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**Deposit Insurance, Institutions and Bank Interest Rates**

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# Deposit Insurance, Institutions and Bank Interest Rates<sup>1</sup>

by

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## Abstract:

Many recent institutional reforms of the financial system have relied on the introduction of an explicit scheme of Deposit Insurance. This instrument aims at two main targets, contributing to systemic stability and protecting depositors. However it may also affect the interest rate spread in the banking system, which can be viewed as an indicator of market power in this financial segment. This paper provides an empirical investigation of the effect of deposit insurance and other institutional and economic variables on bank interest rates across countries. We find that deposit insurance increases the lending borrowing spread in banking. The main effect seems to arise not from the deposit side though, but from an increase in the lending rate. We interpret this result as evidence of the presence of moral hazard problems related to this instrument. We also find that higher quality of institutions is associated with lower spreads, thus contributing to eroding sources of market power in the banking sector.

Keywords: Deposit Insurance, Institutions, Interest Rates

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## **1. Introduction.**

An explicit system of Deposit Insurance may be defined as the instrument through which the banking system guarantees that funds deposited by the public in a bank are independent of solvency and liquidity conditions of the bank itself, so that depositors may be sure of being reimbursed at any time. Recently, much attention has been given in the economic literature to the role of legal, political and regulatory institutions as important determinants of the evolution in both the financial structure and efficiency as well as the macroeconomic performances of one country. In the aftermath of the many banking and financial crises that have shaken the world in the last two decades, many institutional reforms of the financial system have relied on the introduction of an explicit scheme for deposit protection. This particular instrument aims at two main targets, contributing to systemic stability and protecting depositors. However it also affects the interest rate spread in the banking system, which may be viewed as an indicator of market power in this financial segment.

This paper provides an empirical investigation of the effect of deposit insurance and other institutional and economic variables on bank interest rates across countries. Hence, it adds to a starting but growing literature devoted to test different hypothesis regarding the effects of deposit insurance on the stability of the banking system, on market discipline, and on the development of large and efficient financial markets (see Demirguc-Kunt and Kane, 2002, for a survey). It is also related to the literature on the deep determinants of economic growth, which emphasizes the role of institutions as a driving force of economic development. In this paper, we focus on the role of institutions and institutional quality on bank interest rates, which are in turn important determinants of investment and consumption choices.

We start by discussing the role of explicit deposit insurance in the financial safety net as well as the peculiar features of different deposit insurance schemes across countries. We review both the theoretical literature and the empirical evidence on the topic. We then move to investigate how deposit insurance is likely to affect interest rates in the banking sector. We collect data on different economic and financial variables, as well as institutional indicators, for a set of 80 countries. The obvious starting hypothesis to test is how deposit insurance affects the lending borrowing spread in banking. One would expect that deposit protection should raise the spread by mainly affecting the deposit rate (negatively). We do find a positive effect of deposit insurance on the spread, but when we move to study the reaction of its components we find that the main effect seems to arise from an increase in the lending rate. We interpret this result as coherent with the large theoretical literature that underlines the presence of relevant moral hazard problems related to this instrument.

We also find that higher quality of institutions lowers lending borrowing spreads, thus contributing to eroding sources of market power in the banking sector. In our estimations, higher quality of institutions reduces both lending and deposit rates, although the impact is stronger on the former.

The paper is organized as follows. In Section 2, we describe the main features of an explicit scheme of deposit insurance. In Section 3, we review the theoretical and empirical literature on deposit insurance and we discuss how this instrument can contribute to reach the targets of systemic stability and protection of depositors. After focusing on some recent papers that have started to produce empirical evidence on the effect of deposit insurance on the structure, efficiency and stability of the financial system, in Section 4 we present our international dataset and we state the hypothesis that we wish to test empirically. The results of our empirical investigation are given and discussed in Section 5, while in Section 6 we summarize and conclude.

## **2. Deposit Insurance Across Countries.**

In spite of the relevant problems linked to deposit protection and discussed below, most advanced countries have adopted an explicit scheme of bank deposit insurance. Recent surveys conducted by the IMF and the World Bank show that Deposit Protection is currently and explicitly a crucial component in the financial safety net of 72 countries around the world (Garcia, 2000). The financial crises experienced in the 80s and the 90s have surely contributed to the diffusion of explicit systems of deposit insurance in recent times: for example, 30 of the 72 countries mentioned in the study cited above have introduced explicit deposit protection in the 90s (49 in the last two decades) and 33 countries have reformed their schemes in the same period. Besides being an obvious concern for policy makers and regulators, the topic is also widely discussed among academics: the economic literature is rich of both theoretical and empirical papers devoted to deposit insurance, following the seminal works of Bryant (1980) and Diamond and Dybvig (1983). However, in the literature, much less enthusiasm for this instrument can be found with respect to the one observed in practical implementations.

Explicit Deposit Protection may be designed to achieve different policy targets. However, the two main objectives are consumer protection and macroeconomic stability. It is argued that small depositors have to be (preferably partially) insured against losses, as they lack the ability to monitor the banks where they place their money. Furthermore, they have to be provided with a mechanism to quickly recover the funds they are supposed to use for transactions. In addition, given the strong links among banks due to the working of the payment system and the management of monetary policy, it is necessary to avoid or at least minimize the risk that a bank failure spreads out fears of financial contagion in the system, inducing depositors to withdraw their funds even from safe and

solid banks (bank runs). Deposit Protection is hence viewed as an essential component in the financial safety net, together with the lending of last resort provided by the central bank, standard banking regulation and supervisory controls.

Deposit Protection is not offered homogeneously to depositors across countries, as underlined by the investigations performed at the IMF and the World Bank.<sup>2</sup> The currently adopted schemes differ widely with respect to many dimensions. Deposit Insurance is surely a function of public interest. But its provision can be assigned either to a public or to a private (or mixed) agency. Participation to the system can be mandatory or voluntary, and financial resources devoted to payouts can be collected via ex-ante contributions or by raising funds only when needed (ex-post). The Deposit Insurer can be given only the task of reimbursing depositors or can be assigned a broader mandate and participate to information collection, crises management and supervisory activities in the banking sector. Only some categories of deposits can be insured - or all types, and each deposit account or each depositor can be eligible for partial or full payout.

Obviously, the nature and backing (public/private/mixed) of the scheme shapes the kind of mandate and powers that are given to the protection scheme. In advanced countries<sup>3</sup>, supervisory powers are usually not assigned to deposit insurers, the most relevant exception being the FDIC in the United States. In the same countries, participation to a system of deposit protection is normally compulsory. This avoids serious adverse selection problems linked to voluntary participation. In some countries (including Germany and Spain) more than just one scheme is active, but it is not always the case that banks are free to choose their insurer simply as a result of competition: actually, in most countries the market is segmented ex-ante, with certain types of institutions (cooperative or local banks) being obliged to use a system and other types adopting a different scheme.

A protection system is sounder where the number of insured institutions is higher and where the banking sector is less concentrated, as the payouts for a failed bank can be spread on a considerable number of institutions of adequate size. In countries where a few banks have high shares of the market, the failure of a large player can result in excessive burden for other participating members. At the end of 2000, Japan was the only country where deposit protection was complete, that is no limit was established for reimburses to depositors. This was done as an emergency measure, and remained in place until April 2002. Partial insurance was provided by all other countries, with Mexico, the US and Italy offering particular generous protection to depositors (respectively, 100,000 dollars and 100,000 Euro).

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<sup>2</sup> See Garcia (2000) and Demirguc-Kunt and Sobaci (2001). Table 1, in the appendix, provides a summary of the main characteristics of deposit protection across countries.

<sup>3</sup> See also the recent study of the Italian Interbank Deposit Fund (FITD, 2001).

A major difference among the currently active deposit protection schemes is relative to the contribution system. This can be based on ex-post payouts or through raising a fund which is established and managed before crises arise. In this case, ex-post contributions are only asked in order to re-establish the desired level of the fund after interventions, or in case payouts exceed the available funds. Clearly, the existence of a fund makes it quicker and easier reimbursing depositors. It also contributes to increase confidence in the protection scheme and in the banking industry. The appropriate dimension of the fund level depends on the amount and the types of insured deposits. Obviously, all countries where a fund has been raised face the important problem of managing it in such a way to balance the trade off between the objective to minimize ex-post reintegration following future payouts (that is, maximizing its expected return) and the objective to count on a safe, quick and easy to use amount of funds for immediate needs. In the practice, most countries seem to rely heavily on the bond market (more than on either cash or stocks), where the previously quoted trade off may be optimized.<sup>4</sup>

### **3. Do we need Deposit Insurance? Theory, Evidence and Discussion**

Deposit insurance clearly introduces a different treatment of (some) bank deposits with respect to all other financial activities where saving can be allocated. It has the consequence of putting in a situation of comparative disadvantage other financial intermediaries with respect to banks, and, inside the banking sector, it favours deposit collection vis a vis other bank liabilities.

Deposit protection involves a typical problem of moral hazard, providing more incentives for bank managers to undertake risks. Moreover, a moral hazard problem affects also depositors' behaviour: by relying on the full reimbursement of their deposits' nominal value, they have no interest in choosing a specific bank, nor are they interested in monitoring banks.<sup>5</sup> This moral hazard problem increases when the insured quota of bank deposits is higher and is one of the main theoretical arguments put forward by the opponents of explicit systems of deposit insurance.

Indeed, the first theoretical papers on deposit insurance were kind of optimistic. Diamond and Dybvig (1983) were the first authors to explicitly model bank runs as liquidity crises. In their model deposit insurance could prove useful in eliminating the sunspot equilibrium inducing a bank run. However, bank assets were totally riskless in their analysis and runs driven only by exogenous expectations, with the consequence that the role of deposit insurance is not clearly different from the one of lending of last resort. On the other side, Goodhart (1999) underlines that pure liquidity

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<sup>4</sup> See FITD 2001.

<sup>5</sup> Even Deposit Protection Agencies may pose moral hazard problems, especially in the case of a public system. Managers, in order to maintain their position, could be more interested in implementing forbearance policies than in a prompt solution of the crisis, as their target would simply be to avoid bank failures during their term of tenure.

crises do not exist in the modern world, but do only mask solvency crises. If this view is accepted, then the role of deposit insurance and lending of last resort may be better defined. As a matter of fact, it is the lending of last resort function that has to deal with the possible threats to systemic stability posed by the working of the payment system, the interbank market and the use of derivatives. Systemic stability is not so much threatened by retail deposits, to which deposit protection is normally limited.

This view is shared by Di Giorgio and Di Noia (2002) who, in order to rationalize whether and how deposits should be given protection, start by analyzing the role of the two main targets usually assigned to explicit deposit insurance (i.e. protection of depositors and systemic stability). These authors observe that no consensus has been reached on which target is more relevant, the reason being also that such targets seem mutually inconsistent. On one side, the objective of depositors' protection excludes interbank deposits from coverage if the target is to provide insurance mainly to small and naïve investors who are not able to monitor banks. On the other side, systemic stability is at risk mostly because of the strong interbank links in the payment system and in monetary policy operations. This ambiguity may be dangerous, as it is the practical managing of deposit protection schemes when it tries to simultaneously protect the system from the threat of financial contagion after a banking crisis and, at the same time, tries to avoid subsidizing bank risk taking that encourage imprudent choices and banking practices. The clear objective of deposit protection should be what is exactly and explicitly stated in its name, providing depositors with a safe way to transfer resources over time while keeping their immediate liquidity.<sup>6</sup> The objective of macroeconomic financial stability can be pursued with a full set of other tools, including fiscal policy, reserve and capital requirements, lending of last resort; the objective of microeconomic stability, that is avoiding bank failures, maybe, is simply wrong.

But why deposits or depositors have to be protected? Sight deposits have been considered “special” as they combine certainty of nominal value with immediate liquidity (shares of money market mutual funds are also very liquid, but they are market priced). This justifies lower or even zero return in terms of interest earned. But, are these features not compatible with risk? It is quite difficult to sustain such a thesis. The other traditional reason to consider deposits as a “special” asset is linked to their important role in funding bank loans. If bank loans are a “special” source of finance, because of their informational content and because sometimes they are the only source of funding for bank dependent firms, then deposits should also be viewed as particularly relevant in the economy. However, bank loans can be equally (and actually are) funded via other bank liabilities, such as bonds or Certificates of Deposits. Moreover, bank loans are also always less

“special”, since they can be re-organized and more or less easily liquidated through securitization. If one agrees with such arguments, then the only rationale to protect private sight deposits is to assume that their special feature of combining immediate liquidity with nominal value certainty makes them a natural target also for naïve and unsophisticated investors. And such investors would deserve strengthened protection with respect to the general level of protection given to all kind of savings.

Private holders of sight deposits should then be given protection essentially because it would be probably impossible, or extremely costly, to prove in court who is a sophisticated investor and who is not (hence becoming eligible for reimbursement). Hence, Di Giorgio and Di Noia (2002) arrived to a practical motivation for deposit protection, which is linked to the right objective of protecting uninformed and naïve savers. But they also underline that no solid theoretical reason exists to justify this practical solution.<sup>7</sup> In addition, one may also notice that this argument was surely more valid at times in which the financial system was less developed and financial culture and information much more limited. It is less applicable today, as banks are always less special as collectors of savings and investors always more sophisticated, as it is witnessed by the boom in mutual and pension funds, life insurance and direct equity trading that characterize OECD countries.<sup>8</sup>

However, if this practical rationale for deposit protection is accepted, what kind of features should a modern insurance scheme have in advanced industrial countries?<sup>9</sup> Here, the main objective is to deal with the moral hazard problems mentioned above and underlined especially by Benston and Kaufman (1998) and Calomiris (1999). The following broad guidelines can be suggested.

First, the costs of deposit protection should be at least partially borne by the industry, and the scheme should then be either privately managed or “mixed”. This provides the correct incentives for bankers to maintaining soundness and avoiding participants to pay the costs of bank failures (not the case when the burden is entirely put on taxpayers’ shoulders). However, a mixed scheme is to be preferred as a totally private one is less credible in the case of financial contagion, as it may lack the resources to back the obligations of a large number of banks. Some form of government guarantee or a special credit line open with the central bank is hence desirable.

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<sup>6</sup> For an opposite view, see Santomero (2001), who argues that the main target should be that of macroeconomic stability.

<sup>7</sup> Kocherlakota (2000) has a model in which deposit insurance is efficient in providing insurance against realizations of adverse aggregate shocks to the value of collateral required in debt contracts. The result however is not fully generalizable.

<sup>8</sup> We could also go further and sustain an even more provocative argument. Often, the existing Deposit Protection Schemes do not even really provide “insurance” to depositors in the sense that they reimburse the funds after a bank crisis. And this happens because the intervention of the Protection scheme is often intended to solve the crisis in a way different from the simple failure and closing of a bank, thus pursuing the wrong target of microeconomic stability (at least, this seems to emerge from some answers to the FITD Survey mentioned above).

Second, blanket coverage is clearly not an efficient solution under normal circumstances, as it increases the moral hazard problems already linked to deposit insurance. In theory, explicit limited coverage is to be preferred to full insurance as it provides incentives to monitor bank behavior. The same task could be pursued via a mechanism of coinsurance, where each depositor is reimbursed only up to a certain percentage of his credit. In any case, the amount of coverage should not be too high if the main object of protection is the small and naive investor. Insurance should be excluded for selected types of deposit accounts, as inter-bank deposits, government deposits, illegal deposits or deposits that are given higher rates of return.

Summing up, an ideal protection scheme should provide limited but extensive coverage. That is, most depositors should be protected, but the level of individual protection should not be excessive<sup>10</sup> in order to induce wealthier depositors (who are supposed to be more sophisticated and informed) to monitor banks, thereby actively participating to supervision and reinforcing market discipline.

Third, protection should be given according to a proper mechanism of ex-ante contribution by banks, where the insurance premiums should explicitly be risk-weighted.<sup>11</sup> It is essential that the premia be paid for each additional deposit, although the required premia may be lowered once the level of the fund has reached a certain dimension with respect to the amount of insured deposits. Such dimension might be established according to the best practice of OECD countries in the last two decades; this leads to a coverage ratio that should be around 1 or 2 %. In order to correctly measure risks, it would be desirable to adopt methods at least broadly coherent with those envisaged by the New Basel Framework for Capital Adequacy. Risk classes should hence be function of both the solvency ratio and other indicators of bank liquidity and deposits' volatility.<sup>12</sup>

Fourth, it is essential to have the general public aware of the existence and the extension of deposit protection. This might call for a campaign of advertising jointly conducted by the banking supervisory agency and the banking industry.

Finally, it is important to establish appropriate institutional relationships between a deposit guarantee scheme and other banking supervisory agencies and political bodies. The deposit protection agency should have absolute political independence. Economic independence will be

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<sup>9</sup> We do not investigate here the different features that should be adequate for low developed or emerging countries.

<sup>10</sup> The recent FDIC proposal to raise individual protection up to 200,000 dollars in the USA goes, in our view, in the wrong direction.

<sup>11</sup> It is interesting to note that in a very recent contribution, Boyd, Chang and Smith (2002) develop a general equilibrium analysis of deposit insurance programs and obtain results that are not fully consistent with some of the above suggested guidelines. For example, in their paper, actuarially fair pricing of deposit insurance is not always desirable, while some bank subsidization is. Also, not necessarily large losses of the deposit insurance agency are bad in terms of welfare, neither risk-based deposit insurance premia are always good to reduce moral hazard.

<sup>12</sup> Subordinated debt may be an additional effective method to ensure a certain degree of market discipline. The evaluation of risks by subordinated debt owners may be reflected in the structure of subordinated interest rates. The guarantee scheme might consider such rates as a useful indicator for pricing insurance premia, as well as an indicator of the bank's solvency.

provided by ex-ante contributions. It should have limited supervisory powers, and should participate to the decisional process about intervention, working in close collaboration with the banking supervisory agency. It would be interesting to evaluate whether merging the banking supervisory agency with the deposit protection agency would be desirable. The deposit protection agency should be accountable to the banking supervisory agency, to the industry and to the agencies responsible for customer protection. The board of the agency should include “independent” administrators, with the explicit task of safeguarding the interest of private depositors.

The presence and the features of an explicit system of deposit insurance does also affect the banking system with respect to its competitive structure and to bank profitability.

It helps smaller banks in attracting depositors and hence limit pressures towards higher and excessive concentration. In absence of deposit protection, depositors would be more willing to deal with big banks, as these are expected to be too big to fail and to receive implicit insurance from either the central bank or the government.

Besides, it may affect both lending and deposit interest rates, and the bank interest rate spread which may be viewed as either an indicator of market power or of profitability in this financial segment. Deposit rates can be affected because deposit protection raises demand for deposits and contributes to lower their equilibrium required rate of return. Lending rates may be affected directly through a change in the incentives for lending policies associated to higher moral hazard problems linked to the existence of deposit insurance, and indirectly through the effect on the competitive structure of the banking system.

This paper provides an empirical investigation of the effect of deposit insurance on bank interest rates. Hence, it aims to contribute to a starting but growing empirical literature on the effect of deposit insurance on banking and financial systems. Such empirical literature stems from the projects undertaken at the IMF and the World Bank and directed at constructing international databases that could prove useful for this scope. A survey of the first results obtained is presented in Demirguc-Kunt and Kane (2002).

Maybe, the most important empirical work in the field is the one by Demirguc-Kunt and Detragiache (2002), who show that moral hazard matters. Indeed, these authors use data from 61 countries in the 1980-1997 period and find that the presence of an explicit deposit insurance scheme increases the likelihood that a country will experience a banking crisis. They estimate a model in which the dependent variable is the probability of a country experiencing a banking crisis and include in the regressors a set of controlling variables and a dummy variable relative to the presence of deposit insurance. The coefficient of this variable is generally positive (although not always significant at the standard 95% confidence level). Moreover, when they introduce among the

regressors some proxies for the quality of institutions, they find that the positive contribution of deposit insurance to bank fragility is strong and determinant only in countries where the institutional setting is very poor. The result does not hold in countries with stronger institutional and regulatory environments.

A negative effect of explicit deposit protection on the development and efficiency of the financial system (also when coupled with poor institutions) is found in the work of Cull, Senbet and Sorge (2002) and in Laeven (2002) and Demirguc-Kunt and Huizinga (2001). In particular, the first paper finds that the establishment of a scheme for deposit protection retards the development of financial markets and of financial depth in general, while the other two papers show that it reduces market discipline in the sense of lowering banks' interest rate expense and making it less sensitive to bank risk and liquidity.

In the next section, we will address the question of how deposit insurance affects international bank lending borrowing spreads and interest rates.

#### **4. Deposit insurance, institutions and bank interest rates: data and hypothesis to test**

##### *4.1 Data*

We collect data on economic and financial variables, as well as institutional indicators, for a set of 80 countries listed in the data appendix (all OECD countries plus other selected Central and Eastern European, Latin American, Mid-East, African and Asian countries). Control variables that were originally a time series have been transformed into a single observation by computing the arithmetic mean over a period of five years (1996-2001). The sample has been chosen in order to get consistency with deposit insurance data availability, and its length selected because most business cycle effects are likely to become negligible across five years. The sample size varies (from 47 to 80 observations) according to the control variables included in the regression, and it was further adjusted when needed to match non-missing data and to exclude outliers.

Data were drawn from a few different sources: deposit and lending rates, a government bond yield, the inflation rate, nominal and real GDP growth are taken from the IMF International Financial Statistics. The real GDP growth has been computed from the GDP volume index (based =100 in 1995), while the inflation rate from the consumer price index. GDP per capita has been drawn from National Statistics.

The institutional quality indicators are the Rule of Law index and the Hall & Jones index. The former is taken from Kaufmann, Kraay and Zoido-Lobaton (2002), and summarises "in broad terms the respect of citizens and the state for the institutions which govern their interactions". It includes "several indicators which measure the extent to which agents have confidence in and abide by the

rules of society. These include perceptions of the incidence of both violent and non-violent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts. Together, these indicators measure the success of a society in developing an environment in which fair and predictable rules form the basis for economic and social interactions.”. The Rule of Law index is measured on a [-2.5, +2.5] scale.

The Hall & Jones (1999) index is a measure of social infrastructure across countries proxying for “the wedge between the private return to productive activities and the social return to such activities”. It combines an index of government anti-diversion policies<sup>13</sup> with an index of the openness of a country to trade with other countries<sup>14</sup>, which are equally weighted so that the index is measured on a [0,1] scale.

The deposit insurance dummy assigns the value of one to countries where there is an explicit deposit insurance protection system and the value of zero to countries where there isn't. It is taken from Barth, Caprio and Levine (2001), together with the information about a deposit insurance limit per account or per person: this limit has been evaluated in US dollars and considered both as a continuous variable and as a dummy variable (the latter being 1 if the limit is larger or equal to 20 thousands US dollars and 0 otherwise). As regards the features of the deposit insurance protection system we considered also data on the existence of coinsurance: a variable named *coinsurance* has thus been created, taking on the value one “if depositors face a deductible in their insured funds”<sup>15</sup> and zero otherwise. From the same source we drew data on the funding of the deposit insurance scheme: the variable *funding* takes on the value of one if the scheme is funded ex ante and zero otherwise.<sup>16</sup>

Moving to financial structural variables, data about the concentration of the banking sector were taken from Beck, Demirgüç-Kunt and Levine (1999): the variable *concentration* is the ratio of the three largest banks' assets to the total banking sector assets. A highly concentrated commercial banking sector might result in lack of competitive pressure to attract savings and channel them efficiently to investors.

Data relating to a bank-based versus-a market based financial system are taken from Levine (2002): the variable *structure activity* measures the activity of the stock market relative to that of banks,

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<sup>13</sup> It is focused on the government's role in protecting against private diversion and the government possible role as a diverter. So it includes a measure of law and order, of bureaucratic quality, of corruption, risk of expropriation and government repudiation of contracts.

<sup>14</sup> It is the Sachs and Warner index that measures “the fraction of years during the period 1950 to 1994 that the economy has been open”, according to the satisfaction of specific criteria: nontariff barriers cover less than 40% of trade, average tariff rates are less than 40%, any black market premium was less than 20% during the 1970s and 1980s, the country is not classified as socialist, and the government does not monopolize major exports.

<sup>15</sup> The source is Demirgüç-Kunt and Detragiache, 2002.

<sup>16</sup> As in Demirgüç-Kunt and Detragiache, 2002.

where the former is the total value traded ratio<sup>17</sup> and the latter the bank credit ratio<sup>18</sup>. Structure activity equals the logarithm of the total value traded ratio divided by the bank credit ratio. The variable *structure aggregate* is a “conglomerate measure of financial structure based on activity, size, and efficiency. Specifically structure-aggregate is the first principal component of structure-activity, structure-size<sup>19</sup> and structure-efficiency<sup>20</sup>. Thus structure-aggregate is the variable that best explains (highest joint R-square) the first three financial structure indicators” (Levine, 2002).

Summary statistics of our dataset are provided in the data appendix.

#### 4.2 Hypothesis to test

We want to investigate how deposit insurance affects the lending borrowing spread in banking. One would expect that deposit protection should raise the spread by affecting the deposit rate (negatively). The presence of explicit protection makes deposits safer and may thus lower deposit rates. However, if the moral hazard view is right, deposit protection may also affect the lending rate (positively). In fact, explicit deposit insurance could induce bank managers to lend to riskier firms, thus requiring on average higher interest rates for the loans provided. So, the hypothesis to test are:

H1) Explicit deposit insurance raises the lending borrowing spread.

H2) The effect stems from a reduction in the deposit rate.

H3) The effect is driven from an increase in the lending rate.

In order to investigate whether some features of the deposit protection scheme have the desired effect of lowering the moral hazard problems implicit with deposit protection, we also test whether in countries with an explicit deposit insurance scheme, providing coinsurance or limited coverage to depositors has an effect on bank lending and deposit rates. The hypothesis to test here would be the following:

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<sup>17</sup> Which equals the value of domestic equities traded on domestic exchanges divided by GDP. This ratio is frequently used to gauge market liquidity because it measures market trading relative to economic activity. See Levine, 2000.

<sup>18</sup> Which equals the value of deposit money bank credits to the private sector as a share of GDP. See Levine, 2000.

<sup>19</sup> Structure-Size is a measure of the size of the stock market relative to that of banks. The size of the domestic stock market is the market capitalization ratio, which equals the value of domestic equities listed on domestic exchanges divided by GDP. The size of banks is the bank credit ratio. Thus structure-size equals the logarithm of the market capitalization ratio divided by the bank credit ratio. See Levine, 2000.

<sup>20</sup> Structure-Efficiency is a measure of the efficiency of the stock market relative to that of banks. The efficiency of the stock market is proxied by the total value traded ratio since it reflects the liquidity of the domestic stock market, while the efficiency of the banking sector is proxied by overhead costs, which equals the overhead costs of the banking system relative to banking system assets. Structure-Efficiency is the logarithm of the total value traded ratio times overhead costs. See Levine, 2000.

H4) The introduction of limited coverage or coinsurance increases deposit rates because reduces protection.

H5) The introduction of limited coverage or coinsurance reduces lending rates because stimulates depositors to more effectively monitor bank lending policies so as to reduce excessive risk taking.

If H4) and H5) were both accepted, we should then obtain a reduction in the bank spread of those countries where the explicit deposit insurance scheme exhibits such features.

## **5. Estimation and Results**

We estimate the effect of deposit insurance, institutional quality and other economic and financial variables on bank interest rates through simple OLS regressions. Our benchmark equation is:

Dep. Variable = Constant +  $\alpha_1$ (Controls) +  $\alpha_2$  (Deposit Insurance) +  $\alpha_3$  (Institutional quality) + error term

where the dependent variable is either the banking spread or one of its component (deposit or lending rate). The macroeconomic controls we use are: inflation, GDP per capita and real gdp growth. The bank-specific structural variables are: concentration of the banking sector and an indicator of the financial structure. We also include an index of institutional quality. Other explanatory variables taken into account are the existence of limited coverage or of coinsurance and the type of funding system (ex ante – ex post) in the deposit insurance scheme, and an index of creditor rights.

We expect the lending borrowing spread to increase if an explicit deposit insurance scheme is adopted, when controlling for structural variables. An explicit deposit insurance scheme should in fact reduce deposit rates because it makes deposits safer. We do actually find a positive effect of deposit insurance on the spread, but when we move to study the reaction of its components we find that the main effect seems to arise from an increase in the lending rate. We interpret this result as coherent with the large theoretical literature that underlines the presence of relevant moral hazard problems related to this instrument. We also find that higher quality of institutions lowers lending borrowing spreads, thus contributing to eroding sources of market power in the banking sector. In our estimations, higher quality of institutions reduces both lending and deposit rates, although the impact is stronger on the former.

In *Table 1* we report results of different estimated versions of our benchmark regression, where we added or changed explanatory variables one at a time in order to control for the marginal impact of each additional variable with respect to the baseline model (equation 1).

The first column shows that even a few basic variables manage to explain more than 60% of the variability in the spread: all the estimated coefficients but the constant term are strongly significant. The marginal effect of deposit insurance is positive, as expected, and significant at 98.5% confidence level. The point estimate indicates that the introduction of an explicit deposit insurance scheme raises the spread by almost 2 percentage points.

As regards the structural variables, an increase in the concentration of the banking sector, increasing market power of the largest banks, significantly raises the spread. The effect of inflation is positive and strongly significant, thus implying that an increase in the inflation rate is unequally transferred to the two categories of agents a bank has to deal with: the spread increases as inflation gets higher, thus suggesting that banks charge their lenders higher prices because of the loss of purchasing power, but do not symmetrically compensate their depositors for such loss.

*Table 1*

	eq_01	eq_02	eq_03	eq_04	eq_05	eq_06	eq_07
<b>Dep.Var:</b>	spread	spread	Spread	Spread	Spread	spread	spread
Indep. Var.s:							
C	0.017 (0.011)	0.063 (0.018)	0.012 (0.011)	0.019 (0.011)	0.037 (0.012)	0.049 (0.012)	0.032 (0.012)
INFL	0.153 (0.039)	0.197 (0.039)	0.157 (0.056)	0.138 (0.039)	0.047 (0.059)	0.043 (0.038)	0.070 (0.056)
CONC	0.051 (0.016)	0.048 (0.018)	0.054 (0.016)	0.060 (0.017)	0.041 (0.018)	0.043 (0.018)	0.046 (0.015)
RLAW	-0.022 (0.004)		-0.030 (0.008)	-0.024 (0.004)	-0.030 (0.005)	-0.032 (0.006)	-0.020 (0.007)
DEPINS	0.019 (0.007)	0.021 (0.008)	0.016 (0.009)	0.016 (0.007)	0.017 (0.008)	0.017 (0.008)	0.016 (0.009)
HJ		-0.083 (0.022)					
GDPCAP			7.30E-07 (0.000)				
SAGGR					0.005 (0.004)		
SA						0.005 (0.003)	
CRED							-0.003 (0.003)
GROWTH				-0.057 (0.039)			
Adjusted R squared	0,603	0,539	0,611	0,623	0,61	0,617	0,499
n.observations	54	54	54	53	41	41	39

Standard errors in parenthesis.

The institutional quality indicator is also strongly significant and shows that an increase in the Rule of Law index, which is orientated so that higher values correspond to better outcomes, shrinks the spread. An institutional and legal environment that ease authority exercise, supports productive activities and protects output of productive units from diversion seems to encourage banks efficiency and to contribute to eroding market power in lending. The intuition behind this follows from the fact that a more favorable and stable financial and legal environment provides the right incentives to accumulation of capital, skill acquisition, invention and technology transfer, while allowing agents to save considerable resources dedicated to these activities.

These basic results are confirmed by the second regression, in which we use the Hall and Jones index of institutional quality in place of the Rule of Law and in all the other five exercises where we have allowed for an extension of our benchmark regression. Equations 3 and 4 show that the introduction of additional macroeconomic controls, as GDP per capita or real growth, does not play much a role in explaining market power in the banking sector.<sup>21</sup> Equation 5 and 6 show that the introduction of a variable that measures the financial structure of a country (SA or SAGGR), that is whether a country's financial system is more or less market oriented, has very limited explanatory power. Moreover, it eliminates the contribution of inflation to the regression, most likely because this variable is highly correlated with the new ones (given that they include the total value of assets traded on the stock market). Finally, equation 7 provides a negative but statistically not significant coefficient for a variable measuring creditors' rights. In all these specifications, however the effect of deposit insurance and of institutional quality remains basically unchanged.

We then move to analyze where the effect on the banking rate spread is originated by estimating equations where the deposit and the lending rates are the dependent variables.

*Table 2* reports estimates of the deposit and lending rate regressions: observing the two at the same time sheds additional light on the sources of the dynamics of the bank spread described above.

An explanatory variable that is strongly significant in both specifications is the institutional quality index. The Rule of Law indicator enters the deposit equation with a negative coefficient, and a point estimate of considerable magnitude: an improvement in the social infrastructure index of one unit reduces deposit rates by more than 3 percentage points. However such social infrastructure indicator

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<sup>21</sup>Such result is not surprising if we consider the recent growth literature that sees institutional quality as responsible for both the levels and dynamics of GDP. Hall and Jones (1999) find out that social infrastructure is a key determinant of output per worker and economic growth, since it drives successful investments in physical and human capital and the high levels of productivity in using these inputs. Therefore the irrelevance of economic development as an explanatory variable may not be substantial: macroeconomic structure and performance may already be accounted for by the institutional quality index, which has been found to be strongly responsible for that.

ranges from  $-2.5$  to  $+2.5$ , so that a one unit increase reflects a radical change in the institutional and legal environment, that can probably be achieved only on a mid and long-term perspective. The lending equation, in second column, shows that the same one unit increase in the rule of law index reduces the lending rate by more than 5 percentage points, which is consistent with the overall reduction in the spread by approximately 2 percentage points.

Table 2

	eq_dep01	eq_lend01	eq_dep02	eq_lend02	Eq_dep03	eq_lend03	eq_dep_04	eq_lend04
Indep.Vars:								
C	0.090 [0.016]	0.107 [0.017]	0.166 [0.022]	0.229 [0.027]	0.069 [0.017]	0.130 [0.023]	0.068 [0.016]	0.114 [0.020]
INFL	0.383 [0.097]	0.481 [0.056]	0.425 [0.048]	0.582 [0.060]	0.481 [0.157]	0.402 [0.094]	0.474 [0.071]	0.398 [0.093]
CONC	-0.000 [0.020]	0.042 [0.024]	-0.001 [0.022]	0.037 [0.027]	0.029 [0.025]	0.058 [0.029]	0.030 [0.024]	0.056 [0.029]
RLAW	-0.031 [0.006]	-0.056 [0.006]			-0.032 [0.007]	-0.069 [0.008]	-0.033 [0.006]	-0.069 [0.008]
DEPINS	-0.010 [0.011]	0.020 [0.011]	-0.005 [0.010]	0.023 [0.013]	-0.010 [0.011]	0.017 [0.012]	-0.009 [0.010]	0.019 [0.012]
HJ			-0.137 [0.028]	-0.219 [0.034]				
SAGGR							0.003 [0.005]	0.009 [0.006]
SA					0.000 [0.003]	0.007 [0.005]		
Adjusted R squared	0,75	0,844	0,74	0,79	0,806	0,838	0,808	0,84
n.observations	55	53	55	54	42	41	42	41

Standard errors in parenthesis.

Concentration in the banking sector shows a negative and insignificant coefficient in the deposit equation, while positively affects the lending rate<sup>22</sup>.

The variable we are more concerned with is the deposit insurance dummy. We find that the main and obvious argument to explain the positive effect on the bank spread does not seem to be confirmed. The effect of the introduction of an explicit deposit insurance scheme is negative on the deposit rate, as we expected, but it is never statistically significant. Therefore, the effect of the introduction of a deposit insurance scheme on market power in the banking sector is not passing through deposit rates, despite deposits are made safer and thus require a smaller risk premium.

<sup>22</sup> At a 91% confidence level. The effect of Concentration on the lending rate is usually, but not always, statistically significant. We have maintained this variable only for coherence with the previous specification. As a matter of fact,

When we estimate an equation with the lending rate as the dependent variable, we find that the introduction of an explicit deposit insurance scheme plays a role: at approximately 90% confidence level, the introduction of deposit insurance raises lending rates by roughly 1.8%, which basically accounts for the whole change that explicit deposit protection induces on the spread. We interpret this finding as evidence of moral hazard problems induced by deposit insurance on banks' behavior, an issue often raised by economists in policy debates about the pros and cons of deposit insurance. Banks may actually be encouraged to finance high-risk projects (and thus pricing higher lending rates) when a deposit insurance scheme is introduced. This evidence is coherent with the results of Demirgüç-Kunt and Detragiache (2002), that showed how deposit insurance may lead to more bank failures; if banks take on risks that are correlated, systemic banking crises may also become more frequent<sup>23</sup>.

In light of this evidence, it is crucial to stress the role of institutions in order to reduce the possible adverse impact of deposit insurance on bank stability. In the lending rate regression, the rule of law coefficient is strongly significant and negative. As already noticed, an improvement in the quality of institutions and legal environment reduces the lending rate by more than 5 percentage points, thus showing that moral hazard can be controlled by a good social infrastructure. Where institutions are of high quality, so bank prudential regulation and supervision should be, thereby reducing gambling opportunities.<sup>24</sup>

Finally, we have investigated whether some particular features of the deposit insurance scheme do also affect bank rates in countries where an explicit system of deposit protection is in place.

In Table 3, we report our results. While the introduction of a dummy denoting the presence of limited coverage seems to have no effect on both the spread and its components<sup>25</sup>, we do find a (similar in magnitude) and positive (although barely significant) effect of coinsurance on the deposit and the lending rate (so that the spread is not affected). Our empirical evidence hence suggests that depositors do require higher rates when deposit protection is partial, but that they do not engage (or are effective) in monitoring bank risky lending.

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there is no clear motivation why concentration should have a significant effect on either deposit or lending rates when these variables are considered separately.

<sup>23</sup> See Demirgüç-Kunt, Detragiache, 2002.

<sup>24</sup> The message of the other equations in Table 2, where we have included SA and SAGGR as additional explanatory variables is similar, although the coefficient DEPINS becomes less significant.

Table 3

Dep Variables:	Spread	Dep.rate	Lend.rate	Spread	Dep.rate	Lend.rate
Indep. Vars:						
C	0.036	0.094	0.130	0.058	0.059	0.117
INFL	0.133	0.327	0.461	-0.003	0.368	0.364
RLAW	-0.029	-0.031	-0.060	-0.038	-0.035	-0.07
CONC	0.060	-0.013	0.046	0.052	0.015	0.067
DEPINSAMDUM	0.001	-0.005	-0.004			
COINSURANCE				0.002	0.017*	0.019*
Adjusted R squared	0.725	0.794	0.879	0.81	0.851	0.917
N.observations	42	42	42	31	31	31

In Italics coefficients that are not statistically significant

\* means that the coefficient is significant only at 85% (t=1,5)

### Robustness

The evidence in favor of a relevant influence of the deposit insurance on market power in the banking sector has passed different robustness checks. Each regression showed good diagnostic tests, that are available upon request. Residuals' distribution had the standard good features, so that maximum likelihood inference could be done.

Deposit insurance widens the bank interest spread in all our estimated equations. We also find strong and robust effects of concentration, inflation and institutional quality indexes, by adding to the benchmark regression a few other explanatory variables and checking that both the main qualitative and quantitative results of the baseline model continue to hold<sup>26</sup> (see Table 1).

Similar checks have been done with respect to deposit and lending rate regressions reported in Table 2. Here, results on deposit insurance are somehow more ambiguous. The positive effect on lending is obtained only at 90% confidence levels and does not hold when indicators of the financial structure are added to the specification. Results are more robust with respect to different indicators of institutional quality. However, although the qualitative information and the confidence level are basically unchanged, replacing Rule of Law with Hall & Jones, overall produces higher point estimates of the effect of institutional quality on interest rates' dynamics. This may be due to the different ranges of the two indexes.

<sup>25</sup> The same is true also if we use a continuous variable specifying the amount of limited coverage provided in different counties. We also did not find any effect of the type of funding on which the deposit insurance scheme is based on bank rates.

<sup>26</sup> See both Table 1 and 2 where different specification are shown, starting from the benchmark to the most unrestricted. Even by adding other explanatory variables, the key insights do not change.

## **6. Conclusions**

This paper is a contribution to the literature on the empirical effects of deposit insurance. After discussing pros and cons of the introduction of explicit deposit protection and the nice features that a desirable scheme should have, we provide an empirical investigation on the effect of deposit insurance and other institutional and economic variables on bank interest rates across countries. We find that the existence of an explicit deposit protection scheme is likely to increase the lending borrowing spread in the banking sector across countries. However, the effect seems to arise not from the deposit side, as one would expect given that deposit protection make deposits safer and hence allows banks to lower their remuneration, but mostly from an increase in the average lending rate. We interpret this evidence as suggesting the relevance of moral hazard problems induced by this instrument: deposit protection provides incentives to banks to engage in riskier lending activities to which on average higher loan rates are priced.

The only characteristics of the deposit insurance scheme that we find to have a (barely) significant effect on bank interest rates is the presence of a coinsurance provision. This is found to raise deposit rates and lending rates. While the latter effect is expected, the second seems to indicate that this provision is not effective in reducing moral hazard problems linked to bank lending activities.

Finally, we find that indicators of institutional quality have considerable explanatory power in all our regressions. Countries with good quality institutions tend to exhibit lower lending borrowing spread, with the reduction in the lending rate dominating the reduction in the remuneration of deposits.

### **Data Appendix**

#### Country List:

Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Cyprus, Denmark, Ecuador, Egypt, Finland, France, Germany, Ghana, Greece, Honduras, India, Ireland, Israel, Italy, Jamaica, Japan, Kenya, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Panama, Peru, Philippines, Portugal, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Trinidad & Tobago, Tunisia, Turkey, U.K., U.S.A., Zimbabwe, Armenia, Bahrain, Bangladesh, Bolivia, Bulgaria, China, Croatia, Czech Republic, Estonia, Guatemala, Hong Kong, Hungary, Iceland, Indonesia, Jordan, Korea, Latvia, Lithuania, Luxembourg, Malta, Nepal, Nigeria, Poland, Romania, Russia, Saudi Arabia, Singapore, Slovakia, Slovenia, Uruguay, Venezuela, Zambia.

### Data Summary Statistics:

<b>Description</b>	<b>label</b>	<b>mean</b>	<b>s.d.</b>
Lending deposit spread	<i>spread</i>	0.081	0.010
Lending rate	<i>lenrate</i>	0.019	0.018
Deposit rate	<i>deprate</i>	0.011	0.012
Inflation	<i>infl</i>	0.867	6.800
concentration	<i>conc</i>	0.588	0.208
institutional quality	<i>hj</i>	0.691	0.213
institutional quality	<i>rlaw</i>	0.484	0.913
deposit insurance dummy	<i>depins</i>	0.643	0.482
Coinsurance dummy	<i>coins</i>	0.583	0.498
limit coverage	<i>depinsamdum</i>	0.553	0.501
Growth	<i>growth</i>	0.059	0.170
GDP per capita	<i>gdpcap</i>	10336.005	11306.768
structure activity	<i>sa</i>	-2.004	1.160
structure aggregate	<i>saggr</i>	0.0002	0.999
creditors' rights	<i>cred</i>	2.297	1.365

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