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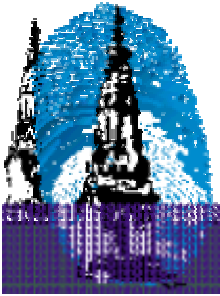
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Bank Insolvency Procedures and Market Discipline in European Banking

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Bank Insolvency Procedures and Market Discipline in European Banking*

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Abstract:

Market discipline in banking requires that explicit and implicit insurance schemes for financial sector firms are limited, and that the lack of insurance of important stakeholders is credible. This credibility cannot be achieved without transparent, predictable procedures for distress resolution for banks, including explicit rules for the liquidation of insolvent banks. We find that very few European countries have explicit procedures for dealing with problem banks. The propositions tested in this paper are that the credibility of non-insurance in European banking depends strongly on (i) the degree of coverage of deposit insurance schemes, and (2) on the existence of enforceable rules that enhance the credibility of non-insurance of groups of stakeholders in bank. The proxy used for credibility of non-insurance in Europe is the probability of banking crisis. Finding a U-shaped relation between the probability of banking crisis and the coverage of explicit deposit insurance we derive the degree of coverage that minimizes the probability of crisis in Western and Eastern Europe.

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1. Introduction

The potential role of market discipline in the regulatory and supervisory framework for the financial sector has received increasing attention in recent years. While many academics have emphasized market discipline for a long time,¹ regulatory bodies until recently have viewed their own activities as substitutes for market discipline in the banking sector in particular. The Basel Committee's recent proposal for a new Capital Accord for Credit Institutions (Basel II) represents a deviation from this view in that it considers discipline as the Third Pillar of the Capital Adequacy Framework. Although the actual proposal does not go far, its view of market discipline as an integral aspect of the regulatory framework – and one that can be enhanced by regulatory measures – represents a break in regulatory philosophy.

Capital requirements may contribute to market discipline themselves by forcing banks to risk shareholder capital in lending activities. This disciplinary effect presumes that shareholders do not perceive themselves as implicitly protected by potential bail-outs in case of bank failures.

Many academics have argued for the inclusion of mandatory subordinated debt in the capital requirements in order to strengthen market discipline per se, and to provide information to supervisors about the financial health of banks.² Similarly, partial deposit insurance schemes could contribute to the awareness of the risk of bank failures. Others emphasize the role of regulation and supervision within a strong institutional environment in coping with the moral hazard induced by explicit and implicit guarantees of banks' creditors. (See, for example, Demirgüç-Kunt and Huizinga, 2004)

One aspect of market discipline related to the motivation for this paper is the issue of credibility of non-insurance of subordinated debt holders, other non-insured depositors, and shareholders. For a group of creditors to be convincingly non-insured, explicit and implicit insurance schemes for financial sector firms need to be limited, and each creditor group must know the order of priority of its claim in case of bank failure. Thus, transparency of distress

¹ The "narrow banking" proposal (Litan, 1987 and Pierce, 1991) represents one attempt to enhance market discipline for credit institutions.

² The idea of using subordinated debt as an instrument of disciplining banks goes back to the 1980s, in particular to proposals made in the U.S. by the Federal Deposit Insurance Corporation (1983) and by Benston, Eisenbeis, Horvitz, Kane and Kaufman (1986). A more recent elaboration can be found in Calomiris (1999). The idea was part of a joint statement by a sub-group of the Shadow Financial Regulatory Committees of Europe, Japan, and the U.S. (1999) and of Europe, Japan, Latin America, and the U.S. (2001), a statement by the European Shadow Financial Regulatory Committee (2000), and it was a key, specific element in recent proposals from the U.S. Shadow Financial Regulatory Committee (2000 and 2001).

resolution procedures by means of ex ante rules and enforcement powers is a requirement for market discipline. Without credible non-insurance stakeholders need not worry about the probability of bank failure, and banks will not compete for depositors' funds by striving to be the best risk evaluators and managers.

In this paper we discuss bank crisis resolution procedures in Europe and test empirically the hypothesis that market discipline in Europe is enhanced by the existence of credibly non-insured creditors of banks. We argue that the credibility of non-insurance depends strongly on the degree of coverage of deposit insurance schemes, and on the existence of transparent, institutionally supported distress resolution procedures for banks, including explicit procedures for the liquidation of insolvent banks. As in Angkinand and Wihlborg (2005) we expect there to be an optimal degree of coverage of deposit insurance that maximizes market discipline and minimizes the probability of banking crisis.

The relevance of this paper within the framework for analysis of transparency set out in the introductory chapter, lies in the relation between the rules and regulation of financial institutions and the cost of capital of non-financial firms. The regulatory and legal framework for financial institutions and its transparency affect the level of, as well as the relative, cost of debt by influencing the incentives of bankers to manage and price credit risk in an efficient manner.

In the following, reasons for the increasing attention to market discipline within the regulatory framework and the role of insolvency procedures are discussed in Section 2. We describe briefly the existing (lack of) procedures for dealing with banks in distress in the EU in Section 3. In Section 4 we develop the model to be tested and specific hypotheses. We test whether the probability of banking crisis in a country falls as the credibility of non-insurance increases. The data described in Section 5 covers 17 Western European countries between 1985 and 2003. In this section the proxy for credibility of non-insurance is explained. We also test whether the quality of institutions in the 17 countries affects credibility. The empirical results are discussed in Section 6. The relation between probability of banking crisis and explicit deposit insurance schemes is described for Western and Eastern European countries. Conclusions follow in Section 7.

2. The Role of Market Discipline and Insolvency Procedures³

Commercial banking has long been considered special because of a perceived high risk of market failure, and because most creditors are explicitly or implicitly insured to safeguard against losses in case banks fail. The rationale for this insurance is banks' role in the payment system and the risk of contagious bank runs. Without going into the economic validity of the risk of bank runs and contagion, it is a fact that supervisory authorities and governments in all countries offer a degree of insurance of banks' creditors. There is explicit deposit insurance in many countries, and expected bailouts imply a degree of implicit insurance. This implicit insurance may be extended to shareholders as well.

The insurance of banks' or other financial institutions' creditors implies that the latter need not monitor risks. If, in addition, the insurance is not priced, then banks have incentives to deliberately take on high risk-high return assets.⁴ Furthermore, under any system wherein banks do not compete by means of risk evaluation skills there is a high likelihood that these skills will be "under-developed" since banks tend to resort to volume competition rather than quality and price competition. Thereby, the financial system as a whole may fail to take important risks into consideration even if bankers do not have the explicit intention to accept excessively risky assets.

Capital requirements in excess of the willingly held equity capital are intended to ensure that shareholders have a stake in all projects, and, thereby, to reduce incentives for risk-taking. The capital requirement for a particular asset determines its cost of capital for a bank. Thus, if assets with different risk-return characteristics have the same capital requirement, banks favor those assets that offer a relatively high expected rate of return. They can engage in "risk arbitrage" and choose relatively risky assets offering the highest expected return among those with a certain cost of capital. The Basel I Capital Adequacy Rules (Basel Committee on Banking Supervision, 1988) have been criticized severely for having too few asset risk classes "risk-buckets". Thereby, Basel I provides incentives for risk arbitrage.

The regulatory dilemma that the Basel Committee has had to struggle with is that if supervisors specify risk buckets that are too broad as in Basel I, then a bank's expertise can be used for risk arbitrage, while if they specify risk buckets too narrowly, then the incentives for

³ This section is based on Benink and Wihlborg (2002)

⁴ See, for example, Dewatripont and Tirole (1994) and Freixas and Rochet (1997) for expanded treatments of the economics of bank regulation.

banks to develop expertise in risk assessment--their presumed comparative advantage—would be weakened.

The proposed solution to the regulatory dilemma of either allowing regulatory arbitrage with broad risk buckets, or removing incentives for banks to develop risk-assessment expertise, is to allow banks to use their own internal ratings as the basis for risk-weighting of assets.

Basel II (Basel Committee, 2004) allows relatively sophisticated, international banks to use internal ratings of loans as a basis for capital requirements. Any approach taken by a bank to evaluate risk must be evaluated and accepted by the bank's supervisory authority.

Opportunities for risk arbitrage may exist under an "internal ratings standard" as well, because risk weights are based on banks' private information rather than on external, verifiable variables. A major problem facing the supervisors is to check the truthfulness of even estimates of probabilities of default. Even the banks face great difficulties to translate their own ratings into probabilities of default. Both the European Commission and the Basel Committee recognize the potential scope for "gaming and manipulation" within an Internal Ratings standard as the one proposed in Basel II.

Two "pillars" of the capital adequacy framework, supervision and market discipline, carry the weight of having to limit risk excessive risk-taking and raise the consciousness and quality of risk assessment in the banking community. Under Basel II most of the burden of controlling banks' internal risk assessment procedures is placed on Pillar 2, i.e. on expanded and active supervision. Supervisory authorities are expected to build up their expertise substantially in both quantitative and qualitative terms. In fact, supervisors are expected to work closely with the banks, when they develop and upgrade their internal risk-scoring models. This envisioned very close cooperation between banks and supervisors is naturally intended to reduce the information- and knowledge asymmetry between banks and supervisors. However, banks will always be able to make decisions based on private information. The intensified involvement of supervisors could instead lead to greater "regulatory capture" in the sense that supervisors identify themselves more strongly with the banks they supervise.

The implication of this discussion is that the need for market discipline as an instrument to induce banks to hold sufficient capital (in total or relatively) for their portfolios of risky asset is arguably stronger under the proposed new Basel II accord. By market discipline we mean that banks are given incentives by market participants' choices of depository institutions to assign

costs of capital to credits reflecting the banks' best evaluation of credit risk from the point of view of share- and debt holders including depositors. To a particular cost of capital for a loan corresponds a choice of debt and equity financing including a certain amount of equity held against a loan. If banks' creditors are insured their choices of depository institutions will be less sensitive to perceptions about banks' risk-taking. Therefore, shareholders have an incentive to use too much low cost debt financing to finance relatively risky loans.

Market discipline should also enhance incentives to compete by means of credit-evaluation and pricing skills. Unintended underestimation of risk seems to have been an important element of banking crises in, for example, the Scandinavian countries and Japan. Regulators have generally been unable to detect this kind of underestimation. There is obviously no guarantee that market discipline resolves this problem, but it increases the likelihood that underestimation of risk can be detected by market participants since banks' risk-taking and procedures for assessing credit would come under the scrutiny of a large number of observers with stakes in the banks. Ratings agencies naturally play a role as producers of information that uninsured depositors and other creditors demand.

The European Commission and the Basel Committee rely on information disclosure to enforce market discipline. However, effective market discipline requires not only that information is available to some observers, but also that the observers value the information, and are able to impose a cost on the bank that releases negative information (or abstains from releasing positive information). As long as depositors and other creditors of banks are insured, or implicitly expect to be bailed out, information about potential credit losses is not going to be a major concern to creditors. Another aspect is that the disclosed information is going to be more relevant and effective, if the choice of disclosed information is based on demand for information in the market place.

By putting their faith in rules for information disclosure alone to create market discipline, the European Commission and the Basel Committee neglect that the amount and truthfulness of information available in the market place depend on incentives on the demand as well as supply side for information. Demand for information is likely to influence both the quantity and the quality of information supplied by the banks themselves, ratings agencies and other analysts.

An indirect method for imposing market discipline is for regulators to use information in the market risk premium on an uninsured portion of the bank's debt to assess a risk-premium on

claims of insured creditors. By requiring banks to issue a minimum amount of “credibly uninsured” subordinated debt regulators may obtain not only a discipline device, but also an information device for imposing costs on banks in proportion to asset risk.⁵ In principle the yield spread on subordinated debt could be used to determine a deposit insurance premium for the bank. The effective pricing of deposit insurance would essentially make capital requirements unnecessary even for banks that are “too big to fail”. An alternative route for the regulator is to use the information in the yield spread to adjust capital requirements and to intervene in the activities of banks approaching distress (“prompt corrective action”).

The arguments in favor of subordinated debt are based on the assumption that the subordination is credible and that the holders of subordinated debt will not be bailed out when a bank faces distress. Any other mechanism that would make banks’ creditors credibly non-insured would essentially have the same disciplinary effects as subordinated debt. In the following we argue that the credibility of non-insurance of holders of subordinated debt, as well as of non-insured depositors, is enhanced substantially by the existence of well specified, ex ante determined insolvency procedures for banks. Deposit insurance, subordinated debt, and prompt corrective action procedures are aspects of insolvency procedures.

The role of insolvency procedures for financial firms is in principle the same as for non-financial firms. There are important differences between banks and non-financial firms, however. First, banks supply liquidity. A large part of the liabilities of banks are very short term and they play an important role in the payment mechanism. These liabilities may be subject to bank runs if creditors fear non-repayment. Second, a large part of the short term liabilities are inter-bank liabilities that may contribute to contagion among banks if one bank fails. Third, creditors of banks in particular are diverse and many. Thus, banks do not generally have one or a few large creditors with a strong interest in resolution of distress. For non-financial firms a large creditor (a bank) often takes the lead in restructuring distressed firms informally or formally in countries with effective restructuring laws like Chapter 11 in the USA.⁶

⁵ Subordinated debt proposals were mentioned in footnote 2. Recently, the literature analyzing the proposals has been growing rapidly. Examples are Federal Reserve Board (1999 and 2000), Federal Reserve Board and Department of the Treasury (2000), Calomiris (1999), Evanoff and Wall (2000 and 2001), Sironi (2000a and 2000b), and Benink and Benston (2001), and additional references below.

⁶ See Wihlborg and Gangopadhyay with Hussain (2001) for a discussion of formal and informal insolvency procedures.

For the reasons mentioned regular bankruptcy law is not often applied in cases when banks face distress. The USA and a few other countries have implemented bank-specific insolvency procedures. Most other countries simply do not allow banks to fail. Although many economists have argued that the fear of contagion of a bank failure is exaggerated few governments are willing to test this belief.

One response to the fear of contagion is deposit insurance. The USA with its relatively complete deposit insurance coverage is actually the country that seems most likely to allow banks to fail. Partial deposit insurance schemes, as the ones mandated in the EU, provide a level of protection for small investors but they may not substantially reduce the risk of contagion. Therefore, the governments' incentives to bail out depositors, and even shareholders, remain.

The recurrence of bank failures across the world suggests that a combination of preventive and remedial measures is needed. A regulatory authority facing an actual or perceived threat to the banking system is compelled to respond in order to eliminate the risk of bank runs. The authority or its government may bail out banks fully or partially—even nationalizing the banking sector, as in Norway in the late 1980s. Other solutions include (a) debt restructuring, (b) a mix of government and more or less voluntary private assistance, and (c) the creation of specialized agencies to take over bad loans, such as the Resolution Trust Corporation in the USA.

Even though these solutions may assist in restoring a functioning market, they tend to be assembled by regulators, central banks and governments in time of crises. Therefore, they fail to provide the sector with transparent, predictable consequences in cases of mismanagement or excessive risk-taking. When the crisis occurs the political pressures to resolve it by protecting strong interest groups are high. Ex ante knowledge of these political pressures lead to expectations of bail-outs. Thus, generally acceptable rules for resolving banking crises must be determined ex ante in order to make statements about a non-bail out policy credible. Furthermore, the non-bail out policy must be politically acceptable. This acceptability can be achieved by limiting the non-insurance of creditors to a certain amount per deposit, or by limiting the non-insurance to particular groups of creditors.

Transparent, pre- and well-specified insolvency procedures for banks could increase the credibility of no bail-out policies, enhance market discipline and thereby reduce the probability

of banks facing distress, and where distress occurs, prevent one bank's failure to have contagion effects.

The European Shadow Financial Regulatory Committee (1998) proposed the following characteristics of distress resolution procedures to achieve the objectives discussed:

1. There should be pre-specified trigger capital ratios for pre-specified regulatory or legal action (prompt corrective action).
2. If a bank's capital is depleted it must be closed and liquidation promptly initiated. This trigger point may actually be set at a positive capital ratio given uncertainty about asset values.
3. Priority among creditors must be pre-specified in such a way that claims with high liquidity value are given priority.
4. Valuation procedures should be made transparent.
5. Since liquidation takes time, claims on banks with high liquidity value can remain liquid only if other banks or the central bank are organized ex ante to provide temporarily the liquidity held up during the liquidation process. Banks may have incentives to organize such arrangements, if clear liquidation procedures exist, but if they do not, then regulators must make sure that arrangements exist.
6. The central bank should be prepared to provide exceptional liquidity only under conditions where a bank's failure may create systemic problems. The lender of last resort function should not be extended to insolvent banks.
7. The authorities managing a crisis must be made independent of ad hoc political pressures in order to enhance the credibility of the intervention process.

3. Distress resolution procedures in Europe

As noted few countries have administrative or legal rules specifying procedures for resolution of distress of a bank. The USA with its high coverage deposit insurance system has been leading in the creation and implementation of pre-specified rules. The Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 sets trigger capital ratios for specific "prompt corrective actions" by banks and regulatory authorities. There are four trigger points at which the FDIC in particular must take action or order the bank to take certain actions. The Fed's ability to act as "Lender of Last Resort" has been strongly restricted unless there is substantial systemic risk. Questions remain, however, about the ability and willingness of the Fed and the FDIC to follow the prompt corrective action procedures if the bank in distress is considered "too big to fail".

The American procedures can be compared to Chapter 11 of the bankruptcy code for non-financial firms. This legislation is primarily aimed at restructuring rather than liquidation and the same can be said about the FDICIA. The legislation therefore has certain disadvantages in that it does not provide much guidance for liquidation of banks. Thereby, it does not provide strong incentives for private initiatives to enter contractual arrangements ex ante for how to resolve liquidity problems or inter-bank claim settlements. Nevertheless, it increases the credibility of both the insurance of depositors and the non-insurance of depositors beyond the pre-specified amounts.

Norway is another country with pre-specified distress resolution procedures for banks. Already before the Norwegian banking crisis there were rules for “public administration” of banks in distress. The procedures are more similar to liquidation procedures than to restructuring procedures and the distressed bank is not expected to remain under public administration for long. Perhaps because of the concentration of the Norwegian banking industry, no bank can be allowed to fail. As a result, the public administration procedures were not employed during the crisis in the late 80s. Instead the banks were nationalized- They were re-privatized again several years later. In spite of some revisions of the procedures after the banking crisis, the spirit of the law is unchanged. From the perspective of those responsible for financial system stability the procedures should be used as little as possible. Instead the Financial Supervisory Authority has obtained stronger powers to intervene when a bank approaches distress. This intervention is not strongly rule based as in the USA.

The Norwegian case illustrates that it is not merely the existence of pre-determined insolvency procedures matter. The banking industry in Norway--like in many other small countries--is dominated by few banks. Therefore, each bank tends to be “too big to fail” making any crisis systemic in the eyes of authorities. If so, liquidation of a distressed bank is not a politically acceptable alternative and liquidation procedures will not be enforced. Thereby, they lose credibility.

In the vast majority of countries there are no formal distress resolution procedures for banks. Regular bankruptcy laws apply in principle on banks. In some countries insolvency law may include procedures that are particularly suitable for banks. In particular, the UK insolvency law includes a procedure called “administration” designed to enable reconstruction of a firm. An administrator can be appointed by either a group of creditors or a court. to lead a distressed firm

The administration procedures are similar to Chapter 11 in several ways except that the administrator takes over management functions. In administration the firm is protected from actions by creditors while negotiations with creditors are ongoing. The intention of administration is to be short lived and the administrator can enter new agreements with the purpose of avoiding liquidation.

After 1997 the British FSA has been given strong authority to issue rules for banks with the purpose of ensuring financial stability. The FSA can force a bank to enter bankruptcy or administration proceedings. It has the right to issue opinions about the result of administration proceedings. The division of responsibility between the FSA, the Bank of England, and the Ministry of Finance has been specified in a “Memorandum of Understanding”. However, the distress resolution procedures for the FSA are not as clearly rule based as in the USA.

The issue of crisis management for banks has been addressed by the EU. In particular, the coordination problem arising when an international bank faces distress has led to some activity with respect to development of principles for crisis resolution. Since most major banks within the EU have some international activity, these principles are the closest the EU comes to insolvency procedures for banks.

In a “Report on Financial Crisis Management” the Economic and Financial Committee⁷ states that “*there is no blueprint for crisis management*” and as a general principle “*private institutions should be involved as much as possible in both crisis prevention and, if this fails, in crisis management.....If financial losses occur, the firm’s shareholders should bear the costs and its management should suffer the consequences. For this reason, the winding down of the institution may be a sensible strategy.*” EU crisis management procedures do not become more specific than this.

The report emphasizes information sharing, coordination, and solutions on a very general level. On the issue of coordination and the assignment of responsibility for decision making with respect to crisis management the report states that, “*the presumption in international banking supervision is that the home country authorities are responsible for decisions on crisis management*”. However, “*The principle of home country control is not directly applicable to foreign subsidiaries, as the host country authorities are obliged to treat these as domestic institutions with their own legal identity. In the event of a crisis at a foreign subsidiary, the host*

⁷ Economic Paper No 156, July 2001 from The Economic and Financial Committee

country supervisor – which is in fact the subsidiary’s home country supervisor – can take any preventive measure envisaged in this context.” Since most international activity takes place in subsidiaries there is very little guidance in these statements.

Other sections of the report refer to alternative solutions in a bank crisis. Private sector solutions are “preferred” but *“Liquidity support might have to be granted in order to stabilise the troubled institution or the market as a whole in order ‘to buy time’. In a less volatile environment, public measures may then be considered, if the winding-down of the institution is not a viable option.”* Competitive implications of crisis management measures are also discussed in a separate section.

The implication for crisis management of these very general principles is that central banks, financial supervisors, and responsible ministries in home and host countries will become involved when a bank with international activities faces distress. Burden sharing easily becomes a major concern in negotiations rather than long-term consequences for incentives of stakeholders in banks. The lack of clear procedures in combination with the need to act quickly and the political incentives to protect depositor groups creates a system where the authorities are obliged to support the distressed bank.

As a country experiencing a severe banking crisis in the early 90s, Sweden has had a debate about distress resolution procedures during the 90s. The Swedish banking crisis was essentially resolved by the issuance of a blanket guarantee for all bank creditors. Even shareholders were indirectly bailed out by this guarantee. Before the crisis there was neither formal deposit insurance nor any bank distress resolution procedures. Depositors and other creditors were nevertheless correct in assuming that they were implicitly insured.

In 2000 a government committee proposed specific legislation for a separate insolvency law for banks, much in the spirit of the Shadow Committee proposal described above. Specifically, the proposal for “public administration” contained a mixture of the American and the Norwegian rules. Like the American FDICIA the purpose of the proposed procedures was primarily to make restructuring possible. Liquidation procedures were also clearly specified. For example, the liquidity problem was addressed directly. The proposal is “resting” after being positively received although some reservations on specifics were expressed by, for example, the Swedish FSA.

The internationalization of Swedish banks have also created a need for “Memoranda of Understanding” between Swedish authorities and foreign authorities with respect to banking supervision. The merger of four major Nordic banks into the pan-Nordic Nordea necessitated agreements among authorities in Sweden, Denmark, Norway and Finland. There is a Nordic Memorandum of Understanding and there is a specific Memorandum with respect to supervision of Nordea. Furthermore, the dominating ownership role of Swedish banks in Estonia has led to a Memorandum of Understanding between the Estonian and the Swedish Financial Supervisory Authorities.

The principles laid down in the Nordic memoranda are similar to and refer to the EU principles discussed above. The Swedish Estonian memorandum refer more directly to “Crisis; bankruptcy; winding-up” in the following paragraph:

“The Estonian and Swedish authorities shall inform each other, without delay, if they become aware of any pending crisis concerning particular credit institutions with cross-border establishments in the other country or if the crisis is limited to a particular cross-border establishment. Also crisis, which may indirectly affect credit institutions, shall be subject to the exchange of information. In either case, the host country authority shall collaborate with the home country authority if supervisory countermeasures are to be taken by the latter. Moreover, the host country maintains the right to apply its own procedures concerning the winding up and reorganization of cross-border establishments to cross-border establishments that are on the verge of bankruptcy.”

These principles with respect to crisis management are hardly more transparent than those for the EU as a whole. If a crisis occurs, ad hoc solutions must be developed quickly in committees including central banks, financial supervisors and ministries in the countries concerned.

The conclusion of this overview of insolvency procedures for banks in Europe is that transparent rules that could enhance the credibility of non-insurance of creditor groups are lacking. There is also little variation across countries. There is some variation in terms of independence of supervisory authorities and more general institutional quality reflecting, for example, the efficiency of the legal system with respect to contract enforcement. These institutional characteristics may have an impact on, for example, the degree to which “private solutions” will be sought in line with the stated principles of the EU. In the empirical section

below we ask whether institutional characteristics of EU countries affect the credibility of non-insurance of banks' creditors.

4. Testing for the relationship between credibility of non-insurance and market discipline

We test the effect of the credibility of non-insurance on the market discipline in the banking sector by using a sample of 17 European countries during the period 1985-2003. Following Angkinand and Wihlborg (2005), AW in the following, we measure the extent of market discipline by using country-level data for the probability of banking crises, which is expected to be higher for a country that lacks market discipline. Lacking a direct proxy for credibility of non-insurance we argue as in the mentioned paper that there is a U-shaped relationship between credibility of non-insurance and explicit deposit insurance coverage. Thus we also expect U-shaped relationships between degree of moral hazard and explicit deposit insurance coverage, and between the probability of banking crisis and explicit deposit insurance coverage. Figure 1 from AW illustrates the hypothesized relationships.

FIG. 1 here

The U-shaped curve in the figure can be viewed as the vertical sum of an upward sloping relation between explicit deposit insurance and moral hazard at a given level of implicit guarantees, and a downward sloping relation showing how the credibility of non-insurance declines with lower explicit coverage. Extensive non-insurance has no credibility. In other words, if explicit deposit insurance is non-existent or very low, moral hazard will be high. The reason is that, fear of contagion in a crisis, as well as considerations of consumer protection, compels authorities to intervene rapidly to guarantee depositors' funds by bailing out the bank. Thereby it can remain in operation. Shareholders may or may not be bailed out but depositors will. A common response in this situation is to issue a blanket guarantee to all creditors. On the other hand, if explicit deposit insurance is complete or nearly so, the moral hazard will be generated by the explicit insurance itself. Credible non-insurance requires partial insurance of depositors. The coverage must be high enough that the non-insurance does not have severe political ramifications and that contagious bank runs are not likely to occur.

Angkinand and Wihlborg (2005) find that the implied positive quadratic relationship between probability of banking crisis and explicit deposit insurance coverage is significant in a

panel data analysis of banking crises in 140 countries, as well as sub-samples, for the period 1985-2003. In this paper we focus on 17 European countries covered by available data.

Hypothesis 1: The probability of banking crisis (reflecting strength of moral hazard incentives) in individual European countries is minimized at an intermediate level of explicit deposit insurance coverage, where the credibility of non-insurance of some creditor groups is high.

We have argued that insolvency procedures could enhance the credibility of non-insurance but we cannot test this proposition directly since there is no variation across the countries with respect to this variable. We will introduce other institutional characteristics that may influence the credibility of non-insurance below. In the figure higher credibility of non-insurance at a given level of explicit coverage causes the U-shaped curve to shift down and more so for low levels of explicit coverage where the credibility is very low.

Hypothesis 2. Institutional characteristics, such as the existence of ex ante insolvency procedures for banks, contributing to credibility of non-insurance reduces the probability of banking crisis for a given level of explicit insurance coverage, and the reduction is greater the lower the level of explicit coverage.

There exists a substantial literature on the relationship between deposit insurance, the probability of banking crisis, and the output costs of banking crises. This literature is reviewed in AW.⁸ It suffices to note that most empirical studies indicate that the probability of banking crisis is an increasing function of deposit insurance coverage. The relationship is not always significant, however. Output costs of banking crises, on the other hand, tend to be declining with higher explicit coverage but this result is controversial. The results in AW confirm that if the analysis is constrained to a linear relation between probability of banking crisis and explicit deposit insurance coverage then a positive relationship is found but if the quadratic formulation is allowed for, then the U-shaped relation is obtained.

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. She finds limited but significant impact of some institutional variables. For example, corruption tends to be positively associated with banking crisis. We return to institutional variables when Hypothesis 2 is tested below..

⁸ Examples are Angkinand (2005), Demirguc-Kunt and Detragiache (1998, 2002), Demirguc-Kunt and Kane (2002), Eichengreen and Areta (2000), Gropp and Vesala(2001), Hoggarth and Redhill (2003), Honohan and Klingebiel (2003), Hutchison and McDill (1998) and Nier(2004)

We turn now to empirical methodology and data. Following AW logit regressions are estimated on the following banking crisis model:

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

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

$BC_{i,t}$ is a banking crisis dummy variable, which takes a value of 1 in a crisis year, and 0 if there is no banking crisis. $\ln[P_{i,t}/1-P_{i,t}]$ is the odd ratio of the Logit estimation, where $P_{i,t}$ is the probability that a banking crisis occurs, or when $BC_{i,t}$ equals to 1. The subscript i refers to a country and t indicates time. To test our U-shaped relationship hypothesis, we enter the variables for explicit deposit insurance coverage (DI), in a banking crisis regression in a quadratic functional form. If there is evidence supporting the hypothesis of the U-shaped relationship, then the estimated coefficient of squared term (δ_2) should be positive and significant, and the estimated coefficient of linear term (δ_1) should be negative and significant.

The banking crisis dummy is obtained from the World Bank data base used in most of the empirical work on the subject.⁹ The judgement of whether a country has had a banking crisis or not a particular year is somewhat subjective. The crisis must have been serious enough to have had a potential impact on GDP but it need not have been systemic.¹⁰ We will actually distinguish between systemic banking crises and those that were not considered systemic by the World Bank analysts.

In the equations above, x is a k -element vector of control variables; real GDP per capita, real GDP growth rate, the ratio of money supply to international reserves, the ratio of domestic credit provided by banking sector to GDP, and the ratio of current account to GDP. The current account surplus is expected to reduce the probability of crises. The ratio of M2 to foreign reserves and the growth rate of the ratio of domestic credit to GDP are expected to have a positive relationship with the probability of crises. The increase in the money supply relative to reserves and the credit growth rate reflects the expansion of credits that may contribute to

⁹ See Caprio and Klingebiel 2003.

¹⁰ The failure of one of thousands of small, US commercial banks or of a very local German Sparkasse would not constitute and banking crisis.

unsustainable rise in assets prices and the bank exposure to foreign exchange risk, which may increase the likelihood of financial crises¹¹. ε_i is the error term.

We also test whether the credibility of non-insured deposits can be enhanced in a country with strong institutional environments including prudent financial regulation and supervision, independence of political pressure, and high quality of domestic institutions. We test this hypothesis from the following model specifications:

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

Each regression includes the same set of control variables previously discussed, each institutional variable, and the interaction term between an institutional variable and the squared term of partial deposit insurance variable¹². The positive summation of ϕ and δ_2 indicates the U-shaped relationship between the probability of crises and the extent of deposit insurance coverage. If a strong institutional environment increases the credibility of non-insured depositors as Hypothesis 2 suggests, the expected negative impact on the probability of banking crisis should be revealed through a negative ϕ and a negative ϕ .

5. Data

Summary statistics for the non-institutional variables are presented in Table 1, dates of banking crises in the 17 countries are presented in Table 4 and characteristics of the deposit insurance systems and the financial regulatory environment are shown in Table 5.

Data on Banking Crises

The country-level data for banking crisis dates for 17 European countries between 1985-2003 are from Caprio and Klingebiel (2003), who compile the data based on the published financial sources and interviews with experts (see Table 4). We use the data of banking crises, which is classified into both systemic and non-systemic (i.e. smaller or borderline) crises. A systemic banking crisis is defined as the situation when much or all of bank capital is exhausted, and a non-systemic or smaller banking crisis is identified when there is evidence of significant banking problems such as a government intervention in banks and financial institutions.

¹¹ A lag of the ratio of current account to GDP and credit growth are used in the estimation.

¹² The interaction term between an institutional variable and the linear term of partial deposit insurance variable is not included, since it leads to the failure of the prediction in logit regressions.

Data on Partial Deposit Insurance

Data for deposit insurance variables is from the database of Deposit Insurance around the World published by Demirgüç-Kunt and Sobaci (2000) at the World Bank¹³. We use three variables to capture the partial extent of coverage limit of deposit insurance. The first variable, called the *comprehensive deposit insurance*, is constructed by aggregating dummy variables of various designs of deposit insurance coverage. These dummies are the foreign currency deposits covered (which is equal 1 for explicit deposit insurance that protects foreign currency deposits, and 0 otherwise), the interbank deposits covered (which is equal 1 for explicit insurance that protects interbank deposits, and 0 otherwise), and the no-coinsurance dummy (which is equal 1 if the explicit system has no coinsurance, and 0 otherwise). The second variable is *Coverage per GDP* (or CovGDP), which measures the coverage limit per deposit relative to GDP per capita, and the third variable is *Coverage per Deposit* (CovDeposit), which measures the coverage limit per deposit relative to total deposits per GDP per capita¹⁴. Table 4 reports deposit insurance data for 17 European countries in our sample.

Data for Bank Regulation and Supervision, Institutional Quality, and Political Independence Variables

We use variables to measure institutional environments from two datasets: the database of Regulation and Supervision of Banks around the World, compiled by Barth, et al. (2004), and the International Country Risk Guide (ICRG). These variables are separated into three groups. For each variable a higher value indicates a stronger institutional environments. The first group measures characteristics of financial regulation and supervision. Three variables are employed from Barth, et al.'s dataset. These variables are *prompt corrective power (PCP)*, which indicates the existence of bank solvency trigger points for intervention and the authorities' power to intervene, *official supervisory power (Ospower)*, which measures the extent of supervisory authority power in taking actions to prevent and resolve financial problems, and *capital*

¹³ The data for the ratio of coverage limit per GDP and the ratio of coverage limit to deposits is taken from Claessens, Klingebiel and Laeven (2004), who also construct these variables based on the World Bank Deposit Insurance database.

¹⁴ For observations prior to the establishment of a formal deposit insurance system (the database of Deposit Insurance contains the dates in which a formal explicit deposit insurance system was established across countries in each country), the dummy for partial deposit insurance is assigned a value of zero, indicating the potential existence of implicit deposit guarantee.

regulatory index (Crindex), which captures the extent of capital requirement stringency^{15,16}. The variables in the second group capture the extent of independence of crisis management from ad hoc political pressures. Two variables are *court involvement (Courtinv)* and *political independence of supervisory authority (Indpoli)*. These variables are also from Barth, et al.'s dataset and shown in Table 5. The last group measures the quality of domestic institutions, which are *rule of law (Law)*, *corruption (Corrupt)*, and *bureaucratic quality (Bureaucracy)*. These variables are compiled by the International Country Risk Guide (ICRG)¹⁷.

The data for economic and financial variables, which are controlled in the models, are from the International Financial Statistics and World Development Indicators, the World Bank.

6. Empirical Results for the Probability of Banking Crisis and Explicit Deposit Insurance

Table 2 reports regression results for the effect of explicit deposit insurance coverage on the probability of banking crises. The three variables for partiality of explicit deposit insurance, which are defined in section 4, enter the regressions in both a linear and quadratic functional form. The regression in column 1 shows that the 0/1 dummy for explicit deposit insurance alone does not explain the likelihood of banking crises for the sample of European countries during the period of 1985-2003¹⁸. All European countries have explicit deposit insurance systems towards the end of the period but not throughout the estimation period beginning in 1985. Columns 2-7 reports regression result when taking into account the cross-country difference of deposit insurance coverage. Columns 2, 4 and 6 show the results with linear specification as in most of the literature. For all proxies of coverage the coefficient for explicit coverage is positive and significant. However, when the quadratic term is introduced in columns 3, 5 and 7 the linear term becomes negative for two proxies for explicit coverage and very small and insignificant in the third case (column 7). At the same time the quadratic term enters positively in all three cases and significantly for two proxies of explicit coverage in columns 3 and 5. Thus, the hypothesized

¹⁵ The official supervisory power variable is scaled 0-16, based on 16 surveyed questions; higher score indicates greater supervisory power. The capital regulatory index is scaled 0-9 on the basis of 9 survey questions.

¹⁶ The data from Barth, et al. is primarily available from 1999, so the extent of regulations and supervisions is assumed not varying overtime. Barth, et al. also compile historical data for some regulation and supervision variables and find that those variables have only marginal change over time.

¹⁷ The rule of law and corruption variables are scaled 0-6. The bureaucratic quality variable is scaled 0-4.

¹⁸ The negative sign of estimated coefficient of the explicit deposit insurance dummy is consistent with Gropp and Vesala (2001). They use the sample of European countries and find that explicit deposit insurance systems decrease banks' risk-taking incentives. For a country with implicit deposit insurance

quadratic relationship is strongly supported when explicit deposit insurance coverage is measured by the *comprehensive deposit insurance* variable and by coverage limit per GDP per capita (*CovGDP*). When using the coverage limit per deposit (*CovDeposit*) the coefficients still imply a U-shaped curve (i.e. the linear term has a negative sign and the squared term has a positive sign), but these estimates are not significant. In addition, by looking at the goodness of fit of the models, the Wald chi-square test points to the superiority of the quadratic estimation. For control variables, the coefficients of real GDP growth rate and the ratio of current account to GDP are negative and statistically significant suggesting that on average countries with high economic growth and a current account surplus experience lower probabilities of banking crises.

Figure 2 shows the U-shaped relationship for the European countries. In Fig 2a the coverage limit per GDP/capita (*covgdp*) measures coverage of explicit insurance. In Fig 2b the *Comprehensive DI* proxy consisting of a summation of dummy variables is used.. It can be seen that the minimum probability of crisis occurs for a value of 1 for *Comprehensive DI* and a value slightly below 2 for *covgdp*. The mean *Comprehensive DI*-value for the countries is 1.4 as shown in Table 1 while the mean *covgdp* value is 1.74. Thus, the probability of banking crisis in Europe could be reduced by a reduction of the types of deposits covered by insurance, while the coverage limit per deposit seems close to the minimum point.

Regression results in Table 3 explore institutional environments that might contribute to the increasing credibility of non-insured deposits and then market discipline. Each regression includes the same economic and financial variable as those used in table (2), but they are not reported. In each case explicit coverage is captured by the *comprehensive DI* proxy.

Columns 1-3 focus on the regulation and supervision in the financial sector. The significant positive coefficients for *prompt corrective power* (PCP) and *capital regulation index* (Crindex) alone do not support the hypothesis that stronger corrective action power and capital requirement stringency reduce the probability of banking crisis. However, the significant negative coefficients for the variables when they interact with the squared term for explicit coverage indicates that the U-shaped relationship between the probability of crisis and the coverage of explicit deposit insurance becomes flatter in countries with stronger corrective action powers and capital requirement stringency. This result is consistent with Hypothesis 2. Increased flatness can be interpreted to mean that changes in explicit coverage have less of an effect on implicit insurance and the credibility of non-insurance.

Turning to the other institutional variables we observe that higher quality of rule of law and higher quality of the bureaucracy also increase the flatness of the quadratic relationship but these variables surprisingly shift the probability of crisis upward. The estimated coefficients for the interactive terms remain negative, although insignificant, when the squared comprehensive DI is interacted with *official supervisory power*, *court involvement*, *political independence of supervisory authority*, and *corruption* variables. These results for the institutional variables and therefore for Hypothesis 2 are not very strong. It is possible that there is not sufficient variation among the 17 European countries to identify significant effects.

All results so far refer to Western Europe since data Eastern Europe exist only for recent years. Nevertheless, as a final exercise we want to compare the relationship between probability of banking crisis and explicit deposit insurance coverage in Western and Eastern Europe. For this purpose we compare our results presented in Figure 2 with results for emerging market economies estimated in Angkinand and Wihlborg (2005). We assume that these results are valid for Eastern European countries. Then we plug in actual values for all variables except deposit insurance coverage for a group of Eastern European countries and draw the curve describing the relationship between probability of banking crisis and coverage of explicit deposit insurance for these countries. Figure 3 shows the emerging market relation using data for Estonia, Hungary, Lithuania, Poland, Slovakia Republic, and Slovenia.

Comparing Figures 2 and 3 it can be seen that the minimum probability of banking crisis is much lower in Western (0.03) than in Eastern Europe (0.25) as we would expect. Furthermore, the explicit deposit insurance coverage that minimizes the probability of banking crisis is lower in Eastern than in Western Europe. For the *comprehensive DI* proxy based on dummies for types of depositors we can actually not identify the minimum probability point, but for the *covgdp* proxy the minimum probability in Eastern Europe occurs when *covgdp* takes a value below 1. The corresponding minimum probability coverage in Western Europe in Figure 2a close to 2.

The difference between Eastern and Western European banking systems is substantial since the Eastern European systems are still relatively immature. Also, the institutional framework is weaker. These differences explain the higher minimum probabilities in Eastern Europe. It may seem surprising, however, that the explicit deposit insurance coverage that minimizes the probability of banking crisis is lower in Eastern Europe. This observation would imply that credibility of non-insurance is obtained at a relatively low level of explicit deposit insurance

coverage. In other words, lack of explicit coverage does not cause expectations of bail-outs to the same degree in Eastern as in Western Europe. This difference is not explained by differences in ex ante distress resolution procedures but it may be explained by a greater political acceptability of losses for depositors in Eastern Europe.

7. Concluding Remarks

We have argued that bank risk taking and credit allocation can be made more efficient by means of enhanced market discipline. Strong market discipline in the banking system requires that there are groups of creditors of banks that are credibly non-insured. Such credibility requires transparent ex ante determined distress resolution procedures for banks and a politically acceptable level of non-insurance. An overview of distress resolution procedures for banks in Europe reveal that they are generally not rule based. Therefore, a sudden banking crisis is likely to be met with ad hoc measures that often include blanket guarantees of creditors or bail-outs of distressed banks. We argue that the lower the coverage of explicit deposit insurance the stronger is the implicit insurance. On these grounds we hypothesize that there is an intermediate level of explicit deposit insurance coverage that maximizes the credibility of non-insurance of groups of creditors. At this level market discipline is relatively strong, moral hazard incentives relatively weak and the probability of banking crisis relatively low. Thus, we expect a U-shaped relation between explicit deposit insurance coverage and the probability of banking crisis.

In the empirical part of the paper the U-shaped relationship is confirmed for 17 Western European countries using data for the period 1985-2003. We take this as evidence that there is an intermediate level of explicit deposit insurance coverage that minimizes the probability of banking crisis by maximizing the credibility of non-insurance of groups of depositors and other creditors of banks.

In a comparison of Eastern and Western Europe we found that the minimum probability of banking crisis is higher in Eastern than in Western Europe, and that the explicit deposit insurance coverage that minimizes the probability of crisis is lower in Eastern than in Western Europe.

Institutional variables describing powers of financial supervisors to take corrective action for distressed banks and powers to intervene more generally to influence banks' risk taking, as well as variables describing the quality of legal and political institutions were introduced to test the hypothesis that the credibility of non-insurance of creditors increases with transparency of

rules for supervisors and legal enforcement. The results for these variables were weak, perhaps because there is not sufficient variation in these qualities among the Western European countries, or because the number of countries included in the study is insufficient to identify influences of institutions. A few variables capturing quality of institutions were found to reduce the impact of changes in explicit deposit insurance coverage on the credibility of non-insurance. This result is consistent with our hypothesis but the same quality variables were found to increase the probability of banking crisis in contradiction to our hypothesis.

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Table 1. Summary Statistics

Variable	Obs	Mean	Std.Dev	Min	Max
Banking Crisis Dummy	323	0.1207	0.3263	0	1
Real GDP Per Capita [†]	306	250.8519	88.8819	74.7131	468.9491
Real GDP Growth Rate	306	0.0266	0.0220	-0.0597	0.1119
M2 to Reserve	312	0.1342	0.0972	0.0280	0.5537
Credit Growth _{t-1}	312	0.0286	0.1515	-0.5437	1.5374
CA to GDP _{t-1}	322	0.0047	0.0392	-0.1044	0.1563
Explicit DI	323	0.8916	0.3113	0	1
Comprehensive DI	323	1.4056	0.6777	0	2
Compreh. DI × Compreh. DI	323	2.4334	1.6393	0	4
Coverage per GDP	323	1.7316	1.9611	0	7.60
CovGDP × CovGDP	323	6.8325	15.0353	0	57.76
Coverage per Deposit	323	2.6665	3.3633	0	11.80
CovDeposit × CovDeposit	323	18.3867	41.6636	0	139.24

Comprehensive DI (Compreh. DI) = interbank + foreign currency + no coinsurance

Coverage per GDP (CovGDP) = coverage limit-to-GDP per capita

Coverage per Deposit (CovDeposit) = coverage limit-to-total deposits per GDP per capita

Table 2. Results of logit analysis of the probability of banking crisis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-0.1700 0.8782	-1.0857 1.0439	-0.8210 1.0239	-0.7727 0.8417	-0.0901 1.0325	-0.6802 0.8378	-0.5350 0.9961
Real GDP per capita	-0.0018 0.0026	-0.0024 0.0028	-0.0003 0.0029	-0.0038 0.0032	-0.0051 0.0034	-0.0051 0.0034	-0.0052 0.0035
Real GDP growth rate	-20.4190** 8.7667	-19.8724** 9.0030	-16.5436* 10.1120	-23.7949** 10.2619	-24.5273** 10.0246	-23.9234** 10.2670	-24.1629** 10.1152
M2 to Reserve	-6.4340 4.2916	-6.1013 4.1060	-5.1488 4.1121	-3.9460 3.3444	-2.5020 3.5621	-2.8055 3.1861	-2.5136 3.2710
Credit Growth $t-1$	-2.3377 1.5483	-2.2790 1.5192	-1.3902 0.9985	-3.2691* 1.8476	-3.3261* 1.9065	-3.1221 1.8413*	-3.2244* 1.8850
CA to GDP $t-1$	-13.3795** 6.6454	-16.5287** 6.8539	-21.7532*** 7.3776	-16.7421** 6.8143	-17.0281* 6.7944	-17.1325** 6.8465	-17.4000** 6.8094
No. of Banks	0.0019* 0.0010	0.0015 0.0010	0.0014 0.0009	-0.0004 0.0010	-0.0002 0.0011	-0.0017 0.0011	-0.0018 0.0012
Explicit DI	-0.3314 0.4997						
Comprehensive DI		0.5452 ^{12%} 0.3501	-4.2947*** 1.3553				
Compreh. DI \times Compreh. DI			2.2478*** 0.6405				
Coverage per GDP				0.3855*** 0.0881	-0.3245 0.4379		
CovGDP \times CovGDP					0.0934* 0.0553		
Coverage per Deposit						0.2978*** 0.0573	0.1786 0.3076
CovDeposit \times CovDeposit							0.0099 0.0243
No. of observations	289	289	289	289	289	289	289
% correctly predicted	86.51%	87.51%	88.24%	88.24%	87.54%	88.58%	88.58%
Wald Chi-Square	27.14	31.22	38.73	48.47	51.80	54.82	56.45
Prob > Chi-Square	0.0003	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.1143	0.1296	0.2020	0.1835	0.1990	0.2117	0.2127
Log-Likelihood	-101.2812	-99.5350	-91.2577	-93.3663	-91.5958	-90.1468	-90.0328

*, **, *** indicate significance level of 10%, 5%, and 1% respectively. The numbers in parentheses are standard errors of estimated coefficients (robust standard error for OLS estimation). Subscripts $t-1$ indicates the value of variable enters regression with one year and average two years preceding crisis year, respectively.

Table 3 Results of logit analysis for explicit deposit insurance coverage and institutional variables (control variables are not reported)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Comprehensive DI	-5.5041***	-4.4049**	-4.6498***	-3.9166***	-4.2337***	-4.7004***	-3.8945***	-3.2569**
	1.3052	1.7528	1.5607	1.2544	1.4262	1.4099	1.3478	1.4054
Comp DI-square	2.9276***	2.5960**	3.1802***	2.2518***	2.3316***	2.3458***	2.0850**	0.7298
	0.6224	1.2891	0.9129	0.5886	0.7291	0.9426	0.8572	1.1014
PCP × Comp DI-square	-0.1581**							
	0.0815							
PCP	0.5031***							
	0.1943							
Ospower × Comp DI-square		-0.0293						
		0.0608						
Ospower		0.1223						
		0.2406						
Crindex × Comp DI-square			-0.1387**					
			0.0597					
Crindex			0.4162**					
			0.2021					
Courtinv × Comp DI-square				-0.1608				
				0.2356				
Courtinv				-0.2559				
				0.8871				
Indpoli × Comp DI-square					-0.2779			
					0.2395			
Indpoli					0.5816			
					0.8505			
Law × Comp DI-square						0.7162		
						0.3843		
Law						0.7162*		
						0.3843		
Corrupt × Comp DI-square							-0.0040	
							0.1461	
Corrupt							0.5792	
							0.6074	
Bureaucracy × Comp DI-square								0.3063
								0.2085
Bureaucracy								-1.1872*
								0.6599
No. of observations	289	289	253	289	289	277	277	277
% correctly predicted	88.58%	88.58%	88.54%	87.54%	87.89%	86.28%	88.09%	88.09%
Wald Chi-Square	47.49	52.63	33.89	43.00	48.60	40.23	37.72	37.82
Prob > Chi-Square	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.2108	0.2044	0.1958	0.2144	0.2081	0.2126	0.2012	0.2112
Log-Likelihood	-90.2452	-90.9758	-77.2433	-89.8351	-90.5601	-88.6359	-89.9229	-88.8034

Comp DI-square = Comprehensive.DI × Comprehensive DI; PCP = Prompt Corrective Power; Crindex = Capital Requirement Index; Ospower = Official Supervisory Power

Table 4. Dates of Banking Crises, 1985-2003

Country	Systemic Banking Crises	Nonsystemic Banking Crises
Austria	-	-
Belgium	-	-
Denmark	-	1987-1992
Finland	1991-1994	-
France	-	1994-1995
Germany	-	-
Greece	-	1991-1995
Iceland	-	1985-1986, 1993
Ireland	-	-
Italy	-	1990-1995
Netherlands	-	-
Norway	1987-1993	-
Portugal	-	1986-1989
Spain	1985	-
Sweden	1991	-
Switzerland	-	-
The United Kingdom	-	-

Source: Caprio and Klingebiel (2003)

Table 5. Designs of Explicit Deposit Insurance System and Characteristics of the Financial Regulatory Environment.

	Date En-acted	For'n Curr Dep	Inter - bank dep	Co-insurance	Cov per GDP	Cov. per Deposit	Blanket Guarantee	DI Funds	Prompt Corr. Power	Cap'l Regulatory Index	Official Supervisory Power
Austria	1979	yes	no	yes	0.9	1.1	no	n/a	5	10	13
Belgium	1974	yes	no	no	1	1	no	n/a	0	6	10
Denm-k	1988	yes	no	no	1.2	2.3	yes	0.17	2	8	9
Finland	1969	yes	no	no	1	2.1	1993-98	0.3	1	5	6
France	1980	yes	no	no	3.1	4.6	yes	n/a	0	4	7
Germ-y	1966	yes	no	yes	0.9	1	yes	n/a	0	6	9
Greece	1993	yes	no	no	0	0	no	0.27	0	7	12
Iceland	1985	yes	no	yes	0.7	1.8	no	0.01	3	6	5
Ireland	1989	yes	no	yes	0.9	1	no	0.2	0	4	11
Italy	1987	yes	no	no	6	11.4	1993-01	n/a	0	5	7
N-lands	1979	yes	no	no	0.9	0.9	no	n/a	0	7	5
Norway	1961	yes	no	no	7.6	11.8	yes	2	1	n/a	9
Portugal	1992	yes	no	yes	0	0	no	0.3	0	7	14
Spain	1977	yes	no	no	1.5	1.9	no	0.3	3	10	9
Sweden	1996	yes	no	no	0	0	1992-96	1	0	3	8
Sw-land	1984	no	no	no	0.5	0.42	no	n/a	0	n/a	14
U.K.	1982	yes	no	yes	1.3	1.2	no	n/a	0	6	11

Source: the World Bank Deposit Insurance database. Coverage per GDP is the ratio of coverage limit per deposit to GDP per capita; Coverage per Deposit is the ratio of coverage limit per deposit to total deposits per capita (data is available at 2000 & from Laeven, 2004). Data for blanket guarantee is from Garcia (2000) and the World Bank database of Financial Regulation and Supervision, compiled by Barth, et al. This information comes from the survey question "Were any deposits not explicitly covered by deposit insurance at the time of the failure compensated when the bank failed?"

Di-Funds = Deposit Insurance Funds-to-Total Bank Assets (%)

Figure 1. The Relationship Between Explicit Deposit Insurance, Credibility of Non- Insurance and Banking Crises

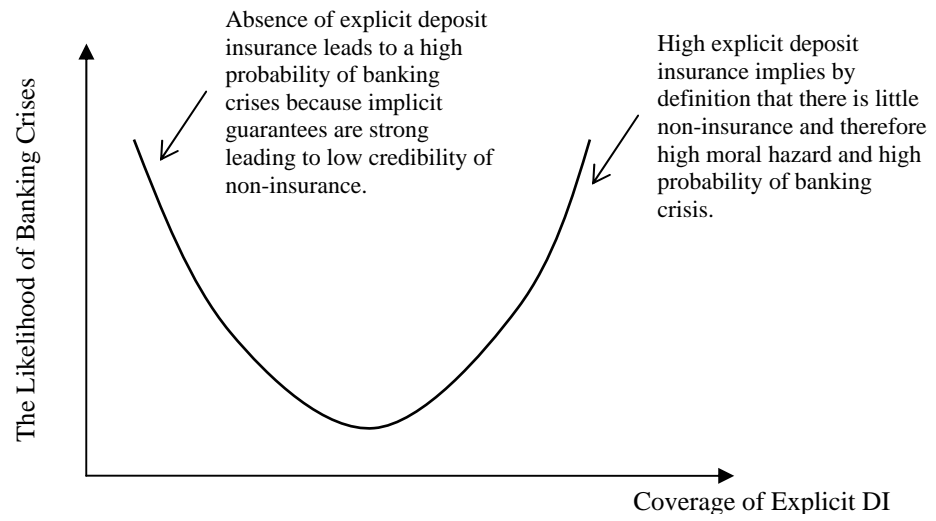


Figure 2 The Predicted Probability of Banking Crises and Coverage of Explicit Deposit Insurance. Western European Countries, 1985-2003

Fig.2a. Explicit deposit insurance coverage measured as coverage- gdp per capita ratio

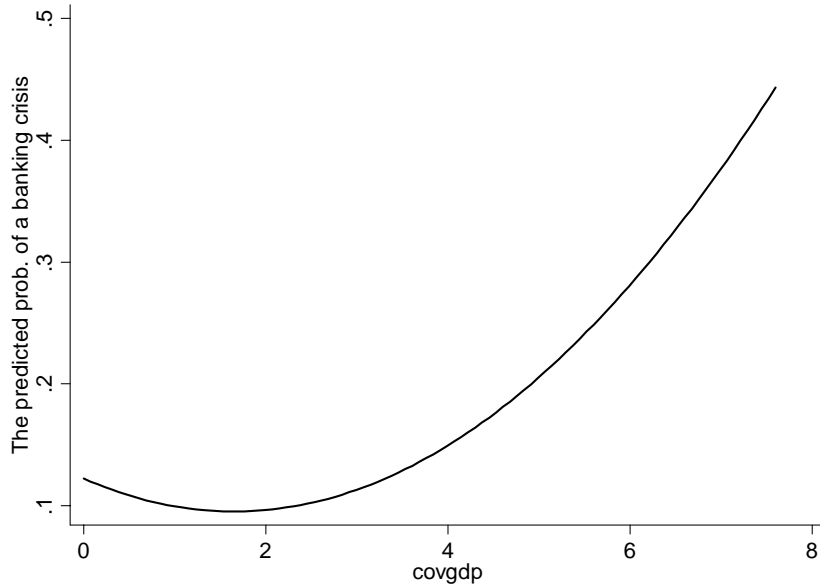


Fig 2b. Explicit deposit insurance coverage measured as comprehensiveness in terms of deposit types (range 1-4).

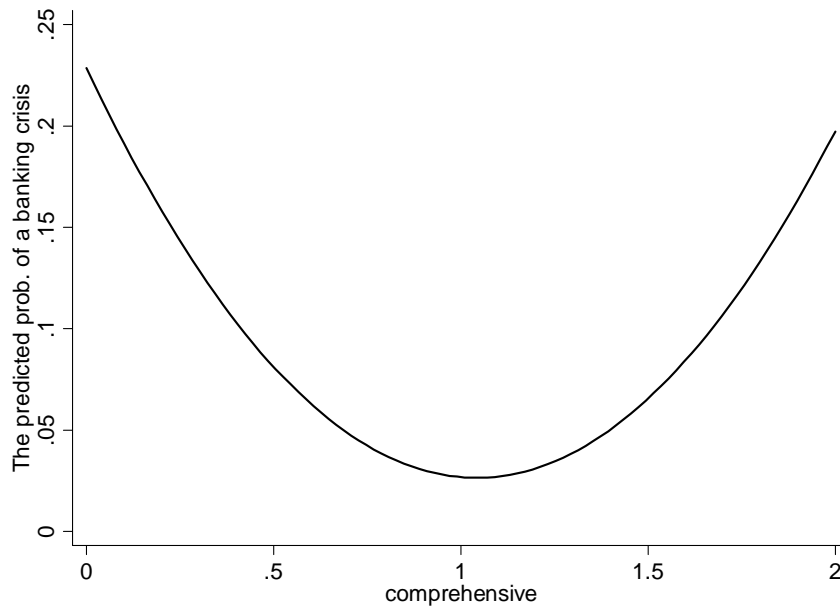
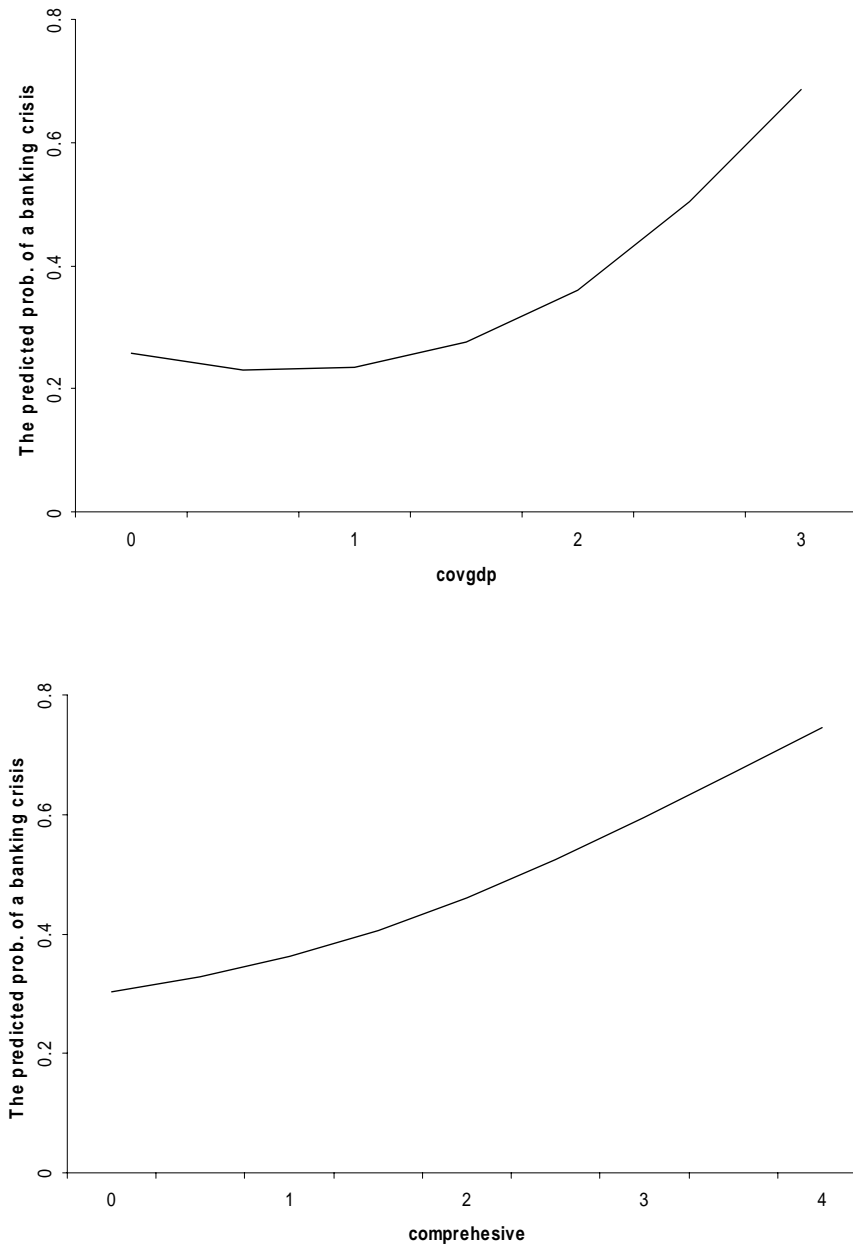


Figure 3. The Predicted Probability of Banking Crises and the Coverage of Explicit Deposit Insurance. Eastern European Countries Based on Coefficient Estimates for Emerging Market Economies in Angkinand and Wihlborg 2005



Note: 1.) Eastern European countries include Estonia, Hungary, Lithuania, Poland, Slovakia Republic, and Slovenia. The predicted values are estimated based a sample of 35 emerging market economies.
 2.) Covgdp is the ordinal data of deposit insurance coverage to GDP per capita. The value of this variable is assigned based on a value of the coverage to GDP per capita ratio, which is equal to 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.
 3.) Comprehensive DI variable is the summation of four dummy variables:

