maximize market discipline if they go to the extremes of either no deposit insurance or full deposit insurance. The reasons for

this result could be that stated deposit insurance schemes lack credibility and that changes in the coverage of these schemes affect the credibility of non-insurance very little.

The hypotheses developed here should be tested on individual bank data as well in order to analyze how country characteristics interact with bank characteristics to determine risk-taking incentives. Policy recommendations on the country level require analyses of institutional factors affecting the credibility of non-insurance of different creditor groups. It seems clear that lowering the coverage of explicit deposit insurance system need not generally enhance market discipline unless such an action is accompanied by, for example, the implementation of distress resolution procedures for banks. Conversely, the implementation of such procedures would allow governments to reduce explicit deposit insurance coverage and, thereby, to strengthen market discipline. These procedures should allow supervisory authorities to close down a bank without fearing contagion effects even when there is no bail-out of creditors across the board.

Table (1) List of Countries

Industrial Countries	Emerging Markets	Developing Countries	
Austria	Argentina	Albania	Kyrgyz Republic
Australia	Brazil	Angola	Laos
Belgium	Bulgaria	Armenia	Latvia
Canada	Chile	Azerbaijan	Lebanon
Denmark	China	Bahamas	Lesotho
Finland	Colombia	Bahrain	Macedonia
Germany	Egypt	Bangladesh	Madagascar
Greece	Estonia	Barbados	Malawi
Iceland	Ghana	Belarus	Maldives
Ireland	Hong Kong	Belize	Malta
Italy	Hungary	Bhutan	Mauritania
Japan	India	Bolivia	Mauritius
Netherlands	Indonesia	Botswana	Moldova
New Zealand	Israel	Burkina Faso	Mongolia
Norway	Jordan	Burundi	Mozambique
Portugal	Kenya	Cambodia	Namibia
Spain	Korea	Cameroon	Nepal
Sweden	Lithuania	Cape Verde	Nicaragua
Switzerland	Malaysia	Central Africa	Niger
United Kingdom	Mexico	Chad	Oman
United States	Morocco	Congo, Republic	Panama
	Nigeria	Costa Rica	Papua New Guinea
	Paraguay	Cote d´Ivoire	Rwanda
	Philippines	Croatia	Senegal
	Poland	Czech Republic	Seychelles
	Russia	Cyprus	Sierra Leone
	Singapore	Dominican Republic	Solomon Islands
	Slovak Republic	Ecuador	St. Lucia
	Slovenia	El Salvador	Suriname
	South Africa	Ethiopia	Swaziland
	Sri Lanka	Fiji	Syria
	Thailand	Gabon	Tanzania
	Ukraine	Gambia	Togo
	Venezuela	Georgia	Trinidad and Tobago
	Zimbabwe	Grenada	Tunisia
		Guatemala	Uganda
		Guinea Bissau	Uruguay
		Guyana	Vanuatu
		Haiti	Vietnam
		Honduras	Western Samoa
		Jamaica	Yemen
		Kuwait	Zambia

Table (2) Data Descriptions

Variable	Description	Source
Banking Crisis	The banking crisis dummy, which is equal to 1 in a banking crisis year (both systemic and nonsystemic banking crises), and 0 otherwise	Caprio and Klingebiel (2003)
Systemic Banking Crisis	The banking crisis dummy, which is equal to 1 in a systemic banking crisis year, and 0 otherwise	Caprio and Klingebiel (2003)
Nonsystemic Banking Crisis	The banking crisis dummy, which is equal to 1 in a nonsystemic banking crisis, and 0 otherwise	Caprio and Klingebiel (2003)
NPLs	The ratio of bank non-performing loans to total loans (%)	IMF
NPLs to capital	The ratio of NPLs to bank regulatory capital to risk-weighted assets	IMF
Real GDP Per Capita	Real GDP per capita (constant 2000 US$). The data is in 100 U.S.$	WDI
Real GDP Growth Rate	Real GDP growth (annual %)	WDI
CA to GDP	Current account balance (% of GDP)	WDI
Domestic Credit	Domestic credit provided by banking sector (% of GDP)	WDI
M2 to Reserve	Money and quasi money (M2) to gross international reserves ratio	WDI
Inflation	Inflation, consumer prices (annual %)	WDI
Real Interest Rate	Real interest rate (%)	WDI
Explicit Deposit Insurance	The explicit deposit insurance dummy, which is equal to 1 in a year that a country has an formal deposit insurance system, and 0 otherwise.	Demirgüç-Kunt, et al. (2005)
Coverage Limit to Deposits per Capita (Covdep)	The ordinal data of the ratio of deposit insurance coverage per deposits per capita. The value of this variable is assigned based on a value of the coverage to deposits per capita. This variable is equal =0 if there is no explicit deposit insurance coverage =1 if the coverage to GDP per capita ratio is between (0,5) =1.5 if the coverage to GDP per capita ratio is between [5,10) =2 if the coverage to GDP per capita ratio is between [10,15) =2.5 if the coverage to GDP per capita ratio is greater than or equal 15 =3 if there is blanket deposit guarantee	Authors' construction Coverage to GDP per capita ratio is from Demirgüç-Kunt, et al. (2005)
Coverage Limit to GDP per Capita (Covgdp)	The ordinal data of the ratio of deposit insurance coverage to GDP per capita. The value of this variable is assigned in the same way of coverage per deposits per capita.	Authors' construction (the data of coverage to deposits per capita ratio is from Demirgüç-Kunt, et al., 2005)
Comprehensive Deposit Insurance	The summation of four dummy variables: 1. whether an explicit system covers foreign deposits, 2. whether an explicit system covers interbank deposits, 3) whether an explicit system has no coinsurance, and 4) whether the full deposit guarantee is implemented (yes=1, no=0).	Authors' construction (four deposit insurance dummies are from Demirgüç-Kunt, et al., 2005)
Prompt Corrective Power (PCP)	This variable is constructed by summing 6 survey questions relating to bank intervention powers (yes=1, no=0). This variable is then multiplied by 1 for a country with formally established law that identifies pre-determined levels of bank solvency deterioration which force automatic action such as intervention. PCP variable is scaled 0-6.	Barth, Caprio, and Levine (2004)
Corrective Action an Early Intervention (CAEI)	CAEI is the aggregated index of 6 survey questions used to construct PCP. This variable captures the extent of supervisors' prompt corrective action and intervention power, but does not consider the existence of a written law on pre-determined level of bank solvency deterioration (see section 5)	Authors' construction (six survey questions are from Barth, et al., 2004)
Ospower	The official supervisory power variable is scaled 0-16, based on 16 surveyed questions including 6 questions used to scale the prompt corrective action variable	Barth, et al. (2004)
Law	The rule of law and order index with the scale of 1-6; high values indicate better quality of law and order.	International Country Risk Guide
Corrupt	The corruption index with the scale of 1-6; high values indicate less corruption.	International Country Risk Guide

Table (3) Summary Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
Banking Crisis	1983	0.1997	0.3999	0	1
Systemic Banking Crisis	1983	0.1483	0.3554	0	1
NPLs	453	10.3461	9.0558	0.4	48.6
NPLs to Capital	428	1.9350	23.5170	-8.4761	486
Real GDP Per Capita	1983	64.9916	87.5678	0.7474	405.2650
Real GDP Growth Rate	1983	3.4373	4.5537	-42.4511	38.2007
CA to GDP	1983	-2.9472	7.9540	-46.6825	43.3987
Domestic Credit	1983	58.7827	47.2552	-77.3779	321.7523
M2 to Reserve	1983	8.3928	13.8718	0.1909	147.0156
Inflation	1983	27.4538	244.9815	-100	7485.4920
Real Interest Rate	1983	7.5552	17.9792	-99	127.6362
Explicit Deposit Insurance	1983	0.3701	0.4830	0	1
The Coverage of Deposit Insurance (All Countries)					
Explicit Deposit Insurance	1983	0.3853	0.4868	0	1
Covdep	1983	0.6220	0.9573	0	3
Covgdp	1983	0.5169	0.8007	0	3
Comprehensive Deposit Insurance	1975	0.6876	0.9960	0	4
Foreign Deposit Covered	1975	0.2623	0.4400	0	1
Interbank Deposit Covered	1975	0.0734	0.2609	0	1
No Coinsurance	1983	0.3006	0.4586	0	1
The Coverage of Deposit Insurance (Only countries with explicit deposit insurance)					
Covdep	764	1.6145	0.8810	0	3
Covgdp	764	1.3416	0.7466	0	3
Comprehensive Deposit Insurance	756	1.7963	0.7743	0	4
Foreign Deposit Covered	756	0.6852	0.4647	0	1
Interbank Deposit Covered	756	0.1918	0.3940	0	1
No Coinsurance	764	0.7801	0.4144	0	1
Corrective Action and Institutional Quality Variables					
PCP	1662	2.3111	2.5310	0	6
CAEI	1608	4.1822	1.7094	1	6
Ospower	1636	10.5339	2.7544	4	14
Law	1629	3.9391	1.4365	0	6
Corrupt	1629	3.1147	1.3068	0	6

Table (4) The Frequency Tables of Partial Deposit Insurance Variables (only countries with explicit deposit insurance systems)

A. All Countries

Covdep		
Scale	Frequency	Percent
1	269	35.21
1.5	123	16.10
2	71	9.29
2.5	128	16.75
3	106	13.87
NA	67	8.77
Total	764	100

Covgdp		
Scale	Frequency	Percent
1	512	67.05
1.5	94	12.30
2	12	1.57
2.5	12	1.57
3	102	13.87
NA	28	3.66
Total	764	100

Comprehensive DI		
Scale	Frequency	Percent
1	296	39.15
2	317	41.93
3	128	16.93
4	11	1.46
NA	4	0.53
Total	756	100

Comprehensive DI (classified by each component)			
	Scale	Frequency	Percent
Foreign	0	234	31.12
	1	518	68.88
Interbank	0	607	80.72
	1	145	19.28
No-Coinsurance	0	168	22.11
	1	592	77.89
Full Coverage	0	658	86.13
	1	106	13.87

B. Industrial Countries

Covdep		
Scale	Frequency	Percent
1	161	52.27
1.5	31	10.06
2	27	8.77
2.5	8	2.60
3	49	15.91
NA	32	10.39
Total	308	100

Covgdp		
Scale	Frequency	Percent
1	229	74.35
1.5	27	8.77
2	2	0.65
2.5	0	0
3	49	15.91
NA	1	0.32
Total	308	100

Comprehensive DI		
Scale	Frequency	Percent
1	95	30.84
2	155	50.32
3	58	18.83
4	0	0
NA	0	0
Total	308	100

Comprehensive DI (classified by each component)			
	Scale	Frequency	Percent
Foreign	0	61	19.81
	1	247	80.19
Interbank	0	270	87.66
	1	38	12.34
No-Coinsurance	0	63	20.45
	1	245	79.55
Full Coverage	0	259	84.09
	1	49	15.91

Table (4) Cont.

C. Emerging Market Economies

Covdep		
Scale	Frequency	Percent
1	57	22.27
1.5	51	19.92
2	37	14.45
2.5	71	27.73
3	32	12.50
NA	8	3.13
Total	256	100

Covgdp		
Scale	Frequency	Percent
1	169	66.02
1.5	38	14.84
2	3	1.17
2.5	7	2.73
3	32	12.50
NA	7	2.73
Total	256	100

Comprehensive DI		
Scale	Frequency	Percent
1	119	46.85
2	81	31.89
3	47	18.5
4	7	2.76
NA	0	0
Total	256	100

Comprehensive DI (classified by each component)			
	Scale	Frequency	Percent
Foreign	0	100	39.37
	1	154	60.63
Interbank	0	181	71.26
	1	73	28.74
No-Coinsurance	0	64	25.00
	1	192	75.00
Full Coverage	0	224	87.50
	1	32	12.50

D. Developing Countries

Covdep		
Scale	Frequency	Percent
1	51	25.50
1.5	41	20.50
2	7	3.50
2.5	49	24.50
3	25	12.50
NA	27	13.50
Total	200	100

Covgdp		
Scale	Frequency	Percent
1	114	57.00
1.5	29	14.50
2	7	3.50
2.5	5	2.50
3	25	12.50
NA	20	10.00
Total	200	100

Comprehensive DI		
Scale	Frequency	Percent
1	82	42.27
2	81	41.75
3	23	11.86
4	4	2.06
NA	4	2.06
Total	194	100

Comprehensive DI (classified by each component)			
	Scale	Frequency	Percent
Foreign	0	77	39.69
	1	117	60.31
Interbank	0	160	82.47
	1	34	17.53
No-Coinsurance	0	41	20.5
	1	159	79.5
Full Coverage	0	175	87.5
	1	25	12.5

Note: - See section (5) and the table (2) for descriptions of each variable.
- NA is Not Available (missing data). For Comprehensive DI (classified by each component), the scale of zero indicates the absence of that deposit insurance feature; the frequency of the zero scale also includes the missing data.

Table (5) The Correlation Matrices of Partial Deposit Insurance Variables (only countries with explicit deposit insurance systems)

A. All Countries (748 Observations)

	Covdep	Covgdp	Foreign	Interbank	Coinsurance	Comp DI
Covdep	1					
Covgdp	0.86	1				
Foreign	-0.03	-0.01	1			
Interbank	0.11	-0.14	-0.30	1		
No Coinsurance	0.42	0.29	-0.29	0.22	1	
Comp DI	0.70	0.60	0.19	0.35	0.71	1

B. Industrial Countries (362 Observations)

	Covdep	Covgdp	Foreign	Interbank	Coinsurance	Comp DI
Covdep	1					
Covgdp	0.78	1				
Foreign	-0.16	-0.10	1			
Interbank	0.13	-0.04	-0.12	1		
No Coinsurance	0.26	0.23	-0.23	0.14	1	
Comp DI	0.39	0.43	0.40	0.48	0.56	1

C. Emerging Market Economies (254 Observations)

	Covdep	Covgdp	Foreign	Interbank	Coinsurance	Comp DI
Covdep	1					
Covgdp	0.71	1				
Foreign	-0.21	-0.18	1			
Interbank	0.20	0.06	0.01	1		
No Coinsurance	0.33	0.29	-0.18	0.06	1	
Comp DI	0.37	0.41	0.46	0.55	0.53	1

D. Developing Countries (194 Observations)

	Covdep	Covgdp	Foreign	Interbank	Coinsurance	Comp DI
Covdep	1					
Covgdp	0.85	1				
Foreign	-0.20	-0.24	1			
Interbank	-0.04	-0.04	-0.01	1		
No Coinsurance	0.03	0.11	-0.32	0.24	1	
Comp DI	0.11	0.24	0.40	0.59	0.52	1

Table (6) The Probability of Banking Crises and Explicit Deposit Insurance Coverage (All Countries)

Dependent Variable: Banking Crisis Dummy; Estimation Method: Logit Model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-1.4919*** (0.1318)	-1.5863*** (0.1341)	-1.5304 (0.1314)	-1.5185*** (0.1298)	-1.4916*** (0.1313)	-1.4970*** (0.1304)	-1.4862*** (0.1326)
Real GDP Per Capita	-0.0058*** (0.0011)	-0.0057*** (0.0010)	-0.0054*** (0.0011)	-0.0062*** (0.0011)	-0.0061*** (0.0011)	-0.0058*** (0.0011)	-0.0057*** (0.0011)
Real GDP Growth $_{t-1}$	-0.0789*** (0.0129)	-0.0767*** (0.0129)	-0.0741*** (0.0127)	-0.0771*** (0.0129)	-0.0761*** (0.0129)	-0.0778*** (0.0130)	-0.0775*** (0.0130)
CA to GDP $_{t-1}$	0.0058 (0.0081)	-0.0003 (0.0080)	-0.0030 (0.0078)	-0.0018 (0.0078)	-0.0023 (0.0078)	0.0051 (0.0080)	0.0052 (0.0080)
Domestic Credit $_{t-1}$	0.0038** (0.0019)	0.0040** (0.0018)	0.0043** (0.0017)	0.0035** (0.0018)	0.0035** (0.0018)	0.0038** (0.0019)	0.0038** (0.0019)
M2 to Reserve $_{t-1}$	0.0124*** (0.0039)	0.0137*** (0.0040)	0.0136*** (0.0040)	0.0136*** (0.0040)	0.0135*** (0.0040)	0.0124*** (0.0039)	0.0122*** (0.0039)
Inflation $_{t-1}$	0.0011*** (0.0003)	0.0010*** (0.0003)	0.0010*** (0.0003)	0.0010*** (0.0003)	0.0010*** (0.0003)	0.0010*** (0.0003)	0.0010*** (0.0003)
Real Interest Rate $_{t-1}$	0.0058* (0.0034)	0.0033 (0.0034)	0.0017 (0.0033)	0.0029 (0.0034)	0.0024 (0.0034)	0.0045 (0.0033)	0.0043 (0.0033)
Explicit DI $_{t-1}$	0.7587*** (0.1302)						
Covdep $_{t-1}$		0.5089*** (0.0604)	-0.4157* (0.2186)				
(Covdep × Covdep) $_{t-1}$			0.3558*** (0.0806)				
Covgdp $_{t-1}$				0.6223** (0.0763)	0.4188** (0.1954)		
(Covgdp × Covgdp) $_{t-1}$					0.0789 (0.0688)		
Comp DI						0.4103*** (0.0596)	-0.3215* (0.189)7
(Comp DI×Comp DI) $_{t-1}$							0.0323 (0.0658)
No. of observations	1983	1983	1983	1983	1983	1979	1979
% correctly predicted	80.58%	80.74%	80.64%	80.58%	80.48%	80.85%	80.80%
Wald Chi-Square	106.17	147.59	169.70	140.43	142.46	123.95	124.70
Prob > Chi-Square	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0600	0.0788	0.0885	0.0773	0.0779	0.0661	0.0662
Log-Likelihood	-931.97	-913.34	-903.68	-914.87	-914.21	-919.94	-919.81

*, **, *** indicate the significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are robust standard errors of estimated coefficients.

Table (7) The Probability of Banking Crises and Explicit Deposit Insurance Coverage Classified for Industrial, Emerging Market, and Developing Countries
Dependent Variable: Banking Crisis Dummy; Estimation Method: Logit Model

Table (7a) Industrial and Emerging Market Countries

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-1.3942*** (0.2590)	-1.0586*** (0.2692)	-1.2371*** (0.2410)	-0.9103*** (0.2646)	-1.2937*** (0.2477)	-1.0738*** (0.2605)
Real GDP Per Capita	-0.0059*** (0.0012)	-0.0056*** (0.0012)	-0.0064*** (0.0012)	-0.0061*** (0.0012)	-0.0062*** (0.0012)	-0.0055*** (0.0012)
Real GDP Growth $_{t-1}$	-0.1315*** (0.0239)	-0.1379*** (0.0239)	-0.1366*** (0.0236)	-0.1395*** (0.0237)	-0.1331*** (0.0236)	-0.1348*** (0.0236)
CA to GDP $_{t-1}$	-0.0295 (0.0205)	-0.0331 (0.0209)	-0.0360* (0.0204)	-0.0389* (0.0206)	-0.0261 (0.0203)	-0.0259 (0.0204)
Domestic Credit $_{t-1}$	0.0100*** (0.0023)	0.0090*** (0.0025)	0.0091*** (0.0023)	0.0076*** (0.0025)	0.0101*** (0.0024)	0.0096*** (0.0025)
M2 to Reserve $_{t-1}$	-0.0127 (0.0111)	-0.0032 (0.0115)	-0.0099 (0.0112)	-0.0018 (0.0113)	-0.0195* (0.0114)	-0.0206* (0.0119)
Inflation $_{t-1}$	-0.0041*** (0.0015)	-0.0054*** (0.0017)	-0.0044*** (0.0015)	-0.0054*** (0.0017)	-0.0039*** (0.0014)	-0.0045*** (0.0015)
Real Interest Rate $_{t-1}$	-0.0004 (0.0054)	-0.0041 (0.0054)	-0.0011 (0.0054)	-0.0039 (0.0056)	0.0008 (0.0054)	-0.0013 (0.0054)
Covdep $_{t-1}$	0.4607*** (0.0906)	-1.0564*** (0.2814)				
(Covdep × Covdep) $_{t-1}$		0.5595*** (0.0976)				
Covgdp $_{t-1}$			0.5268*** (0.1044)	-0.3613 (0.2765)		
(Covgdp × Covgdp) $_{t-1}$				0.3204*** (0.0896)		
Comp DI $_{t-1}$					0.4022*** (0.0876)	-0.3421 (0.2694)
(Comp DI × Comp DI) $_{t-1}$						0.2599*** (0.0901)
No. of observations	869	869	869	869	869	869
% correctly predicted	78.83%	79.75%	79.17%	79.63%	78.37%	78.25%
Wald Chi-Square	91.85	118.25	87.95	98.47	87.59	90.36
Prob > Chi-Square	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0972	0.1313	0.0932	0.1069	0.0898	0.0999
Log-Likelihood	-412.03	-405.13	-422.88	-416.52	-424.49	-419.79

*, **, *** indicate the significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are robust standard errors of estimated coefficients.

Table (7b) Industrial, Emerging Market, and Developing Countries

	Industrial Countries			Emerging Market Economies			Developing Countries		
Constant	-4.0118***	-4.2355***	-3.7808***	-0.1212	-0.0680	-0.5886	-1.1245***	-1.1169	-1.0552***
	(0.7381)	(0.7783)	(0.7742)	(0.3751)	(0.3738)	(0.3873)	(0.1727)	(0.1724)	(0.1718)
Real GDP Per Capita	0.0068**	0.0084***	0.0071**	-0.0166***	-0.0167***	-0.0141***	-0.0265***	-0.0282	-0.0312***
	(0.0033)	(0.0031)	(0.0031)	(0.0037)	(0.0038)	(0.0033)	(0.0054)	(0.0054)	(0.0065)
Real GDP Growth $_{t-1}$	-0.3203***	-0.3095***	-0.3353***	-0.1100***	-0.1176***	-0.1063***	-0.0708***	-0.0728	-0.0722***
	(0.0926)	(0.0875)	(0.0860)	(0.0253)	(0.0255)	(0.0247)	(0.0166)	(0.0170)	(0.0170)
CA to GDP $_{t-1}$	-0.1746***	-0.1914***	-0.1632***	0.0067	0.0006	0.0214	0.0056	0.0057	0.0056
	(0.0507)	(0.0520)	(0.0504)	(0.0241)	(0.0247)	(0.0221)	(0.0112)	(0.0112)	(0.0115)
Domestic Credit $_{t-1}$	0.0091**	0.0081**	0.0108***	0.0034	0.0020	0.0055	-0.0024	-0.0032	-0.0043
	(0.0044)	(0.0039)	(0.0041)	(0.0036)	(0.0037)	(0.0036)	(0.0041)	(0.0042)	(0.0043)
M2 to Reserve $_{t-1}$	-0.0092	-0.0087	-0.0256	-0.0396*	-0.0284	-0.0345	0.0138***	0.0142	0.0141***
	(0.0179)	(0.0178)	(0.0199)	(0.0239)	(0.0241)	(0.0228)	(0.0042)	(0.0043)	(0.0043)
Inflation $_{t-1}$	0.1237***	0.1275***	0.1191***	-0.0050**	-0.0056**	-0.0043**	0.0013***	0.0013	0.0014***
	(0.0431)	(0.0430)	(0.0408)	(0.0021)	(0.0022)	(0.0017)	(0.0004)	(0.0004)	(0.0004)
Real Interest Rate $_{t-1}$	-0.0241***	-0.0233**	-0.0192**	0.0036	0.0007	-0.0001	0.0051	0.0054	0.0069
	(0.0093)	(0.0093)	(0.0087)	(0.0089)	(0.0093)	(0.0089)	(0.0054)	(0.0056)	(0.0048)
Covdep $_{t-1}$	-0.5625			-1.4310***			0.7134		
	(0.5474)			(0.4886)			(0.5561)		
(Covdep × Covdep) $_{t-1}$	0.3843**			0.6667***			-0.0389		
	(0.1732)			(0.1797)			(0.2265)		
Covgdp $_{t-1}$		-0.2341			-0.5014			1.3930	
		(0.6952)			(0.3947)			(0.3954)	
(Covgdp × Covgdp) $_{t-1}$		0.2319			0.3713**			-0.2250	
		(0.2009)			(0.1455)			(0.1859)	
Comp DI $_{t-1}$			-0.7593			0.1999			2.0746***
			(0.6122			(0.3461)			(0.3756)
(Comp DI×Comp DI) $_{t-1}$			0.3553*			0.0691			-0.6546***
			(0.2001			(0.1105)			(0.1519)
No. of observations	379	379	379	490	490	490	1114	1114	1114
% correctly predicted	84.17%	84.17%	83.64%	74.69%	74.90%	74.08%	83.39%	83.21%	83.69%
Wald Chi-Square	62.12	61.23	63.07	68.02	63.36	65.39	120.65	122.01	96.22
Prob > Chi-Square	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.2555	0.2349	0.2298	0.1353	0.1206	0.1154	0.1238	0.1327	0.1268
Log-Likelihood	-130.78	-134.08	-134.98	-246.86	-251.06	-252.56	-456.77	-452.09	-449.14

*, **, *** indicate the significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are robust standard errors of estimated coefficients.

Table (8) The Probability of Systematic Banking Crises and Explicit Deposit Insurance Coverage

Dependent Variable: Systemic Banking Crisis Dummy; Estimation Method: Logit Model

	(1)	(2)	(3)	(4)	(5)	(6)
	All Countries			Industrial and Emerging Market Countries		
Constant	-2.0144***	-1.9735***	-1.9833***	-1.8725***	-1.7024***	-1.9590***
	(0.1549)	(0.1566)	(0.1564)	(0.3634)	(0.3533)	(0.3261)
Real GDP Per Capita	-0.0090***	-0.0101***	-0.0087***	-0.0084***	-0.0094***	-0.0079***
	(0.0013)	(0.0014)	(0.0013)	(0.0013)	(0.0014)	(0.0014)
Real GDP Growth $_{t-1}$	-0.0861***	-0.0880***	-0.0915***	-0.1495***	-0.1584***	-0.1522***
	(0.0136)	(0.0141)	(0.0143)	(0.0273)	(0.0284)	(0.0277)
CA to GDP $_{t-1}$	-0.0174**	-0.0175**	-0.0066	-0.0501**	-0.0607**	-0.0369
	(0.0079)	(0.0079)	(0.0084)	(0.0254)	(0.0258)	(0.0241)
Domestic Credit $_{t-1}$	0.0073***	0.0063***	0.0065***	0.0165***	0.0148***	0.0175***
	(0.0019)	(0.0020)	(0.0022)	(0.0031)	(0.0030)	(0.0029)
M2 to Reserve $_{t-1}$	0.0146***	0.0149***	0.0136***	-0.0354*	-0.0299	-0.0591***
	(0.0041)	(0.0042)	(0.0041)	(0.0190)	(0.0190)	(0.0197)
Inflation $_{t-1}$	0.0006***	0.0006***	0.0007***	-0.0037**	-0.0039**	-0.0029*
	(0.0002)	(0.0002)	(0.0002)	(0.0016)	(0.0016)	(0.0015)
Real Interest Rate $_{t-1}$	0.0072**	0.0076**	0.0106***	0.0010	0.0003	0.0041
	(0.0037)	(0.0037)	(0.0038)	(0.0060)	(0.0062)	(0.0064)
Covdep $_{t-1}$	-0.9759***			-1.3195***		
	(0.2871)			(0.3764)		
(Covdep × Covdep) $_{t-1}$	0.6001***			0.7010***		
	(0.1084)			(0.1302)		
Covgdp $_{t-1}$		0.1724			-0.4730	
		(0.2286)			(0.3458)	
(Covgdp × Covgdp) $_{t-1}$		0.2461***			0.4450***	
		(0.0818)			(0.1113)	
Comp $_{t-1}$			-0.4045*			-0.1603
			(0.2075)			(0.3222)
(Comp × Comp) $_{t-1}$			0.0206			0.2392**
			(0.0718)			(0.1099)
No. of observations	1983	1983	1979	869	869	869
% correctly predicted	85.93%	85.78%	85.70%	86.88%	86.54%	85.85%
Wald Chi-Square	205.18	189.69	152.32	134.39	129.09	102.45
Prob > Chi-Square	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.1339	0.1262	0.0930	0.2118	0.1987	0.1626
Log-Likelihood	-720.79	-727.19	-747.85	-294.48	-299.37	-312.86

*, **, *** indicate the significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are robust standard errors of estimated coefficients.

Table (9) The Onset of Banking Crises and Explicit Deposit Insurance Coverage
Dependent Variable: Banking Crisis Dummy (excluding years during which the crisis is ongoing following the onset of the crisis)
Estimation Method: Logit Model

	(1)	(2)	(3)	(4)	(5)	(6)
	All Countries			Industrial and Emerging Market Countries		
Constant	-2.6462***	-2.6331***	-2.6332***	-1.8226***	-1.8186***	-1.8577***
	(0.2594)	(0.2563)	(0.2537)	(0.6005)	(0.5795)	(0.5357)
Real GDP Per Capita	-0.0014	-0.0014	-0.0012	-0.0020	-0.0018	-0.0013
	(0.0023)	(0.0024)	(0.0024)	(0.0023)	(0.0024)	(0.0023)
Real GDP Growth $_{t-1}$	-0.0531**	-0.0540**	-0.0546**	-0.0868*	-0.0855*	-0.0848*
	(0.0248)	(0.0249)	(0.0252)	(0.0461)	(0.0464)	(0.0475)
CA to GDP $_{t-1}$	0.0074	0.0085	0.0105	-0.0986**	-0.1024**	-0.0998**
	(0.0119)	(0.0124)	(0.0124)	(0.0445)	(0.0454)	(0.0452)
Domestic Credit $_{t-1}$	-0.0023	-0.0028	-0.0030	-0.0061	-0.0071	-0.0073
	(0.0039)	(0.0039)	(0.0040)	(0.0073)	(0.0073)	(0.0070)
M2 to Reserve $_{t-1}$	0.0132**	0.0133**	0.0132**	0.0206	0.0246	0.0209
	(0.0053)	(0.0053)	(0.0053)	(0.0220)	(0.0218)	(0.0229)
Inflation $_{t-1}$	-0.0012	-0.0011	-0.0011	-0.0030	-0.0030	-0.0027
	(0.0010)	(0.0010)	(0.0010)	(0.0022)	(0.0022)	(0.0021)
Real Interest Rate $_{t-1}$	0.0045	0.0053	0.0055	0.0022	0.0023	0.0033
	(0.0065)	(0.0067)	(0.0068)	(0.0093)	(0.0094)	(0.0090)
Covdep $_{t-1}$	-1.1060**			-1.5410***		
	(0.5237)			(0.5689)		
(Covdep × Covdep) $_{t-1}$	0.4268**			0.5557***		
	(0.1882)			(0.2039)		
Covgdp $_{t-1}$		-0.6168			-1.1243**	
		(0.4804)			(0.5090)	
(Covgdp × Covgdp) $_{t-1}$		0.2352			0.4022**	
		(0.1709)			(0.1720)	
Comp DI $_{t-1}$			-0.5664			-0.9977**
			(0.3875)			(0.4878)
(Comp DI × Comp DI) $_{t-1}$			0.2026*			0.3303**
			(0.1220)			(0.1646)
No. of observations	1666	1666	1666	713	713	713
% correctly predicted	95.25%	95.26%	95.26%	94.11%	94.11%	94.11%
Wald Chi-Square	23.53	20.56	21.17	24.20	19.83	18.36
Prob > Chi-Square	0.0051	0.0148	0.119	0.0040	0.0190	0.0312
Pseudo R2	0.0303	0.0256	0.0254	0.0756	0.0670	0.0627
Log-Likelihood	-308.32	-309.80	-309.87	-147.60	-148.98	-149.66

*, **, *** indicate the significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are robust standard errors of estimated coefficients.

Table (10) The Credibility of Non-Insurance and the Role of Corrective Actions and Institutions (Industrial and Emerging Market Countries)[†]

Table (10a) Dependent Variable: Banking Crisis dummy, Estimation Method: Logit Regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Covdep_{t-1}$	-1.0415***	-0.9694***	-1.3071***	-0.9765***	-1.3294***					
	(0.2894)	(0.3067)	(0.3223)	(0.2906)	(0.3059)					
$(Covdep \times Covdep)_{t-1}$	0.6236***	0.5742***	0.5587***	0.4455***	0.6645***					
	(0.1034)	(0.1045)	(0.1325)	(0.1358)	(0.1391)					
$Comp_{t-1}$						-0.3600	-0.2020	-0.3823	-0.3566	-0.5154*
						(0.2966)	(0.2961)	(0.2790)	(0.2701)	(0.2751)
$(Comp \times Comp)_{t-1}$						0.3417***	0.3626***	0.3222**	0.1680	0.2838**
						(0.1215)	(0.1116)	(0.1388)	(0.1098)	(0.1201)
$(PCP \times (Covdep \times Covdep))_{t-1}$	-0.0300***									
	(0.0117)									
$(CAEI \times (Covdep \times Covdep))_{t-1}$		-0.0071								
		(0.0173)								
$(Ospower \times (Covdep \times Covdep))_{t-1}$			0.0110							
			(0.0122)							
$(Law \times (Covdep \times Covdep))_{t-1}$				0.0214						
				(0.0183)						
$(Corrupt \times (Covdep \times Covdep))_{t-1}$					-0.0094					
					(0.0192)					
$(PCP \times (Comp \times Comp))_{t-1}$						-0.0275**				
						(0.0127)				
$(CAEI \times (Comp \times Comp))_{t-1}$							-0.0317*			
							(0.0179)			
$(Ospower \times (Comp \times Comp))_{t-1}$								-0.0044		
								(0.0112)		
$(Law \times (Comp \times Comp))_{t-1}$									0.0260	
									(0.0176)	
$(Corrupt \times (Comp \times Comp))_{t-1}$										0.0051
										(0.0203)
PCP_{t-1}	0.2087***					0.1855***				
	(0.0447)					(0.0463)				
$CAEI_{t-1}$		0.1684**					0.2066**			
		(0.0755)					(0.0844)			
$Ospower_{t-1}$			0.0868**					0.0810*		
			(0.0434)					(0.0473)		
Law_{t-1}				-0.0275					-0.0474	
				(0.0924)					(0.0838)	
$Corrupt_{t-1}$					-0.2637**					-0.2935***
					(0.1086)					(0.1066)
No. of observations	852	836	826	869	869	852	836	826	869	869
% correctly predicted	79.58%	79.43%	79.06%	79.06%	79.06%	78.87%	78.95%	78.21%	78.48%	78.48%
Wald Chi-Square	124.92	109.81	114.75	117.82	114.23	94.54	85.36	85.40	94.07	93.47
Prob > Chi-Square	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.1511	0.1359	0.1388	0.1329	0.1430	0.1176	0.1069	0.1019	0.1023	0.1118
Log-Likelihood	-384.89	-386.13	-378.35	-404.36	-399.66	-400.09	-399.09	-394.59	-418.63	-414.23

[†] Economic and Financial Variables are included in each regression, but not reported. *, **, *** indicate the significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are robust standard errors of estimated coefficients.

Table (10b) Dependent Variable: NPLs, Estimation Method: OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Covdep_{t-1}$	0.4355	2.0567*	1.1507	-0.4275	-0.2984					
	(1.2072)	(1.2272)	(1.1335)	(1.4190)	(1.2198)					
$(Covdep \times Covdep)_{t-1}$	0.1608	0.5076	1.4512*	-0.1970	0.0664					
	(0.5510)	(0.6191)	(0.8613)	(0.5410)	(0.5369)					
$Comp_{t-1}$						-1.0467	0.4094	-0.8997	-0.3094	-1.1295
						(1.0877)	(1.1944)	(1.0937)	(1.5117)	(1.2453)
$(Comp \times Comp)_{t-1}$						0.5848	0.6368	-0.1065	1.0010**	0.1985
						(0.4626)	(0.6059)	(0.9140)	(0.4725)	(0.5141)
$(PCP \times (Covdep \times Covdep))_{t-1}$	-0.0880									
	(0.0620)									
$(CAEI \times (Covdep \times Covdep))_{t-1}$		-0.2337***								
		(0.0842)								
$(Ospower \times (Covdep \times Covdep))_{t-1}$			-0.1544**							
			(0.0672)							
$(Law \times (Covdep \times Covdep))_{t-1}$				0.1468						
				(0.1185)						
$(Corrupt \times (Covdep \times Covdep))_{t-1}$					0.0188					
					(0.1197)					
$(PCP \times (Comp \times Comp))_{t-1}$						0.0156				
						(0.0611)				
$(CAEI \times (Comp \times Comp))_{t-1}$							-0.0704			
							(0.1145)			
$(Ospower \times (Comp \times Comp))_{t-1}$								0.0830		
								(0.0726)		
$(Law \times (Comp \times Comp))_{t-1}$									-0.1641	
									(0.1517)	
$(Corrupt \times (Comp \times Comp))_{t-1}$										0.1649
										(0.1232)
PCP_{t-1}	0.4375**					0.1046				
	(0.2158)					(0.2343)				
$CAEI_{t-1}$		1.0466***					0.8243***			
		(0.2703)					(0.4109)			
$Ospower_{t-1}$			0.2854					-0.0755		
			(0.1946)					(0.2564)		
Law_{t-1}				-0.0073					0.7705	
				(0.6891)					(0.5622)	
$Corrupt_{t-1}$					-1.8363***					-2.1722***
					(0.6077)					(0.6258)
No. of observations	287	282	276	293	293	287	282	276	293	293
F-Statistics	32.85	53.69	50.40	41.53	34.43	34.16	56.90	44.37	43.02	31.45
Prob > F-Statistics	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-Squared	0.4786	0.4908	0.4800	0.4712	0.4882	0.4892	0.5004	0.5033	0.4836	0.5032
Root MSE	6.0366	5.7803	5.8964	6.5333	6.4279	5.9751	5.7258	5.7631	6.4565	6.3325

† Economic and Financial Variables are included in each regression, but not reported. *, **, *** indicate the significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are robust standard errors of estimated coefficients.

Table (10c) Dependent Variable: NPLs to Capital, Estimation Method: OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Covdep_{t-1}$	-0.0768	-0.0005	-0.0363	-11.3936	-8.5444					
	(0.1242)	(0.1140)	(0.1140)	(11.1486)	(8.4111)					
$(Covdep \times Covdep)_{t-1}$	0.0786	0.1206*	0.1765**	-0.3954	0.2024					
	(0.0551	(0.0616)	(0.0887)	(0.6490)	(0.3378)					
$Comp_{t-1}$						-0.0579	-0.0170	-0.0907	-10.6982	-9.7672
						(0.0990)	(0.1088)	(0.1010)	(10.6830)	(9.7779)
$(Comp \times Comp)_{t-1}$						0.0542	0.0791	0.0534	-0.4761	-0.0950
						(0.0424)	(0.0572)	(0.0853)	(0.5959)	(0.2998)
$(PCP \times (Covdep \times Covdep))_{t-1}$	-0.0143**									
	(0.0062)									
$(CAEI \times (Covdep \times Covdep))_{t-1}$		-0.0254***								
		(0.0084)								
$(Ospower \times (Covdep \times Covdep))_{t-1}$			-0.0140**							
			(0.0065)							
$(Law \times (Covdep \times Covdep))_{t-1}$				0.8421						
				(0.8374)						
$(Corrupt \times (Covdep \times Covdep))_{t-1}$					0.6536					
					(0.6783)					
$(PCP \times (Comp \times Comp))_{t-1}$						-0.0062				
						(0.0051)				
$(CAEI \times (Comp \times Comp))_{t-1}$							-0.0119			
							(0.0102)			
$(Ospower \times (Comp \times Comp))_{t-1}$								0.0001		
								(0.0065)		
$(Law \times (Comp \times Comp))_{t-1}$									0.8074	
									(0.8047)	
$(Corrupt \times (Comp \times Comp))_{t-1}$										0.9103
										(0.9061)
PCP_{t-1}	0.0427*					0.0239				
	(0.0230)					(0.0221)				
$CAEI_{t-1}$		0.0551**					0.0450			
		(0.0262)					(0.0409)			
$Ospower_{t-1}$			0.0021					-0.0173		
			(0.0216)					(0.0283)		
Law_{t-1}				-6.0684					-5.3568	
				(6.0693					(5.3637)	
$Corrupt_{t-1}$					-5.4765					-6.3325
					(5.3503)					(6.1080)
No. of observations	267	267	263	273	273	267	267	263	273	273
F-Statistics	17.54	18.20	17.60	0.35	0.46	17.43	18.03	17.51	0.38	0.45
Prob > F-Statistics	0.0000	0.0000	0.0000	0.9719	0.9274	0.0000	0.0000	0.0000	0.9622	0.9311
R-Squared	0.3965	0.4025	0.4033	0.0414	0.0338	0.3936	0.3938	0.4020	0.0387	0.0386
Root MSE	0.5209	0.5183	0.5212	29.3760	29.49	0.5222	0.5221	0.5218	29.4170	29.42

† Economic and Financial Variables are included in each regression, but not reported. *, **, *** indicate the significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are robust standard errors of estimated coefficients.

Figure 1 The Relationship Between the Market Discipline and Explicit Deposit Insurance Coverage

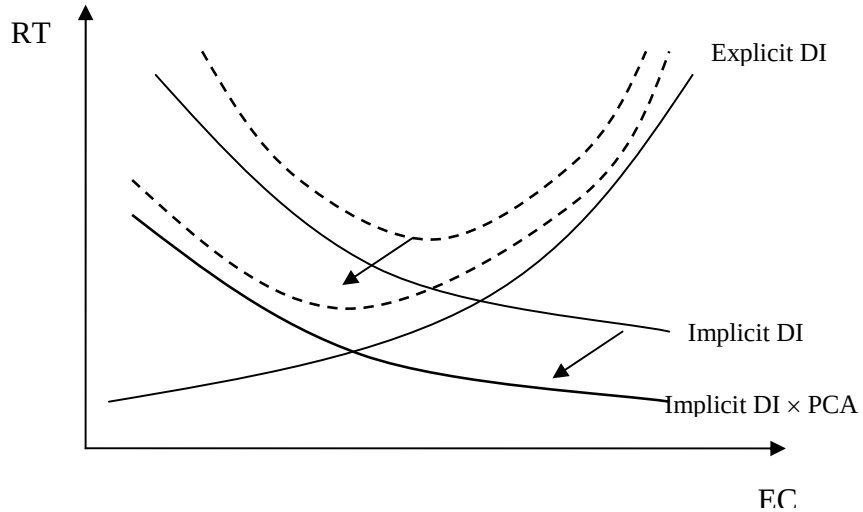


Figure 2a Explicit Coverage, Credibility of Non-Insurance, and Risk-Taking

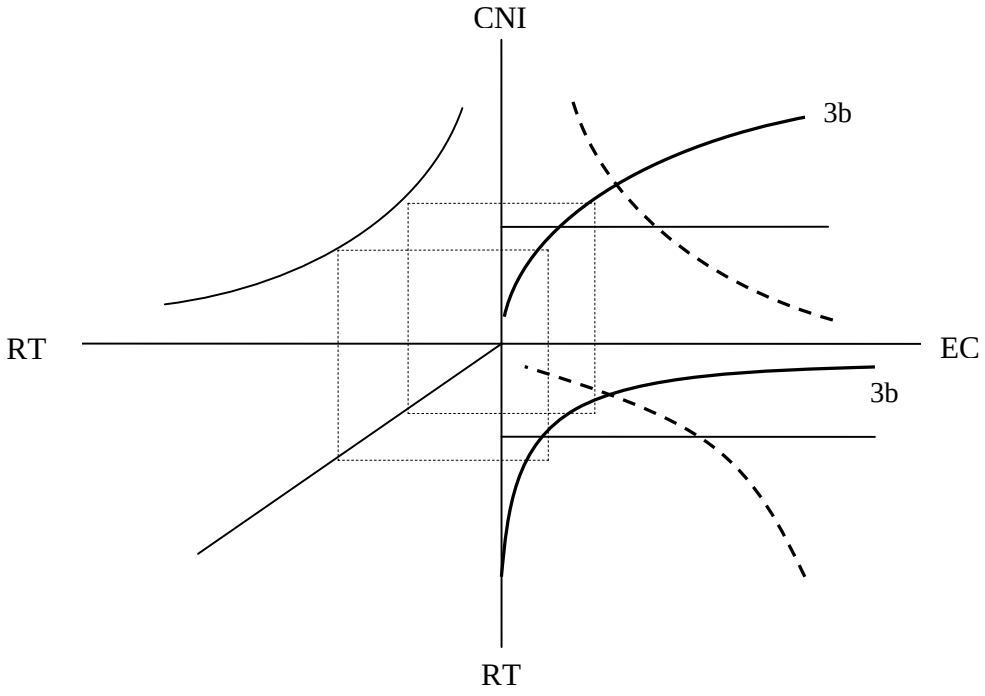


Figure 2b

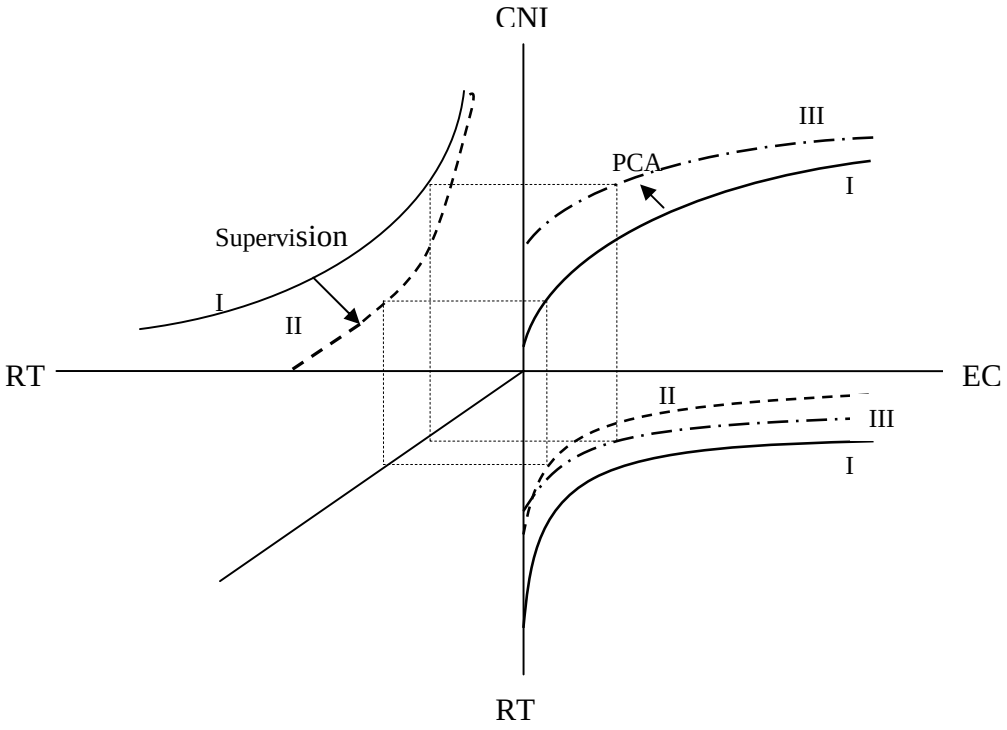


Figure 3 Predicted Probability of Banking Crises and Explicit Deposit Insurance Coverage

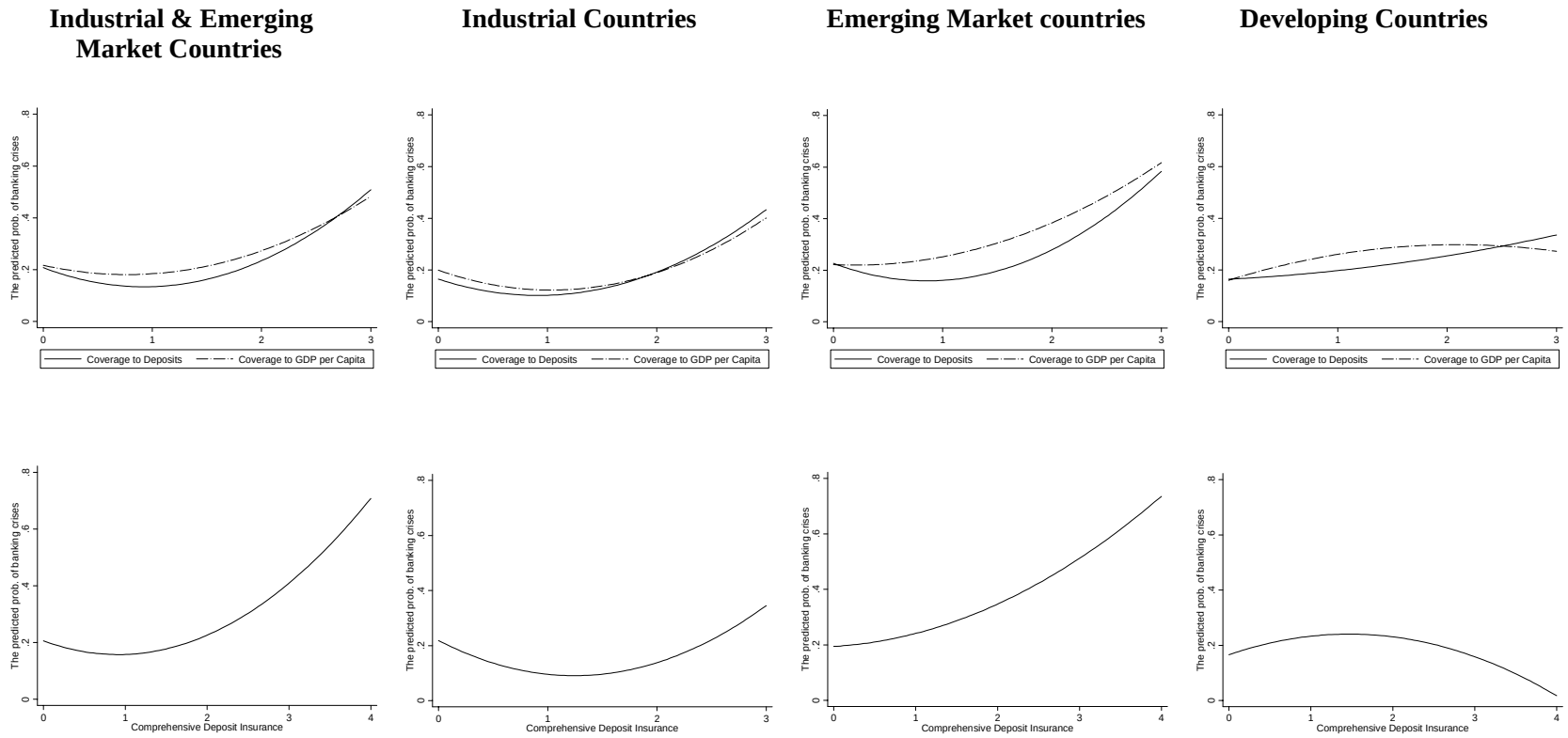
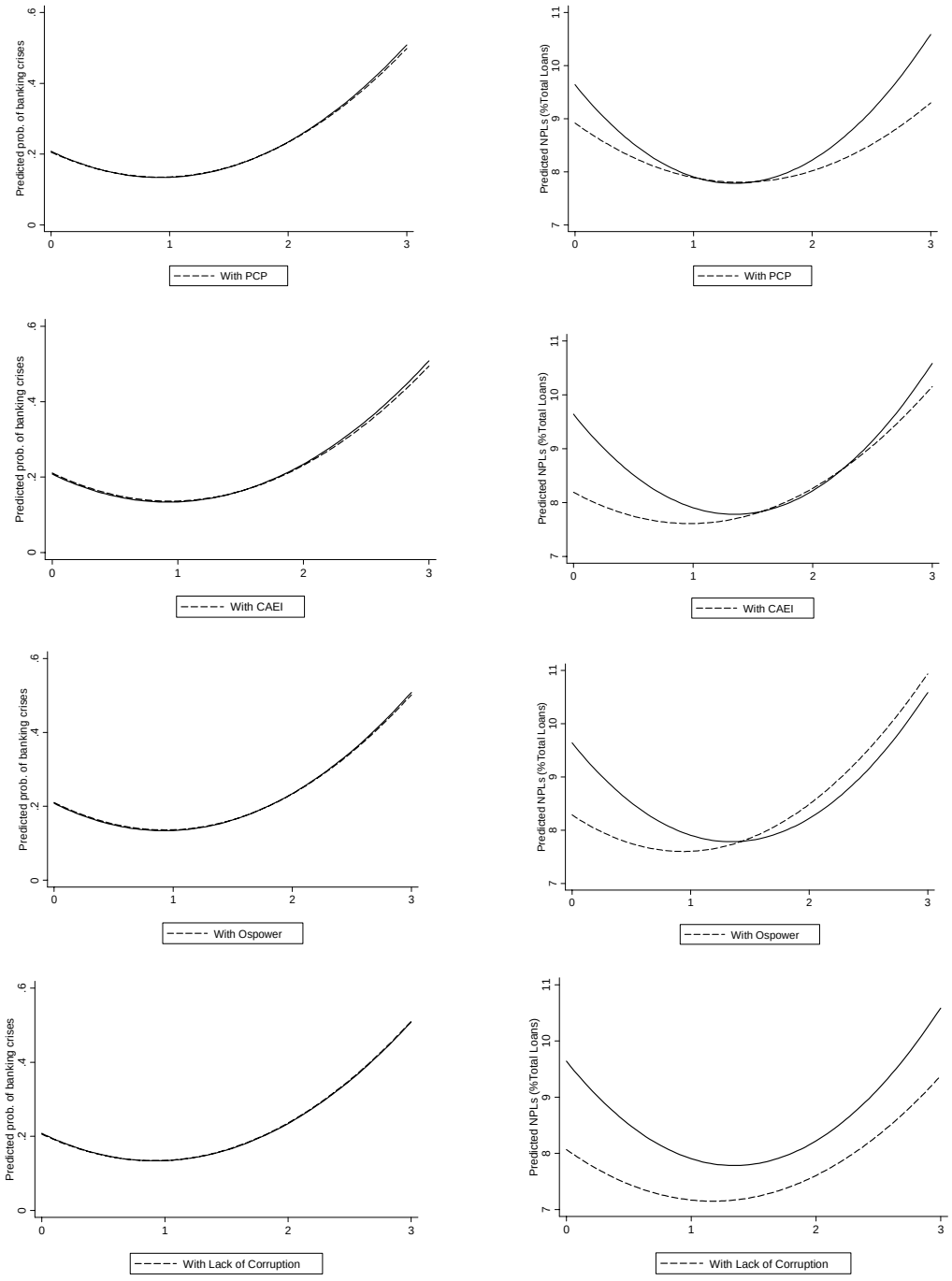


Figure 4 Predicted Probability of Banking Crises, Explicit Deposit Insurance and the Role of Corrective Actions & Institutions (Industrial and Emerging Market Countries)

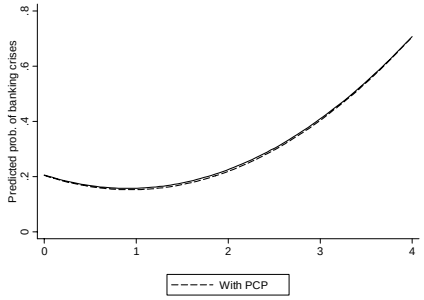
4a Explicit Deposit Insurance Variable: Coverage Limit Per Deposit Per Capita

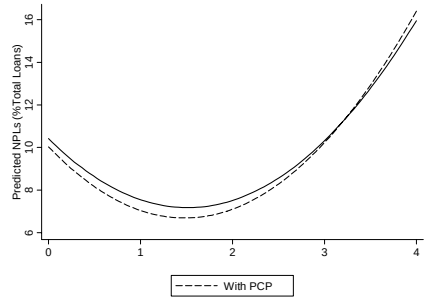
Banking Crisis Regressions **NPLs Regressions**

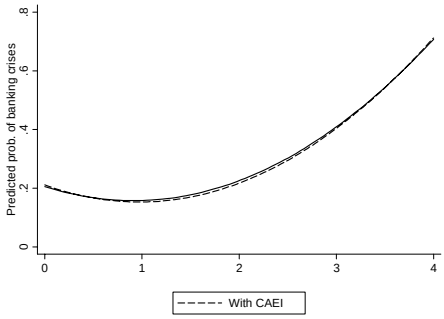


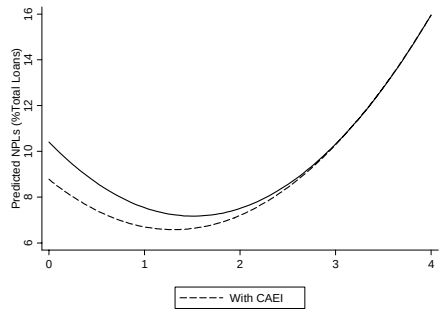
4b Explicit Deposit Insurance Variable: Comprehensive Deposit Insurance

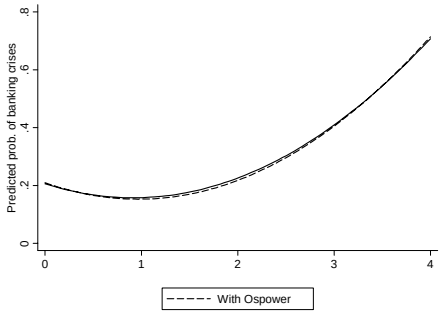
Banking Crisis Regressions **NPLs Regressions**

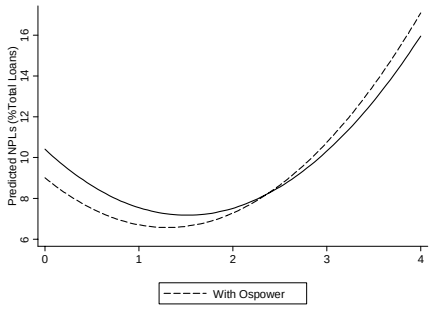


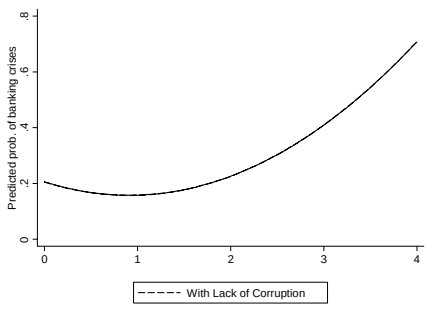


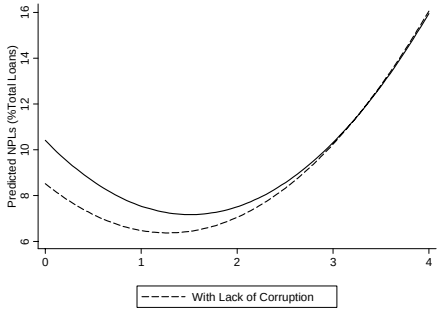












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